

Whakatane Waimana Floodplain Management Strategy - Stage 2

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*Working with our communities for a better environment
E mahi ngatahi e pai ake ai te taiao*



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Cover Photo: *View upstream of Whakatane River at Rewatu Road taken during July 2004 floods*

Executive Summary

The underlying aim of floodplain management planning is to reduce the susceptibility/exposure to flooding to persons and property that exist within the scheme catchment.

Stage 1 identified and described the existing flood issues within the scheme catchment and assessed the risks associated with the theoretical failure of the urban stopbanks. The Stage 1 report concluded that service level requirements, as described in the asset management plan, are being met.

Based on feedback received to date on the Stage 1 report, scheme stakeholders appear to accept the current service levels and no change to these was anticipated. The low level of risk associated with stopbanks breaching was also accepted subject to the outcome of further confirmatory geotechnical tests.

The purpose of this Stage 2 report is to identify flood mitigation options for the issues that arose in Stage 1. As such this Stage 2 report agrees with the conclusion that no further increase in service levels be proposed however it does recommend some improvements. Key conclusions and recommendations arise primarily from the review of the Stage 1 tasks 5, 6, 10 and 18. These are summarised briefly below:

Task 5 – review of non-structural measures

- Flood maps for two low probability events provided in this Stage 2 report are to be given to Civil Defence to help them plan evacuation of residents from the Whakatane main urban area. Flood inundation maps are for the overtopping of Whakatane stopbanks in the 300 year “overdesign” event and a breach at Eivers Road in the 100 year flood event. It is emphasised that the two flood events are scenarios only.
- Environment Bay of Plenty would use its Whakatane building to manage a Level 4 (Regional) Civil Defence emergency. Owing to vulnerability of the building’s power supply and telecommunication network in the event of a severe natural hazard EBOP should investigate acquiring a back-up building so staff can fulfil its emergency duties with minimal disruption.
- Flood maps provided in this floodplain management strategy (FMS) will assist Whakatane District Council (WDC) identify and avoid planning urban development in potentially floodable areas.

Task 6 – hydraulic modelling assumptions

- Review of hydraulic modelling assumptions show that maintaining the Whakatane River mouth spit to the agreed Environment Bay of Plenty/Whakatane District Council level is crucial to ensure design flood levels comply with service level requirements.
- House raising and relocation may provide a more cost effective alternative to building new stopbanks to protect stakeholders property against inundation in Upper Whakatane and Waimana. Further detailed studies are underway in Upper Whakatane to compare 100 year flood levels with actual floor levels. A similar study is recommended for Waimana. House relocation is more advisable where there is not safe access/egress to the building during floods.

Task 10 – geotechnical investigations on Whakatane stopbanks

- Additional geotechnical investigations carried out in this Stage 2 confirm the results of the stopbank risk assessment carried out in Stage 1. Risk is therefore considered to meet engineering standards.

Task 18 – home and contents insurance

- Homeowners in the catchment that do not have home and contents insurance should be encouraged to purchase policies to qualify for Earthquake Commission (EQC) assistance.

Since current service levels are adequate and risk associated with the urban stopbanks is considered adequate future flood mitigation should focus on maintaining and improving existing structural and non-structural measures. A comprehensive list of recommendations including those stated above are provided in section five of this report.

Since recommendations can be implemented simply and independently an additional Stage 3 report is no longer considered necessary.

Contents

Acknowledgements	i
Executive Summary	iii
Chapter 1: Introduction	1
Chapter 2: Update on Stage 1 Recommendations	3
2.1 Task No. 1 – Upper Whakatane river level recorder	3
2.2 Task No. 2 – Stopbank raising at Yacht Club, Whakatane	4
2.3 Task No. 3 – Flood protection for Awatapu Suburb	5
2.4 Task No. 4 – Flood emergency management lessons	5
2.5 Task No. 5 – Review effectiveness of non-structural measures	5
2.6 Task No. 6 – Flood modelling assumptions	19
2.7 Task No. 7 – Flood protection beside Wainui Te Whara Stream	22
2.8 Task No. 8 – Upper Whakatane LIDAR data	24
2.9 Task No. 9 – Flood protection to roads	24
2.10 Task No. 10 – Geotechnical investigations on Whakatane stopbanks	25
2.11 Task No. 11 – Update stopbank risk assessment	26
2.12 Task No. 12 – Flood protection to infrastructure	27
2.13 Task No. 13 – Security of public potable water supplies	28
2.14 Task No. 14 – Security of private potable water supplies	28
2.15 Task No. 15 – Flood protection to power supplies	28
2.16 Task No. 16 – Flood protection to gas supplies	29
2.17 Task No. 17 – Flood protection to telecommunication network	29
2.18 Task No. 18 – Promotion of home and contents insurance	30

Chapter 3: Other Issues Arising in Liaison Group Meeting, 22 August 2006	33
3.1 Flood inundated areas	33
3.2 Climate change and town planning	33
3.3 Emergency spillway for Whakatane stopbanks	34
3.4 Permanent stopbanks for Ruatoki	35
3.5 Permanent stopbanks for Waimana	35
3.6 Impact of flood protection works	35
3.7 Emergency action plan.....	35
3.8 Flood free access at Blacks Corner	36
3.9 Access between Ruatoki and Taneatua	36
3.10 Flood protection affordability	36
3.11 Value of flood protected Maori land.....	37
3.12 House relocation/insurance costs	37
3.13 Responsibility for minimum floor levels	37
3.14 Earthquake risk to stopbanks	38
 Chapter 4: Summary of Task Updates	 39
4.1 Task No. 1 – Upper Whakatane River level recorder	39
4.2 Task No. 2 – Stopbank raising at Yacht Club, Whakatane.....	39
4.3 Task No. 3 – Flood protection for Awatapu suburb	39
4.4 Task No. 4 – Flood Emergency Management Lessons.....	39
4.5 Task No. 5 – Review Effectiveness of Non-Structural Measures	39
4.6 Task No. 6 – Flood modelling assumptions	41
4.7 Task No. 7 – Flood protection beside Wainui Te Whara Stream	42
4.8 Task No. 8 – Upper Whakatane LIDAR data	42
4.9 Task No. 9 – Flood protection to roads	42
4.10 Task No. 10 – Geotechnical investigations on Whakatane stopbanks	42
4.11 Task No. 11 – Update stopbank risk assessment	43

4.12	Task No. 12 – Flood protection to infrastructure.....	43
4.13	Task No. 13 – Security of public potable water supplies.....	43
4.14	Task No. 14 – Security of private potable water supplies	43
4.15	Task No. 15 – Flood protection to power supplies.....	43
4.16	Task No. 16 – Flood protection to gas supplies.....	43
4.17	Task No. 17 – Flood protection to telecommunication network	43
4.18	Task No. 18 – Promotion of home and contents insurance	44
Chapter 5: Conclusions		45
Chapter 6: Recommendations		47
Chapter 7: References.....		51
Appendices.....		53
Appendix 1 – Flood Maps.....		55
Appendix 2 – Whakatane Residential Growth Areas – Flooding and Inundation Risk.....		61

Chapter 1: Introduction

This document is Stage 2 of Environment Bay of Plenty's Floodplain Management Plan for the Whakatane River catchment. This plan is to be known as the Whakatane Waimana Floodplain Management Strategy (WWFMS).

Floodplain management strategies provide sustainable flood risk management which integrates structural and non-structural options, asset management, funding sources and community input to take the scheme into the next 50 or so years. The floodplain management strategy (FMS) will confirm and/or propose the level of service (or protection) that the community (or stakeholders) wish to adopt.

This report constitutes the second of a possible three staged approach to develop the WWFMS. Stage 1 established the context for the flood hazard in the catchment, Stage 2 identifies mitigation options and Stage 3 implements the selected options – if mitigation is required.

The general outcome of the Stage 1 report is that flood protection service levels are in general being met for the scheme. The main vehicle by which this is achieved is the scheme asset management plan.

The main question to be left with scheme ratepayers is whether they are willing to accept the current levels of service. If scheme ratepayers or stakeholders do request a higher level of service then additional costs will be incurred.

The Stage 1 report established a low level of risk associated with potential stopbank breaching at specific locations in the lower Whakatane urban reaches. However acceptance of risk estimates was subject to the outcome of further geotechnical investigations to be undertaken at specific stopbank locations. Geotechnical investigations are now complete and updated risk assessment results are included in this report.

The objective of Stage 2 is to:

- Report on the outcome of recommendations made in the Stage 1 report and subsequent Liaison Group meeting held in August 2006.
- Identify the flood mitigation options that are available to reduce the flood risks identified

Chapter 2: Update on Stage 1 Recommendations

2.1 Task No. 1 – Upper Whakatane river level recorder

2.1.1 Task description

Establish a flow rating for the Upper Whakatane River level recorder (at Ohutu Bridge) and confirm modelling report conclusions. Refer Figure 2.1.

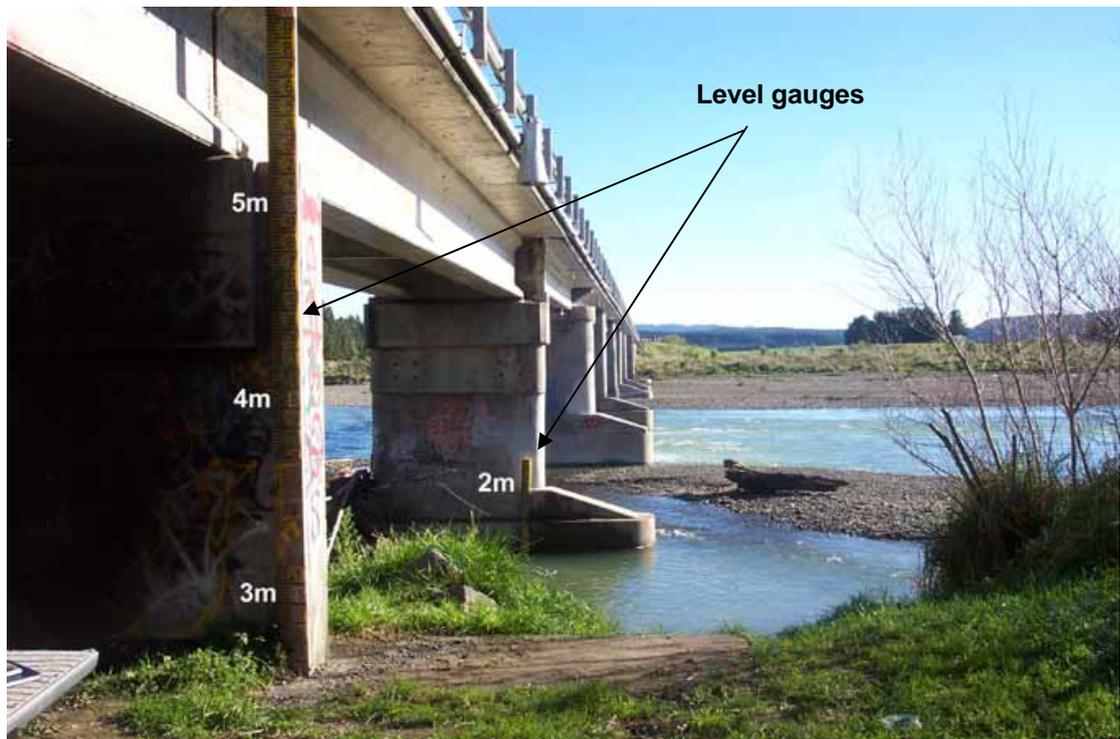


Figure 2.1 Ohutu Bridge with level gauges.

2.1.2 Update

Installing a permanent flow recorder in the Upper Whakatane River is not practical however taking river flow gaugings by boat may be a better solution. To safely gauge off the bridge would necessitate bridge closure and a traffic management plan would be required.

Since meaningful flow results will only be obtained during high river stages *it is recommended that a boat be used to record flow gaugings at some point in the future during a significant flood.* NIWA undertake such data gathering and have carried out similar exercises on other rivers managed by Environment Bay of Plenty. Until rated the level recorder provides considerable benefit in that it shows whether the “Upper Whakatane” arm of the river is still rising assisting downstream forecasts.

2.2 Task No. 2 – Stopbank raising at Yacht Club, Whakatane

2.2.1 Task description

Raise the low point in the stopbank at Yacht Club, Whakatane River to meet River Scheme service level requirements. Refer Figure 2.2



Figure 2.2 Low spot in Whakatane Yacht Club stopbank is located at the driveway into the carpark

2.2.2 Update

The service level at the Yacht Club is 100 year stopbank protection (plus 800 mm and 600 mm freeboard above and below the Yacht Club respectively).

Environment Bay of Plenty plans to raise the short section of low stopbank at the Yacht Club in 2006/07 to meet the Whakatane asset management plan service level requirements.

2.3 Task No. 3 – Flood protection for Awatapu Suburb

2.3.1 Task description

Investigate and implement flood protection options for Awatapu suburb.

2.3.2 Update

Following publication of the Whakatane District Council report titled 'Investigation into Awatapu Lagoon Flood Hazard' consultants were commissioned to identify what additional mitigation options are required to reduce the threat of Awatapu Lagoon stopbanks overtopping in a design event. The outcome of the investigation was that Whakatane District Council will now construct an additional pump station adjacent the Awatapu Drive culverted floodgate.

The additional pump station will ensure excess water in the Awatapu Lagoon is pumped into the Whakatane River in the event that water levels in the river are higher than that in the lagoon. Flow entering the lagoon comes primarily from the Wainui Te Whara Stream. The pump station will include a back-up generator to ensure pumping will continue during a power shortage and a mobile pump that will also be able to be transferred to other problem locations.

2.4 Task No. 4 – Flood emergency management lessons

2.4.1 Task description

Lessons learnt regarding emergency management be incorporated into the CDEM Group Plan

2.4.2 Update

The Bay of Plenty Civil Defence and Emergency Management Group Plan was approved by member councils including Whakatane District Council and Environment Bay of Plenty in May 2005.

The Group Plan is yet to be tested however the document does allow for internal and external review to assess and improve its effectiveness. Refer Section 4.8 in the CDEM Group Plan, (Bay of Plenty CDEM, 2005).

2.5 Task No. 5 – Review effectiveness of non-structural measures

2.5.1 Task description

Review effectiveness of non-structural measures in view of performance during the July 1998 and July 2004 flood events.

2.5.2 Update

Non-structural measures include land use planning methods, voluntary actions and steps floodplain residents, groups, businesses and utility and emergency services can take to prepare for floods. These measures aim to keep people, possessions and development away from flood prone areas. Non-structural measures improve the community's ability to respond to and recover from floods. They enable a community to be more resilient to flooding now and in the future. Such measures include:

- flood monitoring and warning
- flood warning manual
- protection of regional civil defence building
- LIM and PIM reports
- current building standards
- public awareness
- information exchange between organisations

Assessment of each of the non-structural measures was carried out by reviewing post flood reports and interviewing key personnel from Environment Bay of Plenty, Whakatane District Council and Ministry of Civil Defence & Emergency Management (MCDEM) who are responsible for implementing non-structural measures. Discussion of existing non-structural measures follows:

(a) Flood monitoring and warning

Environment Bay of Plenty and NIWA operate telemetered rain gauges, river level recorders and river flow recorders throughout the Bay of Plenty region. Monitoring equipment has provided useful and timely data during times of floods including the July 1998 and July 2004 storms events. When trigger levels are activated within these instruments a page is automatically sent to the Environment Bay of Plenty Flood Manager and Environmental Data Services staff alerting them of the situation. Trigger levels are specific to each catchment and are set out in the flood warning manual. When a page is received; the Flood Manager warns specific stakeholders namely farmers on low-lying land, Environment Bay of Plenty staff, flood wardens, local authorities, civil defence personnel, police, contractors and harbour master (who warns boat owners). These people are contacted by the on duty Flood Manager.

Monitoring equipment is powered by batteries, which are charged by solar panels. During periods of prolonged rainfall and stormy weather it is not uncommon for the batteries to discharge due to a lack of sunlight, thus leaving Environment Bay of Plenty with blind spots in their monitoring system. This was the case in the 1998 flood when the storm duration lasted approximately one month. Since this event the power systems have been updated to better cope with these prolonged events. The environmental data services group, who operate these sites, have means of monitoring the power supply at each of sites. Regular inspection and maintenance is carried out on monitoring equipment and its associated power supplies. It is also possible for the power from sites to be conserved by transmitting data back to Environment Bay of Plenty on a less frequent basis.

Data is transmitted from field monitoring equipment to Environment Bay of Plenty via radio and telephone. The nearest radio transmitter is located on Mt Edgecumbe. Monitoring equipment located on the Lower Whakatane and Lower Rangitaiki rivers transmits data back to Whakatane via phone lines. In the event that that telephone lines fail then both these sites can be monitored easily due to their close proximity to Environment Bay of Plenty Whakatane Building.

Weather forecasts in the region will be greatly enhanced by the installation of new Doppler weather radars in the vicinity of the Mahia Peninsular (2009) and western Bay of Plenty (2010). The radars will increase the Met Services ability to predict arrival of high risk weather systems.

In addition Environment Bay of Plenty and TrustPower have jointly contracted NIWA to develop a new rainfall and floodcasting computer model. Results of the NIWA model will be checked and compared with Environment Bay of Plenty's own in-house flood forecasting model.

(b) Flood Warning Manual

The flood warning manual was prepared by Environment Bay of Plenty to aid the Flood Manager and staff in times of flooding or heavy rainfall. It has been particularly successful in severe floods including the July 1998 and July 2004 events. The manual contains processes that are implemented in the event that the Met Service issues a Warning or when a trigger level has been reached at one of Environment Bay of Plenty's telemetered recorders. Data such as phone numbers of flood wardens and relevant contractors are contained in the flood warning manual and these are updated each year. Other information changes such as an update on operation levels for control structures are sent out to Flood Managers as directed by Group Managers on an adhoc basis.

To keep the flood warning manual current Environment Bay of Plenty updates the manual annually for warden and landowners phone numbers. This task is carried out by the Asset Management Administrator. To keep the balance of the manual up-to-date a three yearly review is considered adequate. This period allows ample time for any changes in flood data to be generated and approved as well as any other operational changes to be included in the manual.

Assigning relevant sections of the manual text to specific individuals to update at three yearly intervals has the advantage of sharing the review load. At the end of the period one member of the group say the Asset Management Administrator could collate the updated portions of text an issue an updated manual.

Another challenge facing new Flood Managers is the lack of time they have available to familiarise themselves with the contents of the flood warning manual and information. A number of options exist to address this point. They include:

- Do nothing. Let new Flood Managers learn the procedures during the flood event.
- The new Flood Manager is assigned the task of familiarising themselves with the flood warning manual and then is given a short test on the information at an assigned later stage.
- New Flood Managers are trained by current Flood Managers during real flood events.

- Provide new Flood Managers with a short induction course on how the flood warning manual is to be used. They should also be shown where information is stored. Allow new Flood Managers to observe experienced Flood Managers 'in action' before undertaking more responsibility.

Learning flood management procedures during an event is not ideal unless supervised by a more experienced Flood Manager. Preparing a test for new Flood Managers is not really practical due to lack of time available to prepare and supervise it. *A short induction makes sense in that new Flood Managers can ask questions without pressure.* Learning is then reinforced by observing procedures in action and ultimately by implementing the procedures themselves.

At the 16-18 July 2004 Flood debrief meeting held on 5 August 2004 one of the actions to be implemented was for possible stopbank breach scenarios to be added to the flood warning manual. To date stopbank breach inundation maps have been prepared for ten sites located in Lower Whakatane. Breach inundation maps are shown in Appendix 4 of the Stage 1 report. However it is emphasised that all breaches modelled are scenarios only, based on certain assumptions and with a calculated low probability of occurrence.

The 100 year Eivers breach inundation scenario is reproduced in Figure A1.1 in Appendix 1 of this report. It is selected because it is the most densely populated urban area in the catchment and damages resulting from a breach have been estimated at \$58 million. The breach inundation map shows the approximate time available, from breach initiation, for Civil Defence staff to evacuate people from the flooded areas. Maximum flood levels expected are also indicated.

Figure 2.3 shows approximate travel times for overtopping Lower Whakatane stopbanks and associated flows for the 300 year ('overdesign') flood in the lower reaches of the Whakatane River. Figure A1.3 in Appendix 1 show the associated flood inundated areas and approximate resulting water level. Travel times shown in Figure 2.3 are taken to be from the time of the Valley Road flow recording to the time overflow begins at the stopbank location indicated. Spillages may be over a length of bank, rather than at discrete locations. The 300 year flood scenario takes into account superelevation of river flows and assumes all freeboard is taken up. Spillage depth over the stopbanks as shown will in most cases be very small (Wallace, 2006)

To avoid unduly clutter of the flood manual it is recommended that all breach/inundation maps be collated in a separate manual that sits alongside the main flood warning manual. Flood maps could also be placed on Environment Bay of Plenty's website to assist emergency evacuation of residents in threatened areas.

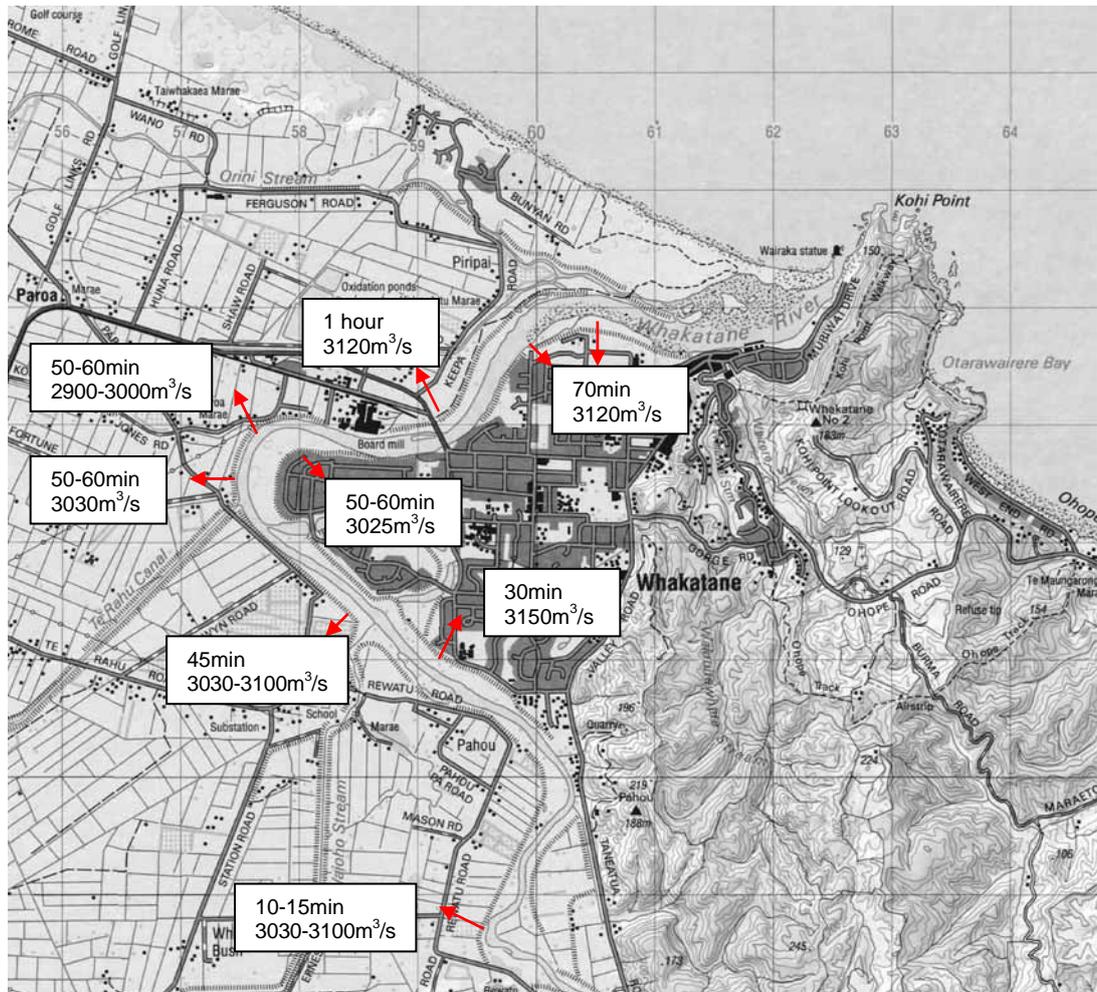


Figure 2.3 Approximate flood travel times and associated Valley Road flows in the event of a 300 year “overdesign” flood

(c) Protecting Environment Bay of Plenty regional civil defence building

Environment Bay of Plenty’s Whakatane building is currently the Emergency Operations Center (EOC). This means that in the event of a Level 4 (Regional) emergency being declared all responses will be organised from Environment Bay of Plenty’s Whakatane base. This base could easily be affected by flood events due to its close proximity to both the river and ocean.

Three primary issues associated with the use of Environment Bay of Plenty’s Whakatane building in emergency events need to be addressed. Firstly access to the emergency building needs to be ensured, secondly back-up power supply needs to be guaranteed and thirdly communication needs to be maintained.

(i) Building isolation and access

In the event of an emergency the Whakatane building may become isolated altogether that is, very few staff can get to the building due to say flood waters blocking their path. Alternatively door access problems might arise due to a power systems failure.

In the July 1998 flood the Environment Bay of Plenty building was surrounded by water, and employees needed to wade through water to get to the building. Refer Figures 2.4 and 2.5.



Figure 2.4 View of flooded Quay Street from Environment Bay of Plenty's building in July 1998

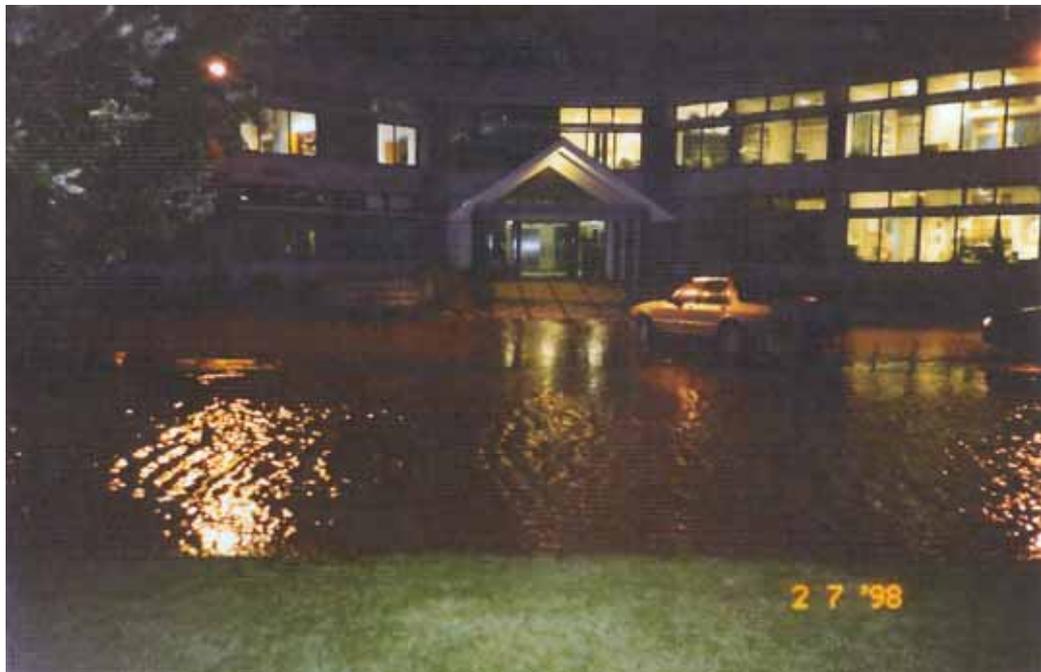


Figure 2.5 View of Environment Bay of Plenty's building showing flood waters in Quay Street during July 1998.

Under more severe conditions the Whakatane building could potentially become isolated with staff unable to get to the building to carry out their emergency duties. Access routes to the Whakatane building could be cut-off leaving the region without an emergency control centre.

The nature of the Whakatane district is such that in times of heavy rainfall it is not uncommon for the town to become isolated from other main centres in the region. Isolation may result from surface flooding and slip material cutting off road access. Under these circumstances there is a possibility that Environment Bay of Plenty staff may not be able to get to the Whakatane building to carry out their civil defence roles. During the July 2004 storm event approximately \$14.16 million of damage was incurred to roads in the Whakatane District, of this \$9.16 million was to local district roads and the remaining \$5 million was to Transit NZ owned roads. During this time many roads were closed due to flooding and slips. It wasn't until the end of August 2004 that all of these roads were cleared.

In a Level 4 (Regional) Civil Defence flood emergency Environment Bay of Plenty's Whakatane building must be accessible and operational for staff to manage the regional event. If the Whakatane offices become isolated and the emergency staff left unable to do their jobs then management of the regional emergency would be left undone. *This scenario is unacceptable and it would be prudent to have a back-up emergency building in case the present emergency building is unavailable.* The back-up emergency building should be set up on higher ground with duplicate equipment available to manage the running of a regional emergency.

In the event that Environment Bay of Plenty relocates its Whakatane office evaluation of the new site should be in terms of its vulnerability to becoming isolated. In addition the new building should also be designed to incorporate features that ensure it remains functional during extreme events.

(ii) Guaranteeing Power Supply

Environment Bay of Plenty has a secondary power system that is set up to run off the generator. This allows the premises to remain operational in times of emergency when mains power is unavailable.

The secondary power system operates a specific selection of essential services that must operate in emergencies. The essential services circuit include the lights and power sockets in the flood room, the computer server room, power to necessary kitchen appliances such as oven, hot water, lights, corridor and stair lighting, toilet lighting and toilet hand driers.

Since the secondary circuit was set up in 1994, several new items have been added to the circuit due to numerous changes to the building layout. An example would be the new kitchen facilities, added to the circuit because there was no room on any other circuit system. *The secondary circuit should be reviewed to confirm if there are any less important functions that can be removed from the board to reduce load on the generator.* In addition those functions powered by the secondary power system should be identified to assist in their location during emergencies. An example may be to give light switches a different colour plate.

Environment Bay of Plenty's building generator is housed in a ground level room in the east wing. During the July 2004 flood, in which the generator was operating floodwater from the carpark flowed around its base. Since then the generator has been raised and placed upon a stand set to the level of the nearby Whakatane river stopbank. This being the case the generator should now be safe to run following a stopbank breach, with up to 1m of water flowing beneath it. However this does not take into account the need to service and refuel it safely. *Procedures for maintaining and refuelling the generator with say a one meter depth of flood waters flowing beneath it should be developed.*

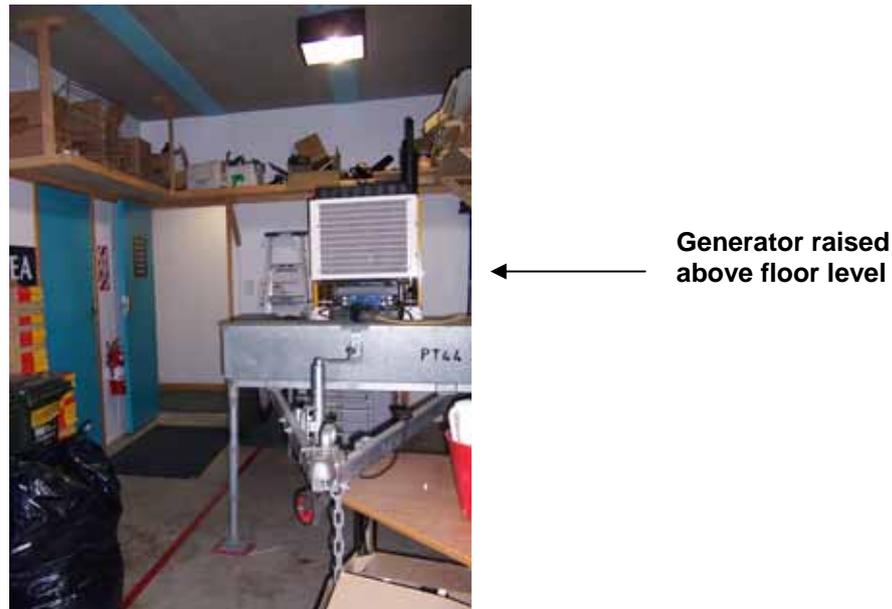


Figure 2.6 *Elevated generator exhausts towards internal office doors and walls in Environment Bay of Plenty's building*

At present exhaust fumes from the generator vent into the room that houses it. Refer Figure 2.6.

Fumes escape the room by exiting through a 2 meter by 0.5 meter ventilation duct located at the top of one of the exterior walls. Unfortunately diesel fumes do migrate into the neighbouring offices because the internal walls are not sufficiently sealed. *Internal walls should be sealed and/or an exhaust manifold provided to the generator to vent fumes directly to the external wall ventilation duct.* These measures will reduce health and safety risks to staff working in adjacent offices.

No spare diesel is stored on the premises for refuelling the generator. This has been a problem in the past with Environmental Data Services staff having to track down diesel prior to a flood event when all petrol stations were closed. Environmental Data Services are arranging to acquire and store a back-up diesel tank beside the generator. The quantity of diesel supplied will be sufficient to run the generator for a small flood event. *For longer duration flood events a larger back-up fuel supply should be made available.* Larger fuel supply options could be secured by:

- Arranging an external contract to supply fuel to Environment Bay of Plenty in the event of emergencies.

- Investigating the viability of Environment Bay of Plenty having their own fuel supply based on-site at Whakatane.
- Providing a reasonable fuel supply on site and having an external contract to supply additional fuel in the event of an emergency.

An investigation should be carried out to determine the most practical fuel supply arrangement to allow ongoing operation of the generator for extended periods of time in emergencies.

Immediately following a mains power failure, Environment Bay of Plenty computer systems and phone systems switch over to battery power. Batteries keep the system running until the generator is started. Running on batteries; the phone system is estimated to last approximately one hour, the computer server between 30 minutes – one hour and individual computers about 30 minutes. If the generator does not start within this timeframe then the computer system will fail. According to Environment Bay of Plenty computer specialists most of the computer system is required to help manage flood events. It is unsure if the generator is able to provide the quality of power that is required to run the computer and phone systems. These services require a steady power supply and will shut down if their power source proves to be too “dirty” (unsteady and fluctuating). At present only the generator is tested on a yearly basis, to check that it is running correctly. *In addition, it is recommended that the computer and phone systems be checked to ensure smooth operation whilst being powered by the generator.*

At present the generator requires a manual start and consideration should be given to installing an automatic start feature to reduce power cuts and reduce load on the computer and phone systems batteries.

Numerous suggestions have been made over the years to move the generator to the roof of the building. Relocating the generator to a higher level would allow the building to remain operative even with the bottom two floors flooded. If this were the case then a marine proof box would need to be constructed around the generator to protect it from the elements. *A feasibility study including a cost benefit analysis for to relocate the generator to a higher level should be completed.*

Currently all staff have a magnetic key that allows them access to the Environment Bay of Plenty offices. In the event of a power failure the locks would become inactive and doors would lock. There is by each door an emergency exit switch that is able to override the door lock and open the door. Also in the event that the fire alarms are set off all doors are automatically unlocked.

Environment Bay of Plenty is currently changing the key system from the magnetic key over to a swipe card system. With this change it is still unsure what if anything will change in terms of entering and exiting the building in times of Emergency. The new swipe card system should therefore be tested under simulated emergency conditions such as a power failure. The swipe card system should also be tested in conjunction with generator tests of other essential equipment such as telephones and computers systems.

(iii) Maintaining Telecommunication Systems

Environment Bay of Plenty uses Telstra Clear to provide its telephone network service. Council uses two 0800 numbers for all its regional offices and depots. Offices and depots are all connected to one another via the Telstra Clear network service. The Whakatane, Tauranga and Rotorua Depots also have an external link to their own local Transfer stations, with a local phone number associated with this link. This local phone number is only publicised in the event of an emergency when external phone services are cut off. The external link enables say, Rotorua people to get in contact with the Environment Bay of Plenty Rotorua office.

The 0800 number works by having incoming calls transferred from Auckland, to Tauranga and then from Tauranga via a fibre optic cable to both Whakatane and Rotorua. The fibre optic cables are owned by Telecom and are the only lines into the region. When the fibre optic cable snapped on the Whakatane route during the May 2005 (Matata) floods the Whakatane office was cut off from its Rotorua and Tauranga depots and associated districts. The only calls getting into Environment Bay of Plenty's Whakatane were local calls.

The present fibre optic cable provision is a problem because resource mobilisation between offices, depots and districts is almost totally dependant on the cables remaining intact and allowing telecommunications to get through. Since flood protection staff and resources are based in Whakatane with radio being the only other form of contact, mobilisation of these resources to other districts (and visa versa) would be hampered. *Environment Bay of Plenty should investigate what other telecommunication systems are available to act as a back up in the event that the sole fibre optic cable fails.*

Council telephones are mostly digital throughout the organisation with the exception of 11 analogue lines. Analogue lines are assigned as Civil Defence Emergency phone lines with seven lines assigned to Whakatane, two for Rotorua and two for Tauranga. During the July 1998 flood event when there was only one civil defence line it was allocated to the Council flood room. Today the Whakatane building has seven lines comprising five phone lines and one fax line all located in CMR2. A single phone line still exists in the flood room. A telecommunication procedure exists for operating the analogue lines and these are tested fortnightly (EBOP, 2007)

Whakatane based 'switchboard' staff located at the Whakatane office man the Environment Bay of Plenty telephone service. This means that if telephone contact with the Whakatane office is cut off then other outlying offices will revert to having only the most basic of phone services. Furthermore if there is no one at the Whakatane office then incoming calls will remain unanswered. One solution might be to have a back-up 'call centre' which would take over the role of the Whakatane telephone service should it be cut-off. *In any case Environment Bay of Plenty should investigate and provide a back-up telephone service for its Whakatane office.*

(d) Land Information Memorandum (LIM) and Project Information Memoranda (PIM)

The Territorial Council upon request prepares a LIM report. It provides a copy of information the Council holds on a property including land and buildings.

A PIM report is issued by Territorial Councils prior to or in conjunction with a building consent. It provides relevant information about building proposals, which the Council have, knowledge of, i.e. location of underground services, and susceptibility to flooding and erosion. A PIM will also advise whether any other consents are required e.g. a resource consent.

Properties affected by flooding in the district are recorded on Whakatane District Council's natural hazard register and flood inspection reports are placed on each of the property files. This information is then available to any person reviewing the property files or applying for building consent, resource consent or a LIM report.

As far as we are aware LIM and PIM reports held by Whakatane District Council continue to record all relevant information related to known flood hazards to date.

One exception is a statement on the LIM report which indicates whether riverside properties comply with Council stopbank bylaws.

The Bay of Plenty Regional Council Floodway and Drainage Bylaw 2002 was adopted by Environment Bay of Plenty in 2003. The Bylaw is potentially a powerful tool in maintaining the integrity of flood defenses with Environment Bay of Plenty having the power to prevent, for example:

- constructing any structure, planting or growing shrubs and trees etc, between the river edge to 12m beyond the landward toe of a stopbank or floodwall
- excavating or undertaking earthworks within 20m of a stopbank or floodwall
- overgrazing of stopbanks
- other interference with stopbanks and floodwalls

This bylaw has not yet been tested nor has there been any significant educational or promotional campaign on the existence of the bylaw. However a bylaw compliance survey of the urban stopbanks has recently been completed and an upcoming exercise to address encroachments, structures and plantings on the Whakatane stopbanks will show how well the bylaw works.

One mechanism for promoting the stopbank bylaw would to be add a note to the LIM of relevant properties. That would require a GIS overlay of such areas to be created and given to Whakatane District Council. *It is recommended that Whakatane District Council consider placing a note on their LIM reports that confirms whether the stopbank bylaw is in effect and whether the property complies (or otherwise) with its requirements.*

(e) Current Building Standards

Any person(s) applying for resource consent to build is required by law to meet certain guidelines set out in the Resource Management Act (RMA). The "New Zealand Building Code Handbook and Approved Documents" is one example of guidelines produced in support of the RMA. The Building Code states that:

"Surface water, resulting from a storm having a 2% probability of occurring annually, shall not enter buildings". With the addition of 500mm computational freeboard.

In 2007 Whakatane District Council and Environment Bay of Plenty agreed to use the 50 year flood levels (based on rainfall intensity data expected in 2055 to set minimum building floor levels. Adopting the higher rainfall figures provides allowance for climate change effects.

In addition it was agreed that the 100 year level should be used for setting minimum subdivision platform levels (Blackwood, 2006). Setting development levels at the 100 year flood level in subdivisions is recommended in s4.3.2.5.1 of NZS4404:2004 Land Development and Subdivision. Since subdivisions might be expected to last for a long period the 100 year flood level should include provision for climate change to the year 2080.

Flood maps provided in this FMS can be used by Whakatane District Council planners. To assist in the process of determining 100 year flood levels Environment Bay of Plenty has produced:

- A 300 year flood map of Whakatane District. Refer Figure A1.2 and A1.3 in Appendix 1. The 300 year flood map is expected to become the 100 year flood map by year 2080.
- Kope – Orini basin 100 year flood level map. Refer Figure A1. 4 in Appendix 1 (EBOP drawing R745). Flood levels on this map are used for determining minimum building floor levels in the area.

In addition Environment Bay of Plenty has produced for Whakatane District a summary of the flood risks to specific areas identified by District Council as having urban development potential. Refer Appendix 2.

Where building or subdivision development is anticipated outside of the abovementioned map boundaries then adjustment of the sub-catchment hydrology is required to take account of climate change effects. Guidance for calculating climate change effects can be found in Ministry for Environment's (MfE) climate change guidelines (MfE, 2004). These guidelines present temperature changes that spatially vary throughout New Zealand plus consequent impacts on heavy rainfall at two benchmark dates 2030 and 2080. The period for which the structure should be designed will be based on its life expectancy. For example if a structure has a life of 30 years then the MfE climate change period to use might be the year 2030. Similarly if subdivisions last say 100 years then the climate change period to use would be the year 2080.

(f) Public Awareness

(i) Emergency response information

MCDEM publishes, inside the back cover of each regional telephone directory, a page of emergency information that should be referred to by its owner during natural hazards including floods, earthquakes and volcanic eruptions.

Civil defence information printed in the telephone directory does work. According to MCDEM Communication Advisor, Chris Baylis, "We do know anecdotally that the Yellow Pages is an established place for Civil Defence information. It has been there for a long period so most people know to look there even if they haven't looked at it recently"

The local Eastern Bay of Plenty directory does not include emergency information however consideration should be given to its inclusion in future editions.

In April and November 2006 MCDEM conducted a survey to assess the emergency preparedness of the general public. Colmar Brunton conducted the survey of 1000 randomly selected participants on behalf of MCDEM. *Environment Bay of Plenty should acquire a copy of any feedback reports produced by MCDEM with the view of using this to improve its floodplain management strategies.*

(ii) Publicity of emergency events and preparedness

Environment Bay of Plenty, Communications Coordinator, Ana Cotter said in an interview "We've done a few stories about our own floods but they're mostly updating people about what's happening and their aftermath. Generally, the education side of Civil defence is done by territorial authorities."

According to Civil Defence officer Bill Wycherley, Whakatane District Council does promote civil defence preparedness in communities throughout the region however not in the form of mail outs. Methods used involve public events, promotion in school newsletters and adverts at the local Cinema. Information promoted is in line with that promoted by MCDEM in their website and in the regional telephone directory. Information includes how to be prepared for different emergency events and having supplies available to ensure the survival of households for up to three days.

Whakatane District Council is currently working with Te Puna Kokiri to prepare Community Response Plans for all small communities throughout the district. Response Plans assign people to set roles, develop procedures and establish evacuation points. In the event that a state of emergency is called in their community, then predetermined people will assume leadership roles and maintain lines of contact with the wider district, region and authorities.

(iii) Internet sites

Internet sites such as the MCDEM web site are helpful, containing information such as how to be prepared for emergencies, what things to have in an emergency kit and what to take from your home if you are evacuated.

The Environment Bay of Plenty website contains similar information to that found on the MCEDM website, in regard to emergency kits, as well as outlining regional hazards, giving reports on some specific events and explaining the CDEM Group and how to get in contact with relevant people.

A search of the Whakatane District Council web site revealed no emergency preparedness information. According to Bill Wycherley the Whakatane District Council web site is to be updated. The aim of the updated Whakatane District Council website will be to contain local Civil Defence information as well as provide a link to the MCDEM web site.

Internet sites are conditional on people having computer and Internet access and being aware of the site. Unfortunately computers are not operational if the power or phone lines are not operational.

(iv) Radio and television broadcasts

Local radio stations have proven invaluable in the past at keeping local residents up to date with emergency status reports, the state of the civil emergency and other useful information such as road closures. Radio 1XX has reported and kept the Whakatane region up-to-date with most developments associated with natural disasters in the catchment over the past 20 or so years.

Television also produces coverage of natural emergencies however it is less likely to instruct affected people on what to do in the event.

(v) Flood event press releases

The Environment Bay of Plenty Flood Manager issues initial press releases. The Flood Manager will issue the first warning when the rivers reach the first flood warning level (or earlier if predicted to reach the first warning level during the night). Flood warnings are advised for each river catchment described in the flood warning manual; subsequent warning levels are advised as events progress.

If back up staff are called in due to flood severity Environment Bay of Plenty's Media Liaison spokesperson, will take over media briefings, issue press releases and provide updates. Generally a standard of two updates are issued per day, however this may fluctuate as necessary. Press releases include information on flooding in the area, predicted peak flow times, state of stopbanks and any warnings to certain groups, e.g. moored boat owners, farmers etc. The Media Liaison spokesperson fronts all TV interviews and shows visiting dignitaries around effected emergency areas.

If a Level 4 Civil Defence Emergency is declared then all public liaison becomes the responsibility of the Group Controller. For all practical purposes, this would generally then be through Media Liaison spokesperson.

Press releases have been successful in updating the public on the status of floods and providing them with other relevant information.

(g) Information exchange between organisations.

If a Level 4 (Regional) state of emergency is declared then:

- the Regional CDEM Plan outlines certain procedures to be implemented, to ensure communication keeps flowing and information is kept consistent
- there is provision for liaison offices and chiefs of various Emergency Services to operate from Environment Bay of Plenty premises alongside the Group Controller

- Environment Bay of Plenty is responsible for coordinating the regional emergency response. In the case of a Level 3 (local) emergency (flooding) being declared by one of the Territorial Authorities, Environment Bay of Plenty's role changes to only having to monitor the flood situation on each of its rivers, operate control structures accordingly, monitor rainfall data equipment and offer warnings and advice to relevant prior decided on affected parties.

Environment Bay of Plenty has standard warnings that are to be issued to various effected parties to reduce confusion. Warning forms are provided in the flood warning manual. Effected parties include farmers and public living on low-lying land. Updates are issued via radio announcements and press releases.

If the flood threat grows then the most important line of communication are those to the Whakatane District Council. The protocol for sharing information between Environment Bay of Plenty and Whakatane District Council is outlined in the flood warning manual. In the past there have been problems with the data transferred. Complaints have been related to the delays or information being sent being unprocessed. As a result Environment Bay of Plenty qualifies information being transmitted stating that data is currently being processing and that the recipient will be updated as soon as processing is complete.

Data transferral problems reduced when either a representative from Whakatane District Council was based at Environment Bay of Plenty's Building or conversely a representative from Environment Bay of Plenty was based at Whakatane District Council Building. This practice is supported.

2.6 Task No. 6 – Flood modelling assumptions

2.6.1 Task description

Flood modelling assumptions for Whakatane and Waimana Rivers are to be confirmed and updated reports published.

2.6.2 Update

(a) Lower Whakatane River hydraulic model

The Lower Whakatane hydraulic model used results of an earlier HECRAS model of the river mouth (Balley, 2000) in its calculations of river levels upstream of the river mouth. The HECRAS model of the river mouth was used because of difficulties in using MIKE11 for this type of application. The HECRAS model assumed partial scouring of the 50m spit to a modest level.

Figure 2.6 shows the spit area in relation to the river mouth. Wallace (2004) concluded in his flood level report that:

“modelling of design flows confirms the calibration findings that levels in the lower river are dependent on the river mouth geometry. If levels are to be kept low during flood events, the mouth needs to be allowed to scour out sufficiently“.

The current operation requires that the spit be excavated down to RL1.01m minimum when it reaches a maximum height of RL2m. The minimum width at the RL1.01m height is to be 50m. When the spit scours the river water level falls and the associated flood risk reduces.

It is important to note that the 600mm freeboard allowance in the river mouth reach does provide for the “unscoured” spit (albeit it may be needed for other phenomenon).

In May 2005 Whakatane District Council commissioned Gary Williams, an independent water and soil engineer to review the performance of the spit fuse. The main issue of concern was the apparent late scouring of the spit fuse during the July 1998 and July 2004 floods. For example in July 2004 the spit was estimated to have scoured at a river level of approximately RL3.05 at 2900 cumecs. This compares with the original design assumption that the spit fuse scours at some level between 600 and 1200 cumecs.

Williams (2005) confirmed the late scouring of the spit fuse in both the July 1998 and July 2004 floods. Williams noted that “the most important retarding influence was the severe sea conditions with heavy swell and high waves breaking at the mouth and spit area”. High sea waves combining with a high tide make it hydraulically difficult for the outgoing river to scour the spit fuse. Other retarding factors include:

- the additional sand being driven ashore opposing the direction of the spit fuse scouring process
- the restrictive nature of the river mouth on a rock platform beside a headland with a large confining spit meaning scouring may not occur until after the flood peak has passed.

Williams (2005) commented that:

“The coincidence of the peak and high tides is an important factor, and the pre-conditions of beach height and mouth width and depth are also important. When calculating peak flood levels along the lower Whakatane River, the conservative assumption would be a coincidence of high tide, and flood peak and a restricted mouth until after the flood peak”.

This is reassuring since the assumptions relating to “peak” (i.e. flood peak) and high tide are the same as those made in the design hydrological conditions of the Lower Whakatane hydraulic model (Refer Section 7.1 in Wallace’s July 2004 report). William’s describes the dredging operation as difficult and dangerous however he adds that if current pre-flood operations are to continue then excavated material from the spit should be pushed to the river estuary side instead of out to sea as is done in the current practice. This measure will reduce the risk of excavated sand being returned to the spit due to wave action.

Despite the late scouring of the spit fuse it should be noted that apart from at Mataatua the urban stopbanks did not overtop during the July 2004 flood. Flooding occurred at Mataatua because stopbanks were being built there at the time and agreement to construct Phase Two works (being stopbanking of the Mataatua Reserve itself) had not been reached at that time. *Environment Bay of Plenty supports in principle any efforts aimed at improving the ability of the spit to scour to the agreed levels.*

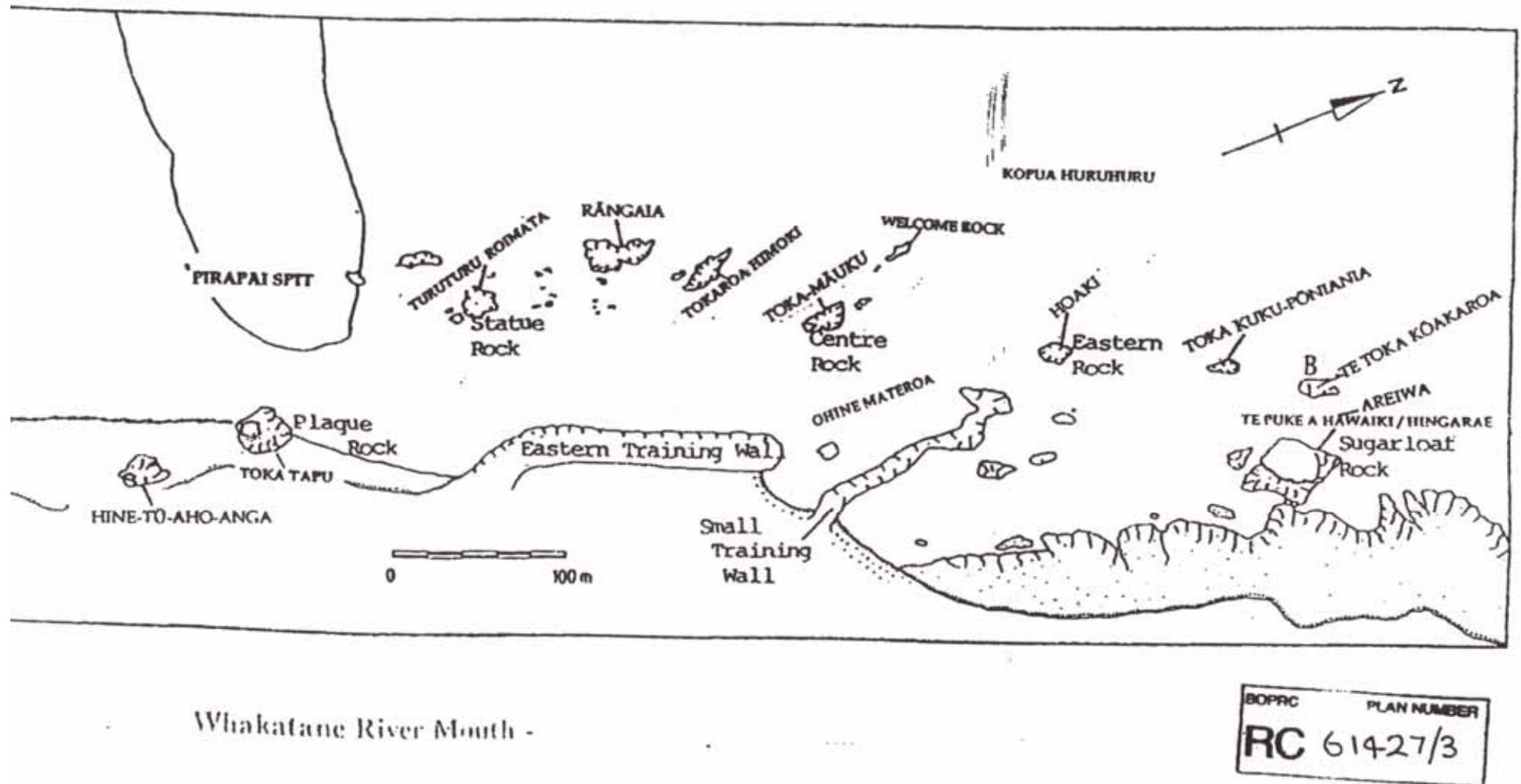


Figure 2.6 Plan view of Whakatane River mouth showing the Piripai Spit.

(b) Upper Whakatane River hydraulic model

Environment Bay of Plenty plans to survey specific flood areas within the Upper Whakatane floodplain. This will allow confirmation of existing LIDAR data which the model uses to calculate flood levels. *Acquisition of additional LIDAR data is recommended in the valley. Further LIDAR data will allow the hydraulic model to be expanded and provide greater accuracy in prediction of flood levels.*

A study is required to compare design levels for the 100 year flood with actual minimum building floor levels for houses in the upper Whakatane River reach. Results of the study may show that domestic dwellings are higher than design levels in which case mitigation measures such as stopbanks may not be necessary. If minimum floor levels are shown to be lower than design levels then mitigation options including house relocation or raising should be investigated.

Environment Bay of Plenty will be building a short length of stopbank at the southern end of the valley near Ruatoki Valley Road. The new stopbank will protect road access to nearby houses in a 10 year flood event. The stopbank is 100 m long and 0.8 m high. Larger stopbanks to provide 100 year level protection to houses were investigated however the high capital and maintenance costs ruled this option out. Urban stopbanks would have been some 2m high by 450 m in length.

Whakatane District Council should compare the design flood levels with minimum floor levels comparison study in Upper Whakatane and investigate potentially low cost mitigation options such as house raising or house relocation which is more advisable where there is not safe access/egress to the building during floods.

(c) Waimana River hydraulic model

Environment Bay of Plenty aim to survey water levels following a 'freshes' storm around Waimana East and Waimana West bridges. Acquisition of this level data will help confirm the efficacy of the Waimana model.

Waimana valley would benefit from a similar design flood/minimum floor level study to that being carried out in Upper Whakatane.

Whakatane District Council should compare design flood levels with minimum floor levels comparison study in Waimana and investigate potentially low cost mitigation options such as house raising or house relocation which is more advisable where there is not safe access/egress to the building during floods. Acquisition of additional LIDAR data is recommended in the valley. Further LIDAR data will allow the hydraulic model to be expanded and provide greater accuracy in prediction of flood levels.

2.7 Task No. 7 – Flood protection beside Wainui Te Whara Stream

2.7.1 Task description

Statutory flood protection is to be provided to residents living near Wainui Te Whara Stream near Douglas Street

2.7.2 Update

This issue is to be addressed by Whakatane District Council as part of Task 3 above.

An investigation is currently underway to establish what work can be done to raise the level of protection provided by the Wainui Te Whara stream stopbanks. Refer Figure 2.7 and 2.8. The protection the stopbanks offered in some places is below the statutory 50 year flood level, thus increasing flood risk to surrounding residents. One option is to construct a detention dam in the upper catchment.



Figure 2.7 Downstream view of Wainui Te Whara Stream from Douglas Street Bridge



Figure 2.8 Upstream view of Wainui Te Whara Stream from Douglas Street Bridge

During discussions with Jim Finlay, Whakatane District Council, it was established that the stopbanks had initially been designed in 1992 to retain a 100 year flood event, however after being built the calculations were found to be incorrect. The stopbanks subsequently were found to contain a 1 in 30 year flood allowing for freeboard and a 100 year flood without freeboard, not taking into account restriction to flow caused by the bridge beams.

At the time of the original stopbank investigations a retention dam design on the stream was also put forward. This was to be situated in the forestry area located within the Mokoroa Hills. The retention dam did not go ahead as the forestry owners were opposed to the plan at the time. However this option is currently being reviewed by OPUS Consultants Ltd as an alternative solution to make up for the stopbanks downstream having a reduced height.

In addition a report has recently been published by the Whakatane District Council titled "Awatapu Flood Hazard Mitigation Solution Study" (WDC, 2005). This report encapsulates the southern most end of the Wainui Te Whara Stream. The report sets out several recommendations that the council will be looking into actioning.

Regardless of the option selected to provide statutory flood protection to residents it is likely a Resource Consent will be required from Environment Bay of Plenty to undertake earthworks and to provide temporary and/or permanent stormwater discharges. In addition to the statutory requirements Environment Bay of Plenty have design standards for dams, bridges, culverts and erosion control measures. These design standards are outlined in Environment Bay of Plenty's Hydrological & Hydraulic Guidelines. As a matter of note, Environment Bay of Plenty's urban stopbanks (above the Yacht Club) provide flood protection against 100 year flood event and include 800 mm freeboard.

2.8 **Task No. 8 – Upper Whakatane LIDAR data**

2.8.1 **Task description**

Acquire further ground survey data and floor levels to confirm LIDAR data in Upper Whakatane sub-catchment.

2.8.2 **Update**

This issue is to be addressed by Environment Bay of Plenty as part of Task 6 above.

2.9 **Task No. 9 – Flood protection to roads**

2.9.1 **Task description**

Provide flood protection to access roads to reduce the risk of being cut off. Roads include Ruatoki Valley Road, the road between Taneatua and Waimana at the Gorge (i.e. SH2), the road through Nukuhou, and several roads in the Upper Waimana catchment.

2.9.2 **Update**

Whakatane District Council have engaged external consultants Burnett, Bloxham and Oliver (BBO) to review the district roading network particularly those roads that enter and exit the Whakatane township and others that are frequently isolated due to flooding.

Transit NZ is responsible for state highways such as the road between Taneatua and Waimana at the Gorge (i.e. SH2). Transit NZ and Environment Bay of Plenty are presently reviewing regional roading network and one possible option may be to alter the route of highways to avoid natural hazard areas such as flooding at the Gorge.

2.10 Task No. 10 – Geotechnical investigations on Whakatane stopbanks

2.10.1 Task description

Geotechnical investigations are necessary at several known potential stopbank breach sites to confirm stability levels. Sites are Eivers/Amber (#4, re-assessment only), Tahare (#9), Fortunes (#10), Selwyn (#11), Carter Holt Harvey Intake (#12) and Rewatu Road (#14). Locations of breach sites are shown in Figures 2.2 and 2.3 of the Stage 1 Whakatane Waimana Floodplain Management Strategy report (Britton, 2007).

2.10.2 Update

Riley Consultants were commissioned to carry out geotechnical investigations of the Whakatane stopbank at the six sites in April 2006. Results of the investigations are summarised as follows:

Failure modes were assessed for the stopbanks and foundations at each of the respective sites. Failure modes checked were piping, batter slope failure and undermining/channel edge erosion. Consideration of overtopping and seismic failure modes were outside the scope of Rileys' brief. Current hydraulic modelling of the Lower Whakatane River indicates flood waters remain within service level limits.

Key conclusions resulting from stopbank stability investigations include:

- For the current conditions the risk of a stopbank breach due to piping in the 100 year flood event is assessed to be low¹ for sites 9 to 14 and moderate to low for Site 4 (i.e. Eivers to Amber Rd reach).
- The risk of batter slope failure is considered low. The theoretical factor of safety for the case of drawdown on the riverside batter stopbank is lower than 1.0. However, this assessment is based on a very conservative assumption that drawdown will be rapid after a long duration flood (i.e. comparable to a steady state flow). In reality drawdown will be gradual after a short duration flood event (transient). Stopbank breach due to this mode is only critical when further flood peak occurs after batter failure.
- The risk of undermining is assessed to be low at most of the sites except site 9 (i.e. Tahare) due to the narrow berms which is assessed as moderate. At Tahare the berm is between 5-8m in width and the location is in the outside of a moderate bend. This risk may increase with time at some sites depending on erosion and long term stability of the river banks. *It is recommended that berm width and signs of erosion continue to be monitored and maintained in accordance with the Whakatane Waimana asset management plan.*

¹ It should be noted that a low risk would generally equate to an "acceptable margin against failure by engineering standards". The moderate, high are increasing risk levels with high equating to at least 30 % chance of failure. Comparing to say the conventional factor of safety approach; 1.5 equals a low risk, 1.2 to 1.3 is equivalent to moderate risk and 1.1 or less represents a high risk (Riley's, 2007)

2.11 Task No. 11 – Update stopbank risk assessment

2.11.1 Task description

Update stopbank breach risk assessment report based on findings in the geotechnical investigation report (refer Task 10).

2.11.2 Update

Results of the original stopbank breach risk assessment (Wallace, 2006) were reviewed based on the findings of the Riley Consultants geotechnical report. The Riley report confirmed that it is unlikely, on the basis of the information gathered that, there are any major geotechnical weaknesses in the stopbanks at the five sites investigated.

In September 2006 Wallace reviewed his risk assessment and concluded that the risk of stopbank breach would not be any higher than his original estimates provided in the Stage 1 Whakatane Waimana FMS report. Risk assessments were not reduced due to:

- Riley's observations that there were some areas with less than ideal material in the stopbank foundations
- Geotechnical findings being based on Riley's judgement and therefore subject to some uncertainties where information was incomplete
- Wallace's risk assessment being based on probabilities which are also subjective.

As with any protection system a certain amount of risk will always be inherent at some point in the life cycle of any flood management system. The flood risk remaining after implementation of risk treatment, for example, the risk of flooding that still exists despite protection provided by say stopbanks is defined "residual risk".

Residual risks in Whakatane Waimana River scheme catchment include:

- Oversdesign events – The historical experience in flood management is that design standard are regularly exceeded in nature and it is not common practice to at least counter the effects of maximum credible events, rate though they might be.
- Stopbanks stability – Implicit in the understanding that stopbanks meet design standards is the assumption that adequate factors of safety exist for geotechnical stability of Whakatane stopbanks to check if acceptable factors of safety exist against failure modes mentioned in Stage 1, s2.5. Remedial work has been implemented to restore factors of safety to acceptable standards at various locations (e.g. Red Conway Park).
- Prolonged steady state seepage conditions – Traditionally stopbanks are designed as water retaining embankments that experience bank full conditions for relatively short periods of time, not extending over more than 12 hours and often less than six hours (pg 130, Atcheson, 1968). As such stopbanks may not be designed to handle prolonged seepage flows and pressures. Risk of failure can be reduced by implementing remedial works that result from an adverse seepag3 and stability assessment. However that being said there are approximately 86km of stopbanks within the Whakatane Waimana rives scheme so some residual risk will always be present.

2.12 Task No. 12 – Flood protection to infrastructure

2.12.1 Task description

Review flood protection provided to infrastructure and implement protection measures where required, to reduce risk of failure. Roads, bridges, sewerage and stormwater networks require review.

2.12.2 Update

Whakatane District Council, Transit NZ, Environment Bay of Plenty and consultants are currently reviewing the adequacy of district and regional roads plus state highways. Natural hazards such as flooding are being considered in the roading review (including bridges). Remediation options may include road raising, relocation or provision of alternative routes. Whakatane District Council has allowed for funding district roads in its Long Term Community Consultation Plan (or LTCCP). Projects planned in the next 10 years include:

- Preparation of a concept plan for improving western access to Whakatane. This may include the planning for a new bridge across the Whakatane River (2006/07)
- Route security – risk response planning and potential improvement works in The Whakatane Waimana Catchments include Te Rahu, Wainui Road, Taneatua Road, and Mac Donald Road

It is recommended that when Whakatane District Council and Transit NZ upgrade its road and bridge assets that they incorporate measures to the risk of further flood damage as was evidenced in July 1998 and July 2004 flood events (Refer s2.3, s2.4 and s2.7.3a in Stage 1 report).

Whakatane District Council will be upgrading its wastewater reticulation system, pump station and treatment plant in the period 2006 – 2016. *It is recommended that when Whakatane District Council upgrade its wastewater assets that it incorporates measures to the risk of further flood damage as was evidenced in July 1998 and July 2004 flood events (Refer s2.73c in Stage 1 report).*

Whakatane District Council recognises the vulnerability of some aspects of its stormwater network. In its LTCCP the Council state:

The July 2004 and May 2005 flood events highlighted stormwater inadequacies in some locations and caused considerable damage to isolated networks (Whakatane District Council, 2006).

It is assumed Whakatane District Council will address the inadequacies in conjunction with its maintenance and renewals programme. Examples of stormwater works necessary as a result of past floods include:

- Completion of stormwater works in Douglas Street (2006/07)
- Wainui Te Whara detention dam construction (2008/09)

It is recommended that when Whakatane District Council upgrade its stormwater assets that it incorporates measures to the risk of further flood damage as was evidenced in July 1998 and July 2004 flood events (Refer s2.73d in Stage 1 report) .

2.13 **Task No. 13 – Security of public potable water supplies**

2.13.1 **Task description**

Review security of supplying potable water and implement flood protection measures to reduce the risk of short supply in future floods.

2.13.2 **Update**

Whakatane District Council expects to be able to sustain water supply scheme sources for the forecasted population growth. However existing treatment and supply assets in urban Whakatane, Ruatoki will not be adequate to meet future demand thus some upgrades and extensions will be necessary (Whakatane District Council, 2006). Water supply improvements in the catchment and outlined in the LTCCP include:

- Water treatment plant renewals and upgrades in Whakatane (2006/16)
- Renewal and upgrading water reticulation in Whakatane and Whakatane West water mains upgrade(2006/16)
- Whakatane water rising main (2007/08)
- Water treatment plant upgrade in Te Mahoe (2011/16)

It is recommended that when Whakatane District Council upgrades its water supply assets that it incorporates measures to the risk of further flood damage as was evidenced in July 1998 and July 2004 flood events (Refer s2.73e in Stage 1 report).

2.14 **Task No. 14 – Security of private potable water supplies**

2.14.1 **Task description**

Owners of private water supplies should have back up supplies of potable water in the event that main water supplies are cut off.

2.14.2 **Update**

Regional and local councils are limited in what they can do to ensure owners of private water supplies maintain their assets so that sources remain potable during flood events. In the end it is up to private owners to take responsible measures such as relocating water sources out of flood prone areas or providing back up sources ready in the event of an emergency.

2.15 **Task No. 15 – Flood protection to power supplies**

2.15.1 **Task description**

Review flood protection provided to power supply facilities and implement protection measures where required to reduce risk of failure

2.15.2 Update

Horizons are currently working with Whakatane District Council and consultants to ensure their assets at risk are identified. Horizons will re-level some of those assets to ensure that security of power supply can be maintained during predicted storm events (Horizons, 2006).

2.16 Task No. 16 – Flood protection to gas supplies

2.16.1 Task description

Review flood protection provided to natural gas facilities and implement protection measures where required to reduce risk of failure

2.16.2 Update

NGC now known as Vector Gas Ltd has reviewed the Stage 1 report. Vector commented saying that gas pipelines at risk are generally those above ground. Since most gas pipelines are buried flood risk is less of an issue.

Vector identified three locations where above ground gas pipeline assets may be at risk from flood waters illustrated in the Stage 1 report:

- The first location is at Carter Hold Harvey site. In the low likelihood event of a breach at Tahere Road (refer Breach 9, Appendix 4, Stage 1 report) an above ground delivery line might be covered by approximately 1m of flood waters.
- In significant storms floodwaters may come close to the above ground delivery line in Ruatoki Valley Road (Refer flood maps on pages 89 – 95, Appendix 3, Stage 1 report).
- The third location is the intermediate high pressure pipeline that is attached to the underside of the Landing Road Bridge (Refer flood maps on pages 83 – 87, Appendix 3, Stage 1 report).

Although not desirable aboveground gas pipelines can withstand some degree of flood inundation so risk to the first and second pipeline locations should be minimal.

However location of the pipeline beneath Landing Road Bridge is at significant risk of damage due to debris impact. *It is recommended that Vector relocate this pipeline to the downstream side of the bridge.*

2.17 Task No. 17 – Flood protection to telecommunication network

2.17.1 Task description

Review flood protection provided to telecommunication network facilities and implement protection measures where required to reduce risk of failure

2.17.2 Update

Telecom has acted quickly to repair their network facilities during past floods. It is assumed they will continue to do so in the future and provide flood protection to risk areas identified in this floodplain management strategy.

2.18 **Task No. 18 – Promotion of home and contents insurance**

2.18.1 **Task description**

Homeowners should be encouraged to obtain home and contents insurance policies that cover flood damage.

2.18.2 **Update**

Current Status of Flood Cover

Following consultation with the Insurance Council of New Zealand and the Earthquake Commission, it is understood that the current state of flood cover still exists for residents in all parts of the Eastern Bay of Plenty. However the government was to review the flood cover policies' following the 2005 flood events, but this is currently on hold.

The current state of Earthquake Cover is summarised as follows:

Under the Building Act 2004, Section 73-74 states that if a building is built on a site that has a known risk of being affected by a natural hazard, then notification of this must be placed on the land title.

Subsequently if a claim is made for the property with a Section 74 notice under the Building Act 2004, placed on it the Earthquake Commission (EQC) may decline the claim, either in part or in whole. The EQC has discretion under the Building Act to evaluate each individual case on its particular merits.

The EQC also has the ability to cancel its future insurance cover on a property following a full pay out. In this case a Section 74 notice would be placed on public record and the applicant notified.

The maximum EQC payout is \$100,000 for home and \$20,000 for contents, any additional cover will come from the resident's personal insurance company.

EQC cover is only provided to those who have a private home and contents policy; therefore those without any policies are left without any cover at all. It is estimated that 60% homes have home and contents insurance policies. However there is no real way to confirm this, short of doing a door to door survey.

Interestingly enough it is noted that of the total number of homes inspected for flood damage in the Whakatane Waimana catchments' after the July 2004 event one third did not have house contents insurance (Environment Bay of Plenty, 2005).

It is recommended that homeowners in the Whakatane Waimana catchment be strongly encouraged to purchase home and contents insurance in order to at least qualify for EQC assistance. Purchase of such policies should be carried out before government changes its flood cover policies which may not necessarily favour those homes built in floodplains.

Environment Bay of Plenty and Whakatane District Council may be able to encourage homeowners to purchase home and contents by raising public awareness of the pitfalls of not having insurance. This task may be better managed by the media/public relations departments of each Council. Awareness could be raised by posting relevant information on Council websites, in its regular newsletters and mail outs etc.

Chapter 3: Other Issues Arising in Liaison Group Meeting, 22 August 2006

On 22 August 2006 the draft Stage 1 Whakatane Floodplain Management Strategy report was presented to the Whakatane Rivers Scheme Liaison. Those in attendance were:

- Environment Bay of Plenty Councillors: Ian Noble, Tipene Marr, Malcolm Whitaker, Bryan Riesterer.
- Environment Bay of Plenty Officers: Clive Tozer, Peter Blackwood, Tony Dunlop, Robbin Britton, Dana Thompson.
- Whakatane District Council: David Bewley, Mike Naude.
- Whakatane Rivers Scheme Liaison Group: Scotty McLeod, Bernie Clark, Robert Brosnahan, Len Brown, Paki Nikora, Richard Holmes, Janette Mitchell, Alan McCracken.

A number of statements and questions were raised during the presentation and these are addressed as follows:

3.1 Flood inundated areas

- Avoid building new habitable buildings in flood inundated areas. Flood maps produced in Stage 1 should assist planners avoid building in these areas.

(Originator: Peter Blackwood, Environment Bay of Plenty)

Response:

Flood maps have been provided in Stage 1 and this Stage 2 report to assist planners identify flood inundated areas and avoid building new developments and subdivisions in these areas. Flood level information has been given to Whakatane District Council. Refer also to s2.5 update above.

3.2 Climate change and town planning

- How should climate change be included in future planning of habitable buildings (with 50 year life) and subdivisions (with 100 year life)?

(Originator: David Bewley, Whakatane District Council)

Response:

Climate change effects have been taken into account in the hydraulic modelling completed by Environment Bay of Plenty. Refer also to comments made regarding minimum building floor levels and minimum platform levels for subdivisions in s2.5 above.

3.3 Emergency spillway for Whakatane stopbanks

- Can an emergency spillway/floodway be provided to spill flows equal to or greater than the current service level flow? This may provide an alternative to raising existing stopbanks.

(Originator: Ian Noble, Environment Bay of Plenty Councillor)

Response:

A brief desk top study undertaken recently revealed that a floodway concept may be difficult to construct because of existing obstructions in the flow path.

The possibility was raised at the Liaison Group meeting of having a portion of stopbank lowered on the true left bank located somewhere downstream of Rewatu Road.

The idea would be to construct a floodway similar to Reid's Central canal/floodway whereby overdesign flood flows can exit the main stopbanked river and discharge down a wide stopbanked canal and exit at the coast. The main problem with the Whakatane River system is that there are numerous canal stopbanks running across the proposed floodway path such as Te Rahu and Waioho.

One option may be to have the lowered section of stopbank between the outlet points of the Te Rahu canal and Fortunes Drain and create a floodway to get water into the Kope East Canal. From the Kope canal water would then connect back into the lower Whakatane River or via the sluice gate into the Kope West canal to the Rangitaiki River. The main difficulties with the floodway option are:

- How to get floodway water into the canals – these have stopbanks. Maybe some form of tipping weir wherein a weir structure only falls one way in the direction of the floodway flow
- Avoiding the oxidation ponds
- Getting floodway water from canals back into the river (there is a gate at the Whakatane-Kope confluence) without flooding more of the floodplain
- Risk of flooding houses in the floodway path

There are numerous challenges in creating a floodway retrospectively. However it should be noted that the crest levels of left urban stopbanks are constructed 300 mm less than their equivalent right urban stopbank counterparts above the Yacht Club and 100mm less down to the river mouth. This means that for large flood events water will overtop into the Rangitaiki floodplain before overtopping into the Whakatane urban area.

3.4 Permanent stopbanks for Ruatoki

- Can permanent stopbanking be provided for houses at Ruatoki?

(Originator: Paki Nikora)

Response:

Ten year stopbanks are to be constructed at the southern end of Ruatoki Valley Road to reduce risk of flood waters cutting off access to several residences. Refer s2.6 above. Flooding is not thought to have entered houses in this vicinity in the past.

3.5 Permanent stopbanks for Waimana

- (Personal view) Stopbanks cannot be justified in Waimana catchment since cost would be high and very little protective value results.

(Originator: Bernie Clark, Liaison Group)

Response:

The Stage 1 report concluded that several buildings in the Waimana flood plain may be at risk of flooding.

A separate study is recommended to compare 100 year flood levels with actual minimum floor levels. Refer s2.6 above for details related to Waimana.

3.6 Impact of flood protection works

- (Observation) Flood protection works in Waimana cannot be implemented without it affecting flood levels downstream.

(Originator: Janette Mitchell, Liaison Group)

Response:

This observation is reasonable. The flood/floor level study described in s2.6 will consider down and upstream effects of stopbanks and/or floodwalls as part of the assessment of effects of various options.

3.7 Emergency action plan

- Can an Emergency Action Plan for floodable areas be prepared wherein warning times to evacuate people are listed?

(Originator: Ian Noble, Environment Bay of Plenty Councillor)

Response:

Flood warning times and flood depths are provided in this Stage 2 report. Refer s2.5 for details. It is anticipated this information will be added to a separate manual that sits alongside the flood warning manual.

3.8 Flood free access at Blacks Corner

- Can flood free access be provided on the road between Whakatane and Taneatua (SH2) at Blacks Corner (Sykes farm)?

(Originator: Tipene Marr, Environment Bay of Plenty Councillor)

Response:

Sykes trigger level is recorded in the flood warning manual. When flood waters reach this critical level Environment Bay of Plenty informs Whakatane District Council, Civil Defence, Police who are responsible for setting up road blocks and diverting traffic.

Whakatane District Council's current Long Term Council Community Plan (LTCCP) anticipates reviewing transport route security in the period 2009 – 14. One of the roads to be assessed includes Taneatua Road. Refer s2.12 for further detail. Possible options could include providing flood free access e.g. raise stopbank or road, or provide an emergency bypass 4WD track (to east).

3.9 Access between Ruatoki and Taneatua

- Road access between Ruatoki and Taneatua floods before Blacks Corner does. Can this be remedied?

(Originator: Tipene Marr, Environment Bay of Plenty Councillor)

Response:

The Ruatoki trigger level is recorded in the flood warning manual and Environment Bay of Plenty responds in similar manner to that described at Blacks Corner (Sykes). Whakatane District Council will be reviewing route security along Ruatoki roads in 2009 – 14. Refer Task 12. Possible options might include providing flood free access by raising the stopbank or road.

3.10 Flood protection affordability

- Section 2.7.6 Community Resilience in the Stage 1 report gives the impression that many of the catchment ratepayers are of low income and therefore cannot contribute financially to additional flood scheme protection. However the benefactors of such flood protection are mostly higher income farmers and the report text should amend to provide a balanced view.

(Originator: Ian Noble, Environment Bay of Plenty Councillor)

Response:

Section 2.7.6 in the Stage 1 report has been reviewed and updated.

3.11 Value of flood protected Maori land

- Currently some multi owned Maori land has no flood protection and this has an associated land value. In the event that flood protection is provided to this Maori land which then ends up on Title then how will people be able to afford it?

(Originator: Bryan Riesterer, Environment Bay of Plenty Councillor)

Response:

The scope of this floodplain management strategy does not include an appraisal of the affordability of land protected from floods. Flood mitigation options may however include purchase of land that cannot be readily protected from floods i.e. purchasing flood inundated land may be less expensive than constructing expensive structural measures such as stopbanks.

3.12 House relocation/insurance costs

- What are the costs to either shift or insure houses in flood inundated areas?

(Originator: Bryan Riesterer, Environment Bay of Plenty Councillor)

Response:

Building relocation costs would be assessed as part of task s.2.6 above. Refer to task s2.18 for further detail on house and insurance costs.

3.13 Responsibility for minimum floor levels

- Who is responsible for existing houses that are known to be below the 50 year flood level?

(Originator: Ian Noble, Environment Bay of Plenty Councillor)

Response:

Under the Building Act 2004 Whakatane District Council is obliged to ensure that all buildings within its territory have their minimum floor levels set above the 50 year flood level.

This requirement applies to buildings constructed since enactment of the Building Act. Since the original amendment came into effect around 1990–1991 there may be buildings constructed before that date, that are lower than the 50 year flood level. As stated above in task s2.6 a more comprehensive flood inundation study is recommended for Waimana and Upper Whakatane. Comparison of the 100 year flood levels with existing minimum floor levels will help determine the type and extent of flood mitigation options required.

- Will a formal letter be forthcoming from Whakatane District Council addressed to Environment Bay of Plenty stating that minimum flood protection (from 50 year flood levels) is/will be provided to WD ratepayers and their buildings?

(Originator: Ian Noble, Environment Bay of Plenty Councillor)

Response:

Under the Building Act 2004 Whakatane District Council is obliged to ensure that all buildings within its territory have their minimum floor levels set above the 50 year flood level. Refer also to previous response related to enactment of the Building Act and buildings constructed prior to 1991. This intent is supported in Section 4.4 of the Whakatane District Plan. Examples of Whakatane District Council's commitment to providing ongoing minimum flood protection to buildings include investigations currently underway for Awatapu and Wainui Te Whara.

3.14 Earthquake risk to stopbanks

- Has consideration been given to the possible earthquake risk of the catchments' stopbanks?

(Originator: Robert Brosnahan, Liaison Group)

Response:

In 2002 GNS carried out a risk assessment of flood protection assets managed by Environment Bay of Plenty (GNS, 2000). The purpose of the study was to review the risk of extreme events to uninsured river and drainage scheme infrastructural assets. GNS reviewed the risk to assets from floods, earthquakes, tsunami and volcanic eruptions.

Blackwood summarised the GNS conclusions in his report to Council in June 2003 (Blackwood, 2003). Regarding earthquake risk Blackwood noted:

"It is apparent that for events of less than 1000 years return period, the infrastructural assets are more vulnerable to tsunami and floods, than they are to earthquake damage. This is not surprising as the full force of a flood is generally felt strongest in the immediate vicinity of the assets. Similarly, a tsunami will impose very large forces along much of the coastline and thereby in the lower reaches of all schemes. Conversely, the damage from earthquakes will attenuate (i.e. die away) rapidly with distance from epicentre"

Environment Bay of Plenty's Technical Services group will be preparing inundation maps that show the effects of tsunami on the upstream reach of major river mouth's within the region. Inundation maps will show flood levels, extent and possible warning times resulting from 100 year (design) and 1000 year ("overdesign" event) ARI tsunamis.

The current target balance for the disaster recovery reserve in the Whakatane Waimana Asset Management Plan is 20% of the Expected Maximum Loss (EML). The EML for the scheme is estimated to be \$2.5M for flood and tsunami events (Environment Bay of Plenty, 2006).

Chapter 4: Summary of Task Updates

4.1 **Task No. 1 – Upper Whakatane River level recorder**

Flow gauging at Ohotu Bridge is best taken from a boat during significant flood events. Data captured will help to confirm the Upper Whakatane hydraulic model.

4.2 **Task No. 2 – Stopbank raising at Yacht Club, Whakatane**

Work to raise the low spot in the stopbank at this location is programmed to occur in 2006/07

4.3 **Task No. 3 – Flood protection for Awatapu suburb**

A new additional pump station is to be constructed at Awatapu Drive to maintain Awatapu lagoon water levels by discharging excess into the Whakatane River.

4.4 **Task No. 4 – Flood Emergency Management Lessons**

The Bay of Plenty MCDEM Group plan was approved by Bay of Plenty Councils in 2005.

4.5 **Task No. 5 – Review Effectiveness of Non-Structural Measures**

The aim of this task was to review and assess the effectiveness of current non-structural flood protection methods used in the Whakatane - Waimana catchment.

4.5.1 **Flood warning and flood monitoring**

Hydrological monitoring systems that underpin Environment Bay of Plenty's flood warning system have worked well in the past and should continue to do so in the future provided equipment is maintained.

4.5.2 Flood warning manual

Environment Bay of Plenty's flood warning manual has proven to be satisfactory during periods of flooding. It has been used effectively during floods including the severe storms of July 1998 and July 2004. The main issues appear to be in keeping the manual up-to-date with new operational data as it comes to hand and training new Flood Managers in its use. Stopbank breach/inundation flood maps are to be collated and kept together in a separate manual that sits alongside the flood warning manual. Flood maps can also be placed on Environment Bay of Plenty's web site and be used in conjunction with flood emergency practices for example in the evacuation of residents from Whakatane urban area. The practice of updating phone contact numbers should continue on an annual basis and revised phone lists issued accordingly. A more comprehensive review and update should be carried out on a three yearly basis. Allocating portions of the text to appropriate staff and making them responsible for keeping their sections up-to-date would help speed up the comprehensive review. New Flood Managers should be given an induction course on the use of the manual and learning's reinforced by observing experienced Flood Managers in operation.

4.5.3 Protecting Environment Bay of Plenty regional civil defence building

Environment Bay of Plenty is responsible for managing a Level 4 (Regional) Civil Defence emergency and would use its Whakatane building to coordinate its response. Challenges to be addressed by Environment Bay of Plenty include assuring the ongoing function of its civil defence responsibilities in the event its building is isolated and/or its power and telecommunication are cut off. If Environment Bay of Plenty's building is isolated due to say, flood waters then staff must still be able to fulfil their regional civil defence responsibilities. Consideration to having a back-up building is recommended. The back-up building would duplicate the civil defence function of the existing Whakatane building. If Environment Bay of Plenty were to relocate its Whakatane building then the new site should be assessed in terms of its vulnerability to become isolated and include features that ensure it remains functional during extreme events.

Operations connected to the secondary power supply should be reviewed and those functions identified as less important in an emergency should be removed to reduce load on the generator. Secondary power circuit functions should also be identified within the building to assist rapid identification during emergencies.

Procedures for maintaining and refuelling the generator with floodwater below should be developed. Internal walls of the existing generator room should be sealed to protect staff in adjacent offices from fume inhalation. In addition, (or as an alternative to wall sealing) the generator exhaust fumes could be vented directly to the external wall ventilation duct.

Investigation should be carried out to determine the most practical fuel supply arrangement to ensure the generator can run for extended periods during emergencies.

Computer and phone systems should be checked to confirm they run smoothly off the generator.

The generator should be fitted with an automatic start feature to reduce power cut delays and reduce the load on computer and phone system batteries.

The new swipe access card installed in Environment Bay of Plenty's Whakatane building should be tested in conjunction with generator tests of other essential equipment.

The feasibility of relocating the generator to a higher level should be explored.

Environment Bay of Plenty's Whakatane office communicates with its other regional offices in Rotorua and Tauranga via a sole fibre optic cable running between Tauranga and Whakatane. If the cable fails as it did during the May 2005 then Whakatane office will not be able to communicate outside the district. Other means of telecommunication to areas outside of the district should be investigated.

Providing a back-up call centre for Whakatane 'switchboard' staff would also appear to be prudent. If Whakatane 'switchboard' staff is unavailable then incoming calls may go unattended.

4.5.4 **LIM and PIM reports**

These are kept by Whakatane District Council and appear to be up-to-date with details of known flood hazards.

4.5.5 **Current building standards**

Resource consent conditions stipulating that new buildings are built above the 50 year flood level continue to be supported and enforced by Whakatane District Council and Environment Bay of Plenty. Design levels now include provision for climate change which means 50 year flood levels are based on rainfall expected in the year 2055. Flood maps and specific advice have been given to Whakatane District Council to be used for approving new building developments and subdivisions. Ministry for Environment climate change guidelines can be used to assess flood levels in those areas not already assessed by Environment Bay of Plenty.

4.5.6 **Public awareness**

The Whakatane public is aware of flood hazards and informed of what to do by means of various publications, the media and Internet facilities. MCDEM, Environment Bay of Plenty and Whakatane District Council continue to take responsibility for increasing public awareness and promoting emergency preparedness.

4.5.7 **Information exchange between local and regional councils**

Based on past performance it appears flood management is enhanced if responsible organisations namely Whakatane District Council and Environment Bay of Plenty have staff temporarily seconded to each other's organisations. This measure promotes better inter-Council liaison and communication.

4.6 **Task No. 6 – Flood modelling assumptions**

4.6.1 **Lower Whakatane**

Late scouring of the Whakatane River mouth spit fuse during the July 1998 and July 2004 floods was confirmed by Williams (2005). Williams concluded that late scouring was a result of high sea waves, high tide, sand build up opposing the scour direction and restricted width of the river mouth.

To ensure the spit fuse does scour during large floods it is important to regularly carry out dredging operations to the levels agreed to between Environment Bay of Plenty and Whakatane District Council. In addition Williams suggests some modifications to the dredging procedure to help the spit scour. Modifications include pushing sand to the river estuary side and restricting the extent of dredging.

4.6.2 **Upper Whakatane**

Whakatane District Council should compare 100 year design flood levels with actual minimum flood levels of potentially affected buildings. Flood protection options such as house raising should be investigated as an alternative to say stopbank construction. House relocation is more advisable where there is not safe access/egress to the building during floods. Acquisition of further LIDAR data is recommended to extend the hydraulic model and increase understanding of areas at risk of flooding.

4.6.3 **Waimana**

Whakatane District Council should compare of 100 year design flood levels with actual minimum flood levels and investigate alternative flood protection measures to say stopbank construction. Acquisition of further LIDAR data is recommended to extend the hydraulic model and increase understanding of areas at risk of flooding.

4.7 **Task No. 7 – Flood protection beside Wainui Te Whara Stream**

Whakatane District Council is investigating flood protection options to protect residents' adjacent Wainui Te Whara Stream. One option is to construct a flood detention dam in the upper catchment.

4.8 **Task No. 8 – Upper Whakatane LIDAR data**

This task is to be addressed as part of task s2.6 above

4.9 **Task No. 9 – Flood protection to roads**

Whakatane District Council, Environment Bay of Plenty, Transit NZ and consultants are currently reviewing route security which takes account of known flood risks.

4.10 **Task No. 10 – Geotechnical investigations on Whakatane stopbanks**

Results of the geotechnical investigations indicate stability is no worse than originally determined in the Stage 1 report.

The risk of stopbank breaching at all sites except at site 4 (Eivers to Amber) and site 9 (Tahere) is considered to be low.

Prior to further geotechnical investigations the risk of stopbank breaching at site 4 was assessed as 'moderate to high'. However with riprap protection and higher freeboard the stopbank breach risk is reassessed as being 'moderate to low'.

The risk of stopbank breach at site 9 (Tahere) is assessed as moderate due to its narrow berm width.

4.11 Task No. 11 – Update stopbank risk assessment

Additional geotechnical investigations carried out in Stage 2 confirm that risk assessment results outlined in the Stage 1 remain unchanged.

4.12 Task No. 12 – Flood protection to infrastructure

Whakatane District Council are aware of the road, stormwater and sewerage infrastructure vulnerable to flood damage. Several flood risk reduction measures are underway as described above. Future flood impact studies are outlined in Whakatane District Council's LTCCP.

4.13 Task No. 13 – Security of public potable water supplies

Whakatane District Council are planning upgrades to aspects of its potable water supply facilities and reticulation. Flood protection measures should be incorporated during planning stages.

4.14 Task No. 14 – Security of private potable water supplies

Ultimately private water supply owners must be responsible for security of their own supply during natural disasters such as flooding.

4.15 Task No. 15 – Flood protection to power supplies

Horizons are actively working towards ensuring all their assets are protected from flood damage.

4.16 Task No. 16 – Flood protection to gas supplies

Vector confirms that their pipeline assets can sustain some degree of inundation without sustaining significant damage. However the high pressure pipeline below Landing Road Bridge should be relocated to the downstream side of the bridge to reduce the risk of debris impact.

4.17 Task No. 17 – Flood protection to telecommunication network

It is assumed Telecom will provide flood protection to their assets identified as being inundated in this floodplain management strategy.

4.18 **Task No. 18 – Promotion of home and contents insurance**

The government plans to review its flood cover policies following the July 2005 flood events in the Eastern Bay of Plenty.

Presently home owners that have home and contents insurance policies can apply for financial assistance in the event of a natural hazard such as flooding. Exemptions are those home owners that have a Section 74 notice on their title or who do not have home and contents insurance policies.

Given that one third of the Whakatane Waimana homes inspected for flood damage following the July 2005 event did not have home and contents insurance policies would have meant that those homes did not qualify for financial assistance from the EQC.

Furthermore those homes that did qualify for EQC financial assistance may have incurred a Building Act Section 74 on their title.

Homeowners should be encouraged to purchase home and contents insurance before the government finalises its flood cover policies.

Chapter 5: Conclusions

The Stage 1 report concluded that current service level requirements are being met for the Whakatane Waimana Rivers Scheme. The Stage 1 report then asked stakeholders if they wished to raise the service levels to provide a higher level of flood protection.

Based on feedback received on the draft Stage 1 report stakeholders appear to accept the current flood protection service levels. The associated low risk of stopbank failure was also accepted by stakeholders subject to results of confirmatory geotechnical investigations. This Stage 2 report, whose aim it was to identify mitigation options, supports the notion that no increase in service levels is necessary at this stage but does recommend some improvements. The bulk of the improvements arise in four of the 18 tasks namely:

- Task 5; review of non-structural measures
- Task 6; hydraulic modelling assumptions
- Task 10; geotechnical investigations on Whakatane stopbanks
- Task 18; home and contents insurance.

Key conclusions are noted as follows;

Task 5 – Review of non-structural measures

Flood maps for two low probability events are to be included in the flood warning manual. Flood maps show estimated inundation depths and warning times and will help Civil Defence personnel plan the evacuation of residents living in Lower Whakatane urban areas. The flood maps to be included in a separate ‘sister’ manual to the flood warning manual comprise the ‘overdesign’ (or 300 year) flood event and the breach scenario at Eivers stopbank. Eivers is representative of the highest hazard location during a 100 year flood. However it should be understood though that the breaches portrayed in this Floodplain Management Strategy are considered low probability scenarios only.

Since Environment Bay of Plenty is responsible for managing a Level 4 (Regional) Civil Defence emergency it would use the Whakatane building to coordinate its response. Challenges to be addressed by Environment Bay of Plenty include assuring the ongoing function of its civil defence responsibilities in the event its building becomes isolated and/or its power and telecommunication are cut off. If Environment Bay of Plenty’s building is isolated due to say, flood waters then staff must still be able to fulfil their regional civil defence responsibilities. Consideration to having a back-up building is recommended. The back-up building would duplicate the civil defence function of the existing Whakatane building. In the event that Environment Bay of Plenty decide to relocate then the new site should be assessed in terms of its vulnerability to becoming isolated and include features that will ensure it remains functional during an extreme event.

Provision of flood maps and specific advice to Whakatane District Council will help them identify and avoid planning new development and subdivisions in potentially floodable areas. The flood maps enable setting of minimum building floor levels and minimum subdivision platform levels. The effects of climate change have also been taken into account when providing advice on future flood levels.

Task 6 – hydraulic modelling assumptions

To ensure Lower Whakatane flood levels calculated in this study are maintained it is extremely important that the spit fuse is maintained and kept to the level mutually agreed to by Environment Bay of Plenty and Whakatane District Council.

Alternative structural measures apart from stopbanks may be available to stakeholders to protect their property from flooding in Upper Whakatane and Waimana. Further detailed flood studies are being undertaken in Upper Whakatane. Flood levels in the Upper Whakatane reach are to be compared with actual minimum floor levels in the sub-catchment. Mitigation options such as house raising or relocation can then be investigated on a case by case basis. Further detailed flood studies similar to those being undertaken in Upper Whakatane are recommended for Waimana. House relocation is more advisable where there is not safe access/egress to the building during floods.

Task 10 – geotechnical investigations on Whakatane stopbanks

Geotechnical investigations confirm that stopbank stability risk assessment for the 100 year flood event remains the same as that determined in Stage 1. Maintaining flood protection assets are essential for ensuring stopbank stability. Review of hydraulic modelling assumptions show that maintaining the Whakatane River mouth spit to the agreed level is crucial for ensuring flood levels comply with current service level requirements.

Task 18 – home and contents insurance

Homeowners in the catchment that do not currently have home and contents insurance should be encouraged to purchase policies in order to qualify for EQC assistance.

Since existing risk associated with the flood protection system is considered adequate future flood mitigation becomes more a matter of maintaining and improving existing structural and non-structural measures instead of raising service levels. Several recommendations related to improving existing flood protection measures have been made throughout this Stage 2 report. Since recommendations can be implemented simply and independently an additional Stage 3 report is not considered necessary.

Chapter 6: Recommendations

The purpose of this Stage 2 report was to identify mitigation options. Since current service level requirements are being met and no changes to these are recommended the nature of proposed mitigation options focus mainly on maintaining and improving existing structural and non-structural measures. To this end the following mitigation options are recommended.

Task	Recommendation	Stakeholder Responsible	Required Output	Completion Date
	Upper Whakatane Level Recorder (Report ref: 2.1)			
1	Using a boat take flow readings at high stage upstream of Ohotu Bridge. Use information to refine hydraulic model of Upper Whakatane (Report reference: 2.1)	Environment Bay of Plenty	Review and update Upper Whakatane Capacity modelling report	To be confirmed
	Effectiveness of Non-Structural Measures (Report ref: 2.5)			
2	The flood warning manual should be updated by appropriate Environment Bay of Plenty staff. Updating phone contact lists on an annual basis should continue. A comprehensive update should be carried out on a three yearly basis. Appropriate staff members should be given responsibility for updating a specific section of text to speed up the comprehensive review.	Environment Bay of Plenty	Continue updating flood manual contact phone numbers annually. Carry out comprehensive review of the flood manual on a three yearly basis.	Before end-of-June of each year
3	New Flood Warning Managers should be given an induction course on the flood warning manual and observe experienced Flood Managers in operation before taking 'sole' responsibility for the duty themselves	Environment Bay of Plenty	Allow training time for new Flood Warning Managers. Appoint a trainer.	As required.
4	Environment Bay of Plenty should consider establishing a back-up emergency building to ensure it can continue to manage regional civil defence emergencies.	Environment Bay of Plenty	Identify and acquire use of an alternative emergency facility	ASAP

Task	Recommendation	Stakeholder Responsible	Required Output	Completion Date
5	If Environment Bay of Plenty decides to relocate its current Whakatane building then the new site should be assessed in terms of its vulnerability to becoming isolated. The new building design should incorporate features that allow it to continue functioning during extreme events.	Environment Bay of Plenty	If necessary – select new site and design building to ensure emergency management functions can be maintained during extreme events.	As required.
6	Functions connected to the secondary power circuit that are less important in an emergency should be removed to reduce load on generator	Environment Bay of Plenty	Switch board to be modified as appropriate	ASAP
7	Procedures should be established for maintaining operation of the generator located in Environment Bay of Plenty's Whakatane building in the event that floodwaters lie below.	Environment Bay of Plenty	Review and update Generator Operations and Maintenance Manual	ASAP
8	Whakatane building generator fumes should be vented away from adjacent offices to an external wall duct	Environment Bay of Plenty	New vent installed	ASAP
9	A larger fuel supply should be made available for the generator to run during longer flood periods	Environment Bay of Plenty	Larger fuel supply provided	ASAP
10	Environment Bay of Plenty should test its door swipe cards, computer and telecommunication systems using the generator.	Environment Bay of Plenty	Complete door swipe tests	ASAP
11	Automatic start feature should be installed on the generator to reduce power cut delays and reduce load on back up batteries	Environment Bay of Plenty	Automatic start installed on generator	ASAP
12	Feasibility of relocating Whakatane building generator to a higher level should be investigated	Environment Bay of Plenty	Complete investigations	To be confirmed.
13	Availability of back-up telecommunication networks should be investigated in the event that the sole Telecom fibre optic cable between Tauranga and Whakatane fails.	Environment Bay of Plenty	Complete investigations	To be confirmed.
14	A back-up call centre for the Whakatane based 'switchboard' staff be investigated in the event they are unavailable to man the Whakatane building telephone system.	Environment Bay of Plenty	Complete investigations	To be confirmed.
15	WDC should consider placing a note on their LIM reports that confirm whether the stopbank bylaw is in effect and whether the property complies (or otherwise) with its requirements.	Environment Bay of Plenty	Complete investigations	To be confirmed.

Task	Recommendation	Stakeholder Responsible	Required Output	Completion Date
16	Provide flood maps to Whakatane District Council and Civil Defence personnel for town planning purposes and evacuation of residents in the event of high hazard/low probability flood events.	Environment Bay of Plenty	Flood maps are included in this Stage 2 report.	ASAP
17	Consider placing emergency information in local directory. Acquire results from MCDEM poll (Colmar Brunton) which assesses emergency preparedness	Environment Bay of Plenty	Discuss option with Civil Defence	To be confirmed.
18	Staff from Whakatane District Council to be on-site in Environment Bay of Plenty's emergency building during Level 4 civil defence storm events (and visa versa during Level 3 storm events) to improve communications between the two organisations.	Environment Bay of Plenty/ Whakatane District Council	Agree on a mutually acceptable arrangement before a CD emergency arises	ASAP
	Lower Whakatane Modelling Assumptions (Report ref: 2.6)			
19	Maintain ability of spit fuse to scour to the agreed level. Seek ways to improve scour operation and performance	Whakatane District Council	Investigate options for improving scour and continue to ensure spit is kept at agreed level	Ongoing
	Upper Whakatane Modelling Assumptions (Report ref: 2.6)			
20	Compare 100 year design levels in Upper Whakatane with minimum building floor levels. Investigate mitigation options including house raising or relocation as alternative to stopbanks. House relocation is more advisable where there is not safe access/egress to the building during floods. Acquire further LIDAR data for modelling purposes	Environment Bay of Plenty / Whakatane District Council	Complete investigations	31 December 2007
	Waimana Modelling Assumptions (Report ref: 2.6)			
21	Compare 100 year design levels in Waimana with minimum building floor levels. Investigate mitigation options including house raising or relocation as alternative to stopbanks. House relocation is more advisable where there is not safe access/egress to the building during floods. Acquire further LIDAR data for modelling purposes	Environment Bay of Plenty / Whakatane District Council	Commence and complete investigations	31 December 2007

Task	Recommendation	Stakeholder Responsible	Required Output	Completion Date
	Geotechnical Investigations on Whakatane Stopbanks (Report ref: 2.10)			
22	Continue maintaining stopbanks and edge protection assets in accordance with the AMP to maintain stability.	Environment Bay of Plenty	Stopbanks and edge protection maintained in accordance with AMP	Ongoing
	Flood Protection to Infrastructure (Report ref:2.12)			
23	Include flood protection measures when planning upgrades to road and bridge assets.	Whakatane District Council		Ongoing
24	Include flood protection measures when planning upgrades to wastewater assets.	Whakatane District Council		Ongoing
25	Include flood protection measures when planning upgrades to stormwater assets.	Whakatane District Council		Ongoing
	Flood Protection to Gas Supplies (Report ref: 2.16)			
26	Relocate high pressure pipeline beneath Landing Rod Bridge to downstream side to reduce risk of debris impact.	Vector	Relocate pipeline	ASAP
	Security of Public Potable Water Supplies (Report ref:2.13)			
27	Include flood protection measures when planning upgrades to public water supply assets.	Whakatane District Council		Ongoing
	Promotion of Home and Contents Insurance (Report ref:2.18)			
28	Homeowners in the Whakatane Waimana catchment be strongly encouraged to purchase home and contents insurance in order to at least qualify for EQC assistance.	Environment Bay of Plenty / Whakatane District Council to promote	Reduction in the number of homeowners without insurance cover	ongoing

Chapter 7: References

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Appendices

Appendix 1 Flood Maps

Appendix 2 Whakatane Residential Growth Areas – Flooding and Inundation Risk

Appendix 1 – Flood Maps

The scenario shown in Figure A1.1 assumes a breach is initiated near the peak of a 100 year flood which then develops to full depth (to general ground level) and width (200m) one hour later. Times shown indicate time from breach initiation to first general flooding at the location and time to peak levels. Peak levels are metres above Moturiki Datum. No freeboard is assumed. Refer to *Whakatane Hydraulic Model Report by Wallace, July 2004* for further detail. It should be noted that this is a scenario only and risk assessment indicates that it is a low probability event.

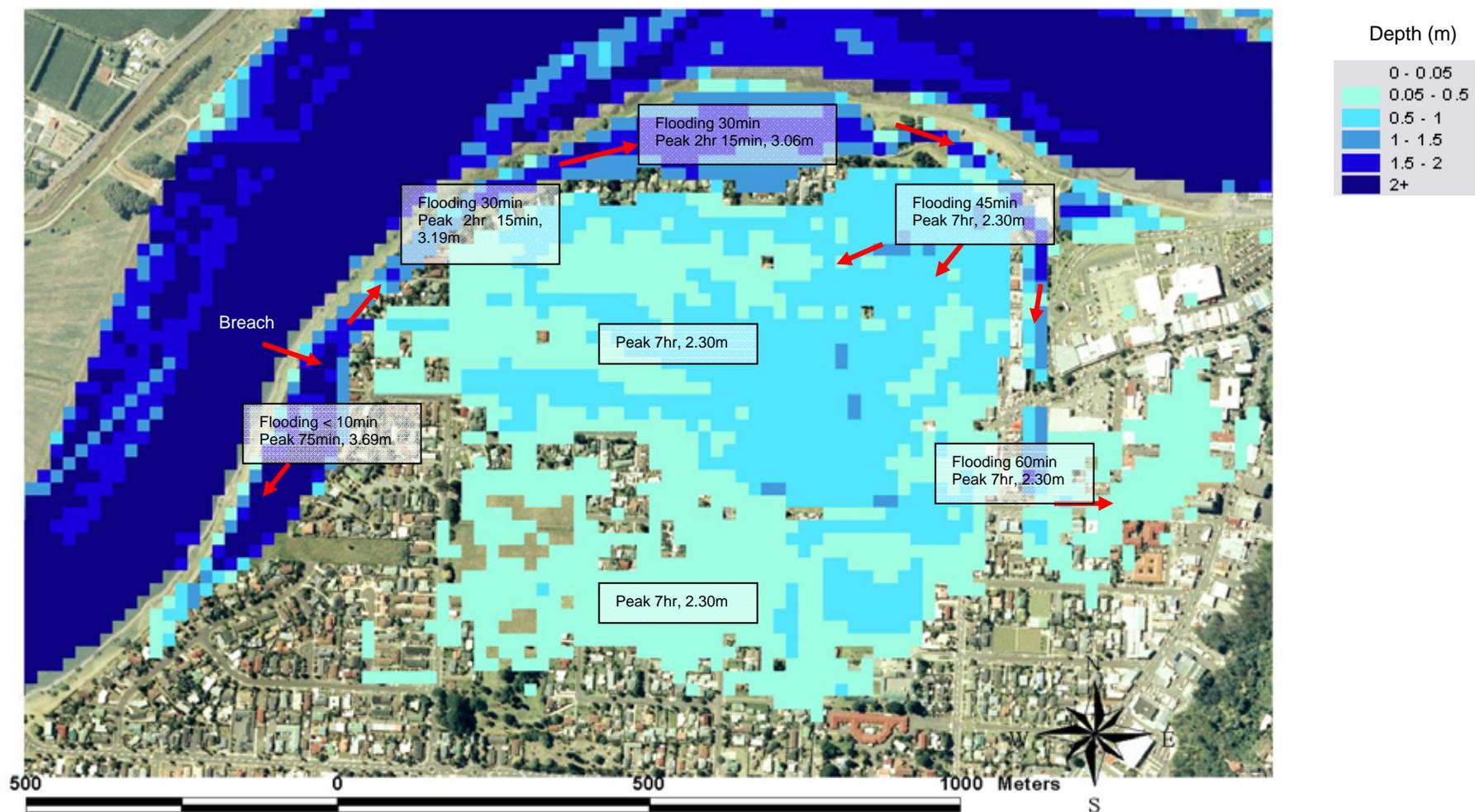


Figure A1.1 Eivers Breach Scenario – Flood timing and water levels with 100 year flood.

0.33% AEP (300 Year) Flood Levels

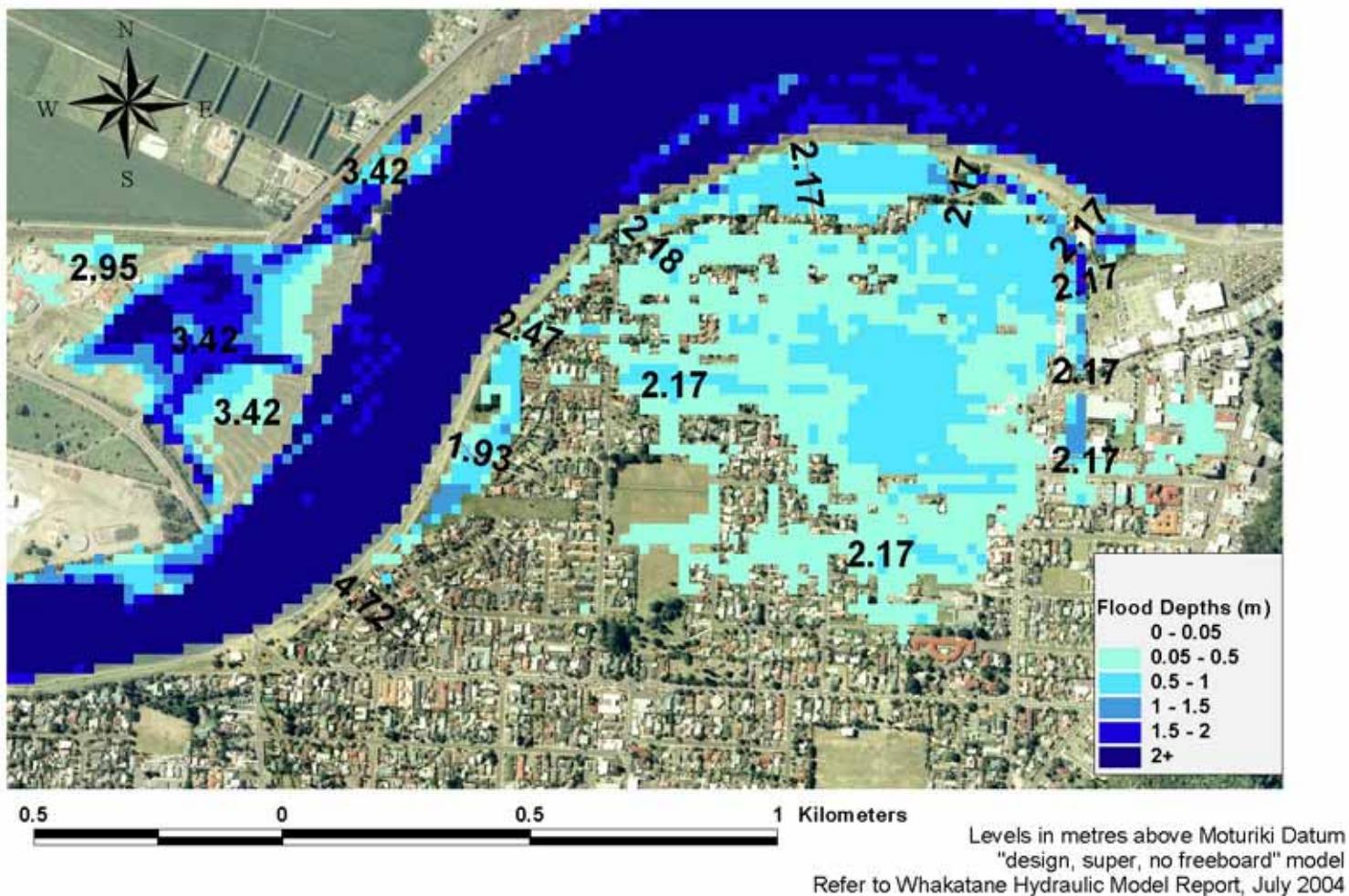


Figure A1.2 Whakatane River – 300 year flood extent with water levels, north of Landing Road Bridge

0.33% AEP (300 Year) Flood Levels

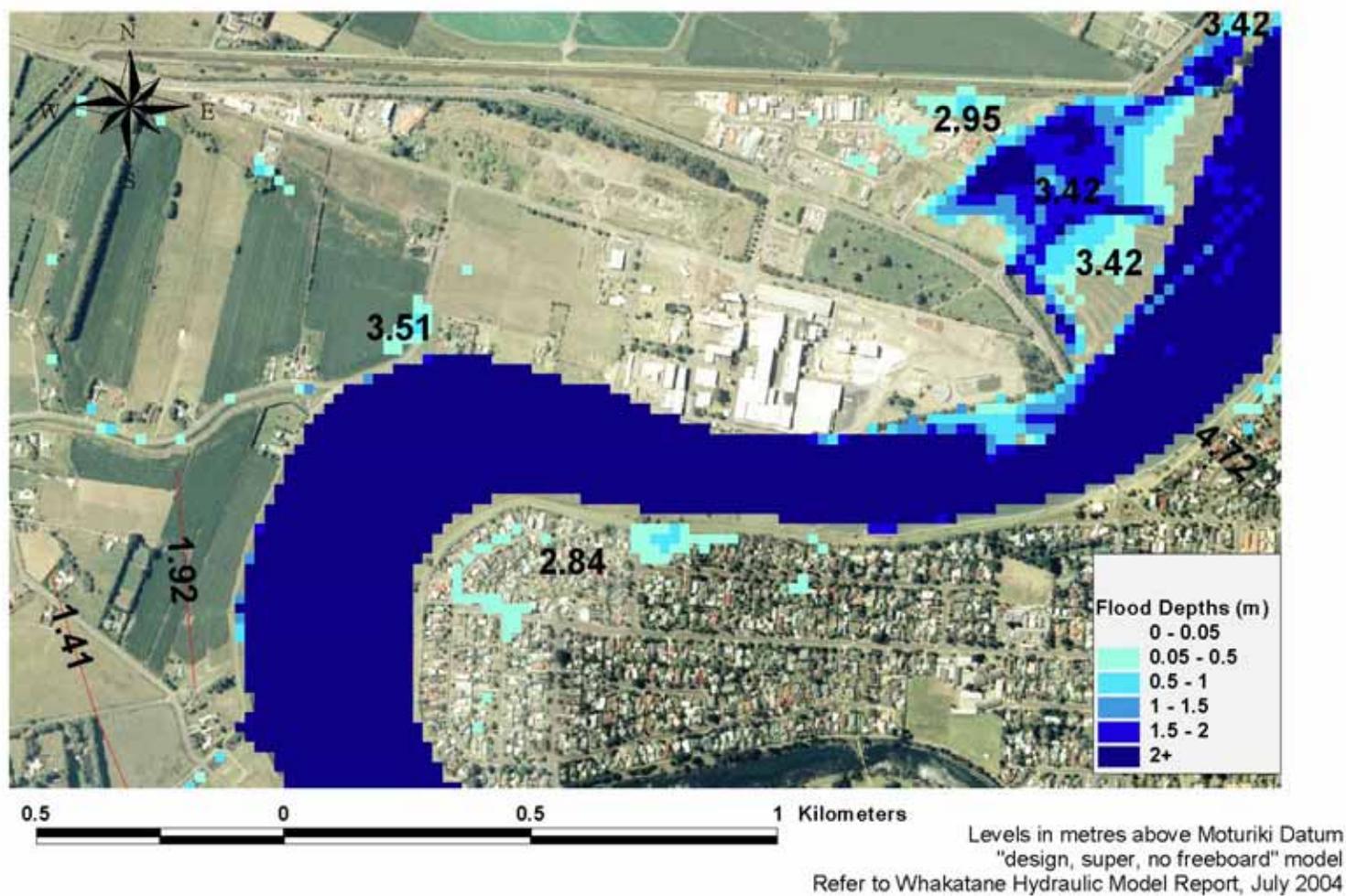


Figure A1.3

Whakatane River – 300 year flood extent with peak water levels, south of Landing Road Bridge



<p>Notes: 0.5m Freeboard Added The Sub-Catchment areas shown have a single design flood level throughout attached as a label. For other areas (shaded blue) careful interpolation between cross sections is required. Refer to report "Kope-Orini Canal System Model" Environment Bay of Plenty Operations Publication 2003/04 This map is based upon best information at time of preparation (By definition, there is a 1% probability of getting a 1% AEP [Annual Exceedence Probability] flood, or a larger flood, in any given year. A 1% AEP flood is also referred to as a "1 in 100 year flood" or more simply, as a "100 year flood". The ground contours shown are based on photogrammetry elevation points and should not be used for analysis on this map. Values above 10m are hidden for clarity.</p>	<p align="center">Kope-Orini Basin 1% AEP Flood Level Map</p> <p>Legend</p> <table border="0"> <tr> <td>Sub-catchment boundaries</td> <td>0.5m Contours</td> <td>1.5</td> <td>4</td> <td>8.5</td> <td>9</td> </tr> <tr> <td>Single value area. See label</td> <td>Height</td> <td>2</td> <td>4.5</td> <td>7</td> <td>9.5</td> </tr> <tr> <td>Base Level Lines</td> <td>0</td> <td>2.5</td> <td>5</td> <td>7.5</td> <td>10</td> </tr> <tr> <td>Interpolation needed. See notes</td> <td>0.5</td> <td>3</td> <td>5.5</td> <td>8</td> <td></td> </tr> <tr> <td></td> <td>1</td> <td>3.5</td> <td>6</td> <td>8.5</td> <td></td> </tr> </table>	Sub-catchment boundaries	0.5m Contours	1.5	4	8.5	9	Single value area. See label	Height	2	4.5	7	9.5	Base Level Lines	0	2.5	5	7.5	10	Interpolation needed. See notes	0.5	3	5.5	8			1	3.5	6	8.5		<p>Plan No. R 745</p> <p>Amendment: 1</p> <p>Drawn: PLB 17.07.2006 Traced: TB 17.07.2006 Checked: PLB 17.07.2006</p>	 <p align="center">1:20,000</p> <p align="center">0 100 200 300 400 500 600 700 800 900 1,000 1,100 1,200 1,300 1,400 Meters</p>
Sub-catchment boundaries	0.5m Contours	1.5	4	8.5	9																												
Single value area. See label	Height	2	4.5	7	9.5																												
Base Level Lines	0	2.5	5	7.5	10																												
Interpolation needed. See notes	0.5	3	5.5	8																													
	1	3.5	6	8.5																													

Figure A1.4 Kope – Orini Basin 1%AEP Flood Level Map

Appendix 2 – Whakatane Residential Growth Areas – Flooding and Inundation Risk

In 2005 Whakatane District Council identified six potential residential areas located within Lower Whakatane catchment. Whakatane District Councils asked Environment Bay of Plenty to provide recommendations based on the highest level of “resistance” to flooding from the 100 year flood. In August 2006 Environment Bay of Plenty advised Whakatane District Council of the flood and inundation risk to these areas repeated below for ease of reference (Blackwood, 2006).

Environment Bay of Plenty based its recommendations to Whakatane District Council on the 100 year flood levels expected in 2080 (Refer Figure A3.3). The 100 year flood levels in 2080 were selected since subdivisions are required to be designed for a 100 year life (Refer NZS4404) and flood level estimates in 2080 come close to this period requirement.

Advice was given to Whakatane District Council with the underlying view that it is best to avoid building new habitable buildings in flood inundated areas. A summary of the current level of risk and further investigative work required at the potential residential areas is provided below

A2.6.1 – Area 1 West of Coastlands

Low risk, wave run-ups would reach around 7meters (Moturiki Datum, MD) in the 100 year flood event. Some tsunami risk in places.

A2.6.2 – Area 2 Keepa Road

Moderate risk, 100 year flood levels is 2.2meters (MD). Most land north and south of Fergusson Road is at least 0.5m below this level. Drainage problems are likely during wetter seasons. Although Whakatane River stopbanks are assessed to have a very low risk of failure in a 100 year flood further detailed review would be necessary as consequences of failure are greater to a low lying area. It is not good practice to locate subdivisions in flood ponding areas. Further studies are necessary to assess feasibility.

A2.6.3 – West of Carter Holt Harvey Tasman Mill Site (new industrial)

Generally low. Some low spots exist. Approximately 25 hectares of land is relatively high. Risk of Whakatane River stopbank failing in a 100 year flood is low. Further studies required to assess feasibility.

A2.6.4 “Blacks Farm” South of Whakatane Township

Half of this land is protected by 100 year Whakatane stopbanks and a further 30% is protected by 10 year stopbanks. A major side stream caused flooding in July 2004 to the area on the inside of the 10 year stopbanks but land protected by the 100 year stopbanks appeared okay. With climate change the 100 year stopbanks overtop. Further studies are required to determine suitable flood measures to protect from the side stream and from the future 100 year flood.

A2.6.5 – Burma Road

Low risk, minor gullies and streams would require careful subdivisional practices. Slope stability poses greater hazard than flooding.

A2.6.6 – Kohi Point Lookout Road Junction

Low risk, minor gullies and streams would require careful subdivisional practices. Slope stability poses greater hazard than flooding.