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Committee Hutt Valley Flood Management Subcommittee
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Updating the Wainuiomata River Flood Hazard Information

1. Purpose

To advise the Subcommittee on estimated costs to update the flood hazard information for the Wainuiomata River using LiDAR survey information, and seek a decision on the priority for updating the information.

2. Significance of the decision

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

3. Background

The Wainuiomata River Flood Hazard Assessment was completed in 2000, in recognition of the increased flood hazard that was considered likely to result from further development of the lower Wainuiomata River floodplain. Subdivision of rural land on the floodplain presents the potential for increased risk to property and also raises the likelihood of increased demand for river crossings. Using the results of the Wainuiomata River Flood Hazard Assessment for planning and advice about future development on the floodplain enables the hazard to be avoided.

The Flood Hazard Assessment was based on the best information available at the time (2000), using surveyed cross sections and photogrammetric topographical information, and has been used to guide advice about development since then. In 2009/10 data sheets were produced using this information to inform property owners of the available flood hazard information following the updating of the Hutt City Council (HCC) hazard register. The available hazard information about a property is now available through a HCC Land Information Memorandum (LIM).

Many residents consider the information on the data sheets has the potential to affect the value and saleability of their properties along the river, is not correct and may be misinterpreted, especially with regard to the indicated modelled water depths.

The Wainuiomata River Flood and Erosion Hazard Information was described in Report 11.111 for consideration by the Hutt Valley Flood Management Subcommittee (HVFMS) at its 9 March 2011 meeting. This report sought to advise the HVFMS on the request from Hutt City Council (HCC) to undertake further, more detailed hydraulic modelling of the Wainuiomata River. The Flood Protection Department proposed to prepare an estimate of the cost to update the flood hazard information for the Wainuiomata River using LiDAR survey information and more extensive cross sections, which would then be reported to the June 2011 Hutt Valley Flood Management Subcommittee Meeting. The HVFMS would then be able to make a decision about the priority for updating the flood hazard information for the Wainuiomata River, with regard to the proposed use of the information.

The HVFMS resolved that the Subcommittee:

“Endorses the preparation of a report estimating the cost to undertake more detailed flood modelling of the Wainuiomata River and to report this back to the next HVFMS meeting in June 2011.”

The Subcommittee also resolved that it:

“Asks Officers to meet with residents involved to discuss the relevant issues in detail.”

This report summarises the estimated costs to undertake more detailed flood modelling of the Wainuiomata River and makes a recommendation for the Subcommittee to consider. It also reports briefly on meetings with residents to discuss the relevant issues in detail.

4. Available Information and New Information Requirements

4.1 LiDAR Aerial Survey

LiDAR aerial survey has been carried out for the Wainuiomata River by Hutt City Council. Unfortunately, an area of the floodplain near the river mouth has been left out of the survey. As this part is of limited extent, the missing information may be addressed by either:

- a) Using the photogrammetric contours to add the missing area to the LiDAR data, or
- b) Adding the missing area to the LiDAR data following topographical (ground) survey. This would be considerably more cost effective than commissioning further LiDAR survey, which is considered unnecessary.

4.2 Cross Section Survey

The length of the Wainuiomata River investigated in 2000 Flood and Erosion Hazard Assessment was approximately 28km. Cross section survey for this comprised 63 sections in the urban reach of the river at 75m intervals and 74 sections in the rural reach at 300m intervals.

For more accurate hydraulic modelling of the Wainuiomata River, it is considered that these cross sections would need to be resurveyed across the wetted part of the River (as the river has migrated since 2000) and where necessary to supplement the LiDAR through areas of thick vegetation (gorse). Additional cross sections would be required over the rural reach to reduce the cross section interval to 150m. Detailed surveys would also be required at 11 bridges.

4.3 Hydraulic Model

Updated hydraulic modelling of the Wainuiomata River and floodplain using Danish Hydraulic Institute's (DHI) MIKE Flood (1D/2D) hydraulic model would be carried out. The expected grid size for this work would be 10m. Updated hydrology, including climate change, would be required for input to the model.

The hydraulic model would be run for various design flood scenarios, and water level, velocity and flow information obtained. The model would be calibrated using historic flood events (aerial photos and 'flood pegged and levelled' flood events of 2003/4/5), and data obtained from the gauging stations.

4.4 Design River Channel

A design river channel would be assessed for the Wainuiomata River (main channel only), to assist with defining the river corridor and to provide guidance on future river management. The design channel could be used to guide erosion management and control the extent to which the river is allowed to migrate across the floodplain.

The assessment of the design channel would be based on the natural character of the river, taking account of variations along the river. The aim is to determine the boundaries of the active river area (including the channel and a vegetation buffer) under current conditions, enabling sustainable management of the river.

The design channel would be defined using an established (empirical) process, based on changes to the river shown from aerial photography taken over time, and analysis based on the main river-forming influences of flood flows, channel grade (or slope) and bed material (river gravel) size. The alignment would be adjusted to fit the present river channel, taking account of controlling features, which may be more resistant to erosion, such as the valley sides and terraces.

4.5 Updated Assessment of Erosion Hazard Areas

An updated assessment of the erosion hazard areas from the morphology of the Wainuiomata River, and an assessment of the impact of any past and present river management by private riparian owners would be carried out to provide information additional to that of the 2000 assessment. Note that Greater Wellington does not actively manage the rural reach of the Wainuiomata River but gives advice on request to landowners adjacent to the river.

This would include investigation of:

- geological features and general morphology of the catchment, river, and floodplain;
- river characteristics including relic channels that may provide overflow paths or indicate potential areas of erosion;
- areas of historic and active riverbank erosion;
- past and present management practices by landowners adjacent to the river and their effectiveness;
- a summary assessment of the gravel transport regime and gravel management.

4.6 Flood and Erosion Hazard Maps

There are two alternatives for presentation of the flood and erosion hazard maps:

- a) Flood hazard area and erosion hazard/structural damage lines – similar to the existing maps but without the water depth classes as per the existing maps.
- b) Flood and erosion hazard areas redescribed on the maps as river corridor, overflow path, erosion hazard, building setback, and ponding. These could be used for a Plan Change for the Hutt City Council (HCC) District Plan.

5. Options

Various options using the outcomes of Section 4 above are possible. These require different levels of information and further work with resulting time and cost impacts. The various options are detailed in Appendix 1. A brief comparison of options follows:

Option 1:

Estimated Cost \$0

Retain the same flood hazard information sheets and provide information to people making enquiries based on the best available information available at the time of the request. This is essentially the current process with information being provided on a case by case basis to the level that would be achieved in Option 2. While the up front costs are nil there is an ongoing cost in that as each individual enquiry comes in we have to do a site specific assessment

which does take time. Having more information prepared up front therefore reduces the ongoing assessment costs.

Option 2: **Estimated Cost \$35,200**
Plot current flood level into LiDAR to get refined flood extents and depths. Re-publish the information sheets with the updated information, mail out to all affected landowners, and make available for HCC LIMS.

Option 3: **Estimated Cost \$78,400**
The same as Option 2, but includes design river channel assessment and updates the hazard information so it may be used in a HCC District Plan Change.

Option 4: **Estimated Cost \$107,000**
The same as Option 3, but updates the model using LiDAR, current survey data and updated hydrological information.

Option 5: **Estimated Cost \$266,000**
Full upgrade of the hydraulic model to DHI MIKE Flood (1D/2D), with extensive additional cross section survey information and updated hydrological information. Includes design river channel assessment and updates the hazard information so it may be used in a HCC District Plan Change. The information sheets would be re-published with the updated information, mailed out to all affected landowners, and made available for HCC LIMS.

Option 6: **Estimated Cost \$302,000**
The same as Option 5, with updated assessment of erosion hazard areas.

6. Comment

The purpose of the flood and erosion hazard information is to identify areas where new development should be avoided, as a first option. Furthermore, where development does take place, it needs to be compatible with the flood risk.

Greater Wellington Flood Protection uses flood and erosion hazard information to:

- Advise landowners (and prospective landowners) that properties are subject to a hazard through the HCC LIM process. Note that the hazard is applied to the property as a whole, and the hazard to buildings or houses is not distinguished unless information is on the HCC Building Consent file.
- To advise on suitable house sites for subdivided properties – including safe access.
- To advise on proposed river crossings taking the hazard into account, and avoiding multiple river crossings where possible.
- To provide site specific information e.g. for building floor levels or water depths at potential development sites. To respond to site specific

requests, Greater Wellington uses the current modelled information. From the modelled water level surface, assuming that the water surface between cross sections is uniform, the predicted flood water level at a location may be determined. Using the LiDAR information this predicted water level may be used to determine a predicted water depth, related to the local topography.

- To provide advice for works in the river.
- Through the Isolated Works Policy, to provide a contribution up to 30% of the actual cost of an eligible isolated work. Isolated works are privately owned flood or erosion protection works that are constructed outside areas where GW manages community flood protection schemes e.g. outside the urban area for the Wainuiomata River. The intent of the contributions is to provide a level of service to areas that are not eligible for rate funded community flood protection schemes. Access to the available budget has traditionally been provided on a first in first served basis, with the work having to show benefit to 2 or more properties, among other things.
- Note that Greater Wellington Flood Protection staff are happy to discuss the flood and erosion hazard, and provide advice for any particular property on request and at no cost.

It should be noted that when people seek advice from Flood Protection presently, the Option 2 equivalent is carried out on a site specific basis. What these options achieve is making the revised extents available in the public domain without having to seek the information from Greater Wellington directly. While this may help individuals with an initial assessment of a property, it will not substitute for the expert advice available on request from Greater Wellington.

Given the above uses of the information, and taking into account the concerns of affected residents in the area, Greater Wellington Flood Protection's recommendation is to undertake Option 2 as soon as practicable. Updating the information to Option 6 standard will be considered along with other priorities for hazard assessment as part of Greater Wellington's Long Term Plan.

7. Communication

Officers met with residents in the lower Wainuiomata River valley on 12 April and 2 May to discuss their concerns, and view areas of issue on site. Councillors were also present at these meetings. Concerns raised at these meetings related to:

- The inaccurate representation of the flood spread (areas were shown to be floodable which wouldn't be and conversely areas which would be flooded were not shown to be so).
- The flood water depths were not consistent with the topography and readily misinterpreted

- The erosion hazard line appeared to be in the wrong place.
- Whether HCC would undertake to protect Coast Road – in which case the erosion hazard line should not cross the road from the river.
- Hazard categories should be consistent with those used elsewhere in the region, i.e. flood and erosion hazard areas described on the maps as river corridor overflow path, erosion hazard, building setback, and ponding.

When the information sheets have been updated, they will be re-published, mailed out to all affected landowners, and made available for HCC LIMS.

8. Recommendations

That the Subcommittee:

1. **Receives** the report.
2. **Notes** the content of the report.
3. **Recommends** to Council that budget is made available for Option 2 in the 2011/12 Annual Plan.

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Appendix 1 – Option Details

Appendix 1: Option Details

Option 1:

Estimated Cost \$0

Retain the same flood hazard information sheets and provide information to people making enquiries based on the best available information available at the time of the request. This is essentially the current process.

- Carry out individual assessments as and when required.

Option 2:

Estimated Cost \$35,200

Plot current flood level into LiDAR to get refined flood extents and depths. Re-publish the information sheets with the updated information, mail out to all affected landowners, and make available for HCC LIMS.

- Plot current flood hazard extent over LiDAR using 2000 hydraulic model levels.
- For missing LiDAR area use 4.1a).
- Use existing erosion hazard and structural damage lines, with minor refinements.
- Present the information as in Section 4.6a), i.e. more accurate flood hazard area and without the water depth classes shown.
- Re-publish the information sheets with the updated information, mail out to all affected landowners, and make available for HCC LIMS.

Option 3:

Estimated Cost \$78,400

The same as Option 2, but includes design river channel assessment and updates the hazard information so it may be used in a HCC District Plan Change.

- Plot current flood hazard extent over LiDAR using 2000 hydraulic model levels.
- For missing LiDAR area use 4.1a).
- Use existing erosion hazard and structural damage lines, with minor refinements.
- Assess a design river channel (as in 4.4).
- Present the information as in Section 4.6b), i.e. flood and erosion hazard areas described on the maps as river corridor, overflow path, erosion hazard, building setback, and ponding.
- The flood extent would be more accurate than the existing maps.
- Re-publish the information sheets with the updated information, mail out to all affected landowners, and make available for HCC LIMS.
- Flood and erosion hazard areas could be used for a Plan Change for the Hutt City Council (HCC) District Plan.

Option 4:

Estimated Cost \$107,000

The same as Option 3, but updates the model using LiDAR, current survey data and updated hydrological information.

- Set up and run the 2000 MIKE 1D hydraulic model using LiDAR information and the original cross sections.
- Updated hydrological information would be required for model input.
- For missing LiDAR area use 4.1a).
- Calibrate using historic flood events.
- Use existing erosion hazard and structural damage lines, with minor refinements.
- Assess a design river channel (as in 4.4).
- Present the information as in Section 4.6b), i.e. flood and erosion hazard areas described on the maps as river corridor, overflow path, erosion hazard, building setback, and ponding.
- The flood extent would be more accurate than the existing maps.
- Re-publish the information sheets with the updated information, mail out to all affected landowners, and make available for HCC LIMS.
- Flood and erosion hazard areas could be used for a Plan Change for the Hutt City Council (HCC) District Plan.

Option 5:

Estimated Cost \$266,000

Full upgrade of the hydraulic model to DHI MIKE Flood (1D/2D), with extensive additional cross section survey information and updated hydrological information. Includes design river channel assessment and updates the hazard information so it may be used in a HCC District Plan Change. The information sheets would be re-published with the updated information, mailed out to all affected landowners, and made available for HCC LIMS.

- Carry out cross section survey (as in 4.2).
- Set up and run a DHI MIKE Flood (1D/2D) hydraulic model using LiDAR information and the new cross sections.
- Updated hydrological information would be required for model input.
- For missing LiDAR area use 4.1b).
- Calibrate using historic flood events.
- Determine new structural damage lines from model results
- Use existing erosion hazard lines
- Assess a design river channel (as in 4.4).
- Present the information as in Section 4.6b), i.e. flood and erosion hazard areas described on the maps as river corridor, overflow path, erosion hazard, building setback, and ponding.
- The flood extent and building setback would be more accurate than the existing maps.
- Re-publish the information sheets with the updated information, mail out to all affected landowners, and make available for HCC LIMS.
- Flood and erosion hazard areas could be used for a Plan Change for the Hutt City Council (HCC) District Plan.

Option 6:

Estimated Cost \$302,000

The same as Option 5, with updated assessment of erosion hazard areas.

- Carry out cross section survey (as in 4.2).
- Set up and run a DHI MIKE Flood (1D/2D) hydraulic model using LiDAR information and the new cross sections.
- Updated hydrological information would be required for model input.
- For missing LiDAR area use 4.1b).

- Calibrate using historic flood events.
- Determine new structural damage lines from model results
- Carry out an updated assessment of erosion hazard areas (as in 4.5)
- Assess a design river channel (as in 4.4).
- Present the information as in Section 4.6b), i.e. flood and erosion hazard areas described on the maps as river corridor, overflow path, erosion hazard and building setback, and ponding.
- The flood extent, erosion hazard and building setback would be more accurate than the existing maps.
- Hydraulic model information could be used for accurate predicted water depths on the floodplain.
- Re-publish the information sheets with the updated information, mail out to all affected landowners, and make available for HCC LIMS.
- Flood and erosion hazard areas could be used for a Plan Change for the Hutt City Council (HCC) District Plan.