

STAFF REPORT

TO: Chair and Members, Engineering Services Committee

FROM: Gary Clark, Transportation Manager

REFERENCE: R605-1

DATE: 26 January 2011

SUBJECT: **Motueka Flood Control – Identification of Reasonably Practicable Flood Management Options, Lower Motueka River Local Govt Act 2002 s78(b) – Stage 2 - RESC-11-02-06-DEC**
Report prepared for meeting of 3 February 2011

1 PURPOSE

1.1 The purposes of this report are to:

- provide information on the Motueka Flood Control Project;
- provide the Committee with the outcomes of consultation on the process to identify “reasonably practicable options” for the project;
- seek the Engineering Services Committee’s agreement to the identified reasonably practicable options for the project; and
- seek the Engineering Services Committee’s agreement to officers undertaking consultation to seek community views on the reasonably practicable options.

2 BACKGROUND

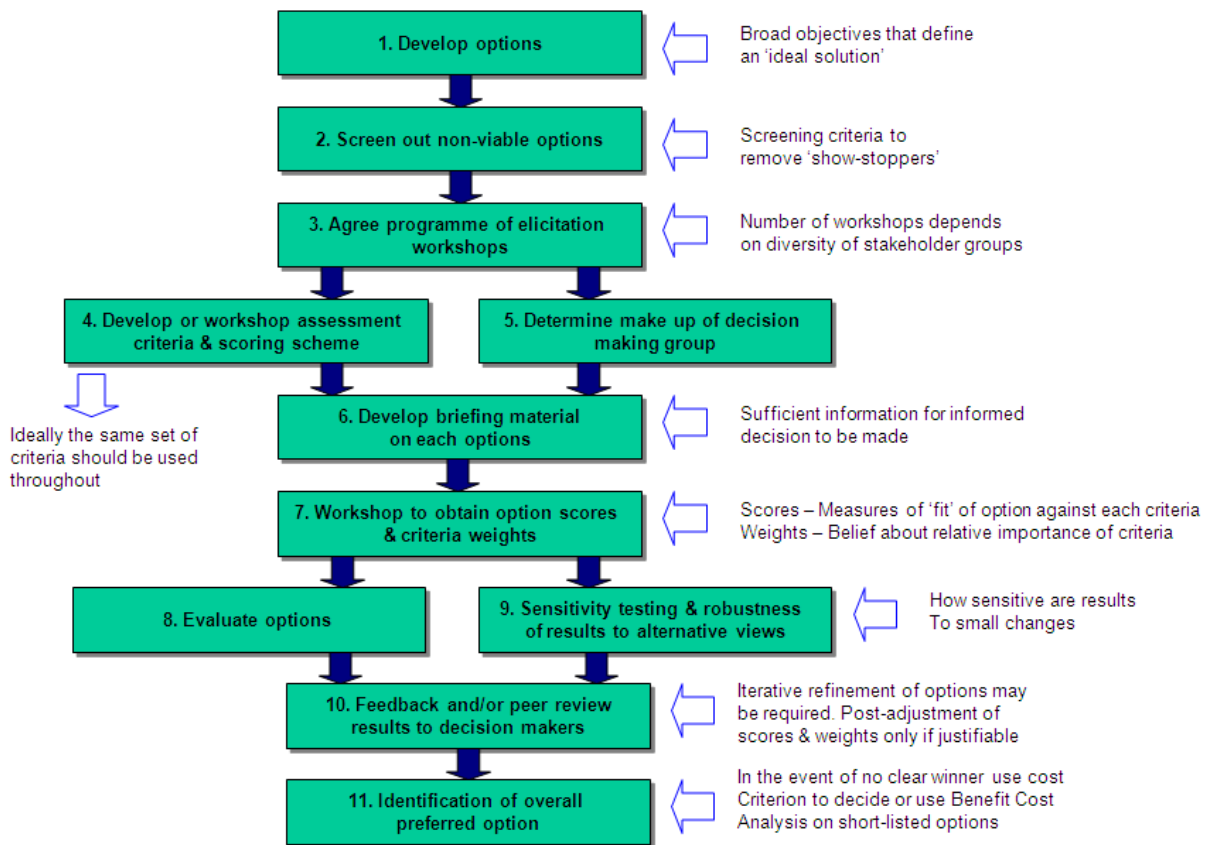
- 2.1 As you will be aware from previous reports on this subject, the project involves investigating flood control options to provide an affordable scheme for the Motueka River that meets the risks that the community is prepared to accept with regard to flood protection.
- 2.2 As an important part of managing this project staff are required to report back to the Council on progress and to enable Council to make decisions at each of the steps in the process officers are following.
- 2.3 Tasman District Council’s Ten Year Plan identified the need to reconstruct the current stopbanks on the Motueka River to provide better flood protection to the lower Motueka Valley. Council has more recently considered the problem and the objectives for the project. Council concluded that there was a need to determine the best practicable and affordable flood control option. Council has also undertaken consultation with the community on this matter and on the issues that need to be considered when identifying the possible options for providing improved flood protection.
- 2.4 Although the stopbanks have prevented major flooding in the past, they do not meet modern standards. It is known that the construction methods used did not provide adequate compaction of the central core of the banks. Recent investigations have

shown that the current engineering fitness of the stopbanks is such that they would not hold up under sustained or repeated flooding events. It is, therefore, considered that in their current state they do not provide adequate protection to local residents and their assets.

- 2.5 The current flood control measures and stopbanks were discussed at length by submitters during the Ten Year Plan consultation process. While many submitters acknowledged the need for action, it was on the condition that adequate ongoing public consultation was an integral part of the process. At the heart of the conditional agreement by the community was the need to better understand the risks posed by the current state of flood defences. The community was concerned that any decision would take account of the balance between what is an acceptable level of risk, versus what the community was prepared to pay.
- 2.6 During the period February to May 2010 a number of community meetings and feedback forums were held. A local Motueka market stall was set up to gather first-hand community feedback and provisions were made for views to be expressed through the Tasman District Council website. This information has been pulled together into a risk register that identifies both risks and opportunities for flood control and management. A summary of how the pertinent issues raised by community have been considered are addressed in the options assessment are provided below in this report.
- 2.7 Section 78 of the Local Government Act until recently set out the requirements for a local authority, in the course of its decision-making process, to give consideration to the views and preferences of persons likely to be affected. Section 78 was recently amended deleting these requirements, however, Council has resolved to continue that process, as it is good practice for major projects. Under the process consideration of community views must be given at the following stages in the process:
- a) The stage at which the problems and objectives related to the matter are defined;
 - b) The stage at which the options that may be reasonably practicable options of achieving an objective are identified;
 - c) The stage at which reasonably practicable options are assessed and proposals developed; and
 - d) The stage at which proposals of the kind described in paragraph above are adopted.
- 2.8 Accordingly a series of reports will come to Council throughout the process seeking approval to go to consultation at each of the steps in the decision making process. A report on the first step in the process has already been considered by the Committee (Report titled "Motueka Flood Control – RESC-10-11-09").
- 2.9 This report covers the next step in the process, providing information on the reasonably practicable options to be considered prior to determining the best option to achieve the project objectives.

3 DISCUSSION

- 3.1 The objective of this step in the process for the Motueka River flood control project is to formally assess and determine the reasonably practical options for managing the flood risk on the lower reaches of the Motueka River. A Multi Criteria Assessment (MCA) approach, in which options are rated against a defined set of criteria will provide a robust process to assess the options.
- 3.2 The MCA process takes into consideration the communities concerns, technical understanding, costs, ability to fund, and flood protection aspirations and objectives. The options are also judged on a range of other factors, including whether they are likely to be supported through the next round of public consultation, practicality, environment issues, cultural issues and sustainability matters.
- 3.3 This process then refines the broad range of options to identify a set of reasonably practicable options that should be taken forward to the full assessment phase of this project.
- 3.4 Formal methods of decision making offer a robust defensible means of selecting preferred options as per best asset management practice. Such methods are useful when there is significant uncertainty over what might be considered an optimal solution amongst a range of options. The MCA method is one of the most ubiquitous of formal methods. The method is particularly helpful when there are a number of issues, both tangible (eg, scheme economics, etc) and intangible (eg, cultural impacts, etc) that could influence preferences amongst the options.
- 3.5 Decision Conferencing is the name given to a decision making process based around structured group discussions such as in a workshop. Here the discussions seek to obtain a consensus view on the decisions to be made using the MCA method.
- 3.6 The MCA method involves scoring the various options against a defined set of criteria that represent what is good and bad about any particular option. The option with the highest weighted sum of scores across all criteria gives an indication of the preferred solution.
- 3.7 The figure below gives a process diagram showing the basic steps in applying a MCA process.
- 3.8 The consultation has enabled the development of various options that can be considered further. As part of the MCA process a fatal flaw assessment is carried out on the community's suggested options to ensure any suggestions are reasonable and practical.
- 3.9 It is relevant to note that a range of people will be involved in the MCA process, including iwi representatives, scientists and people representing community groups, along with Council officers.



Representation of the General Multi-Criteria Decision Making Process

4 SUMMARY COMMUNITY FEEDBACK

4.1 A summary of the key issues and areas of concern raised by the community from the various public feedback forums is outlined in the table below. An indication of how these various issues were taken into account in the assessment of flood management options is given in the right hand column. Issues are grouped under broad headings. Other than this, they are listed in no particular order.

Summary of Issues Raised During Consultation

The Stop Bank

| Issue raised by the Community during consultation | How Project has taken these issues into account |
|--|---|
| A full replacement stop bank upgrade is not required. | Refurbishment of the stop banks is included as Option 2 in the assessment. |
| The existing stopbanks have worked since the 1950's and they continue to work. | A Geotechnical assessment [Woods, 2010] on the current condition of the stop banks suggests that the risk of a bank failure in a flood lasting more than 6 hours is quite high. |
| There are some areas along the banks that are of concern and need to be repaired, these are: <ul style="list-style-type: none"> • Woodmans corner • Blue Gum Corner • Sinclairs | Refurbishment of the stop banks is included as Option 2 in the assessment. |

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| <ul style="list-style-type: none"> • Water that comes up behind the banks • Brooklyn Stream | |
| Stopbanks were not built to modern standards so they may not offer as much protection as is required. | A full rebuild of the stop banks to modern standards is included as Option 1. |

Motueka State Highway Bridge

| Issue raised by the Community during consultation | How Project has taken these issues into account |
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| Motueka State Highway Bridge restricts the river flood flows. Gravel has built up around the Bridge which restricts the water. | Historical records show that the overall area available for flow under the bridge has increased, caused by the lowering of the river bed and exposing more gravel giving the impression of gravel build up. |
| If you remove the gravel this could cause further problems with stability of the bridge | The piles on which the bridge supports are constructed are already being exposed and further lowering of the river bed could further compromise the bridge. |
| It carries services to the other side, so it is important that it doesn't wash away. Also important for access to avoid community isolation. | While this issue is important for maintaining essential services in a flood situation the relocation of services is outside the scope of this project. Options that allow peak flood waters to dissipate over a wider area would tend to reduce the potential for damaging services attached to the bridge because the peak flood depths would be reduced. |

Costs of any Upgrade

| Issue raised by the Community during consultation | How Project has taken these issues into account |
|---|---|
| If you removed and sold the gravel this will fund any required upgrade. | Extraction of gravels would be uneconomic unless on a large scale. Large scale extraction would have an adverse effect on groundwater levels and encourage higher rates of bank erosion. The ownership of gravels is currently highly uncertain. There would likely be no economic net return from any royalties to Tasman District Council. |
| The community has already paid and continue to pay for river protection. | Currently rates fund river maintenance only. Major capital investments such as being considered here are separated considered and funded. |
| The whole district should be paying for anything required – it is not the communities' issue that they live next to the river. | Contributions are intended to reflect the degree of benefit that different sections of the community derive from the river. A criterion is included within the assessment of options that takes account of wider district views. |
| Cannot afford a water system and stopbanks at the same time. Cannot afford a 'gold plate' solution. Excessive increases in rates would have a slow but debilitating effect on the local community, many of whom were already 'double rated' | Various options are being considered in part to assess the costs versus benefits. A more detailed benefit cost analysis will be performed on the most promising options identified from the MCA exercise. Any proposal will be designed to do what is required and no more. It will not be a gold plated scheme. The town water supply system is still largely dependent on attracting significant government subsidies if it is to be considered affordable. |

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| If something has to be done, make sure you use local contractors. | It is part of council policy to use an open competitive tender process. All contractors have an equal chance of putting the best offer forward. |
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Gravels

| Issue raised by the Community during consultation | How Project has taken these issues into account |
|---|--|
| There has been significant build up of gravels and stones in many places along the river and these stop the water flowing freely in a flood. Remove the exposed gravels from river berms and river bed. | The impression that gravels are building up over time is created because the river bed is lowering exposing gravels. There may be advantages in redistributing some gravels on river berms to improve the flow of the river during floods. |
| Large scale gravel extraction would cause major problems to the river environs and watertable. | Large scale gravel extraction from the river's active channel would lower the water table causing problems to surrounding arable land and could impact boreholes close to the river. |

The Concerns/Risks

| Issue raised by the Community during consultation | How Project has taken these issues into account |
|---|---|
| Timber and other debris carried in flood waters could cause major damage. | It is proposed that improved river management be part of any option chosen. The removal of Crack Willow which is a prime source of such debris is part of ongoing maintenance of the river. This and other debris clearance is likely part of any improved river management initiatives. |
| A tsunami/tidal wave could cause significant flooding of Motueka town centre – not the river. | The project is concerned with flooding from the river. Marine flooding is outside the current project. The effects of tides and storm surge are, however, included in flood modelling. |
| Flash flooding a major risk to people and animals. | The potential for flash flooding, e.g. from sudden stop bank failure was one of the issues considered in developing and assessing the flood management options. |
| Motueka river is significant to local Iwi and Maori generally. | Iwi and Maori issues are included in the assessment of options together with other criteria which cover the four well-beings promulgated by the Local Government Act. |
| Flood controls could restrict access to the river. | This is an issue that was considered in the assessment of options. Rebuilding the stop banks for example could include features that improve access over the current situation. It was also considered that secondary stop banks, although lower in height, would further restrict access to some degree. |
| Effect of climate change. | In order that the comparison of options should be fair, options were compared on the basis that they would each provide the same level of protection from river flooding. The effects of climate change were included in flood modelling through both increased rainfall and through sea level rise. |
| Risk to the services (sewage, water etc) | The security of essential services will be taken into account in the detailed design of any chosen option. Other than services attached to the Motueka bridge, services are generally buried and |

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| | therefore at relatively low risk of damage in a flood. |
| Parts of the community don't mind if they get wet feet | This view was taken into account in development of spill way options, but these views may not be universally held by all those potentially affected. These issues were considered when assessing the relative merits of options. |
| Could be a loss of confidence for future development if the area is flooded. | This is one of the motivations for seeking to ensuring / improving the community's protection from river flooding. |
| Must protect lives and the town. | This is one of the motivations for seeking to ensuring / improving the community's protection from river flooding. |
| Horticulture land is too important to the future of Motueka to be flooded. | This is one of the motivations for seeking to ensuring / improving the community's protection from river flooding. |

Suggested Improvements

| Issue raised by the Community during consultation | How Project has taken these issues into account |
|---|--|
| Open up some of the old flood plains and old river courses. | This suggestion is incorporated into options 3, 4 and 5. |
| Open up the channel behind Peach Island. | The effect in reducing flood impacts if the western route around Peach Island were re-established was assessed and the effect found to be small, however, the small effect may be beneficial when finalising the options. |
| Use further rock wall protection for 'patching up' the existing stop banks. | Refurbishment of the stop banks is included as Option 2 in the assessment. |
| Give the eastern bank of the river a high level of flood protection compared to the western side allowing waters to inundate the western side of the river to protect the Motueka town. | It was felt that both sides of the river should have the same level of protection. However the spillway options explore the possibility of allowing the river to spill over into its old channels with secondary stop banks providing additional protection to land and property beyond. |
| Dredge and widen the mouth of the Motueka River to increase the dispersion of flood water to sea | Flood modelling has shown that this would be ineffective because of the strong tidal influence on the ability of the flood to drain out to sea. |
| Further investigation is required to gain a better understanding of the strength of the stopbanks, the community can then understand the risks versus the benefits of possible options. | Flood modelling has been undertaken [Keenan, 2010] and a geotechnical assessment completed [Woods, 2010] to provide a greater understanding of the dominant issues and effects. Further work will be undertaken as part of the analysis of options following the MCA workshop. |
| Undertake better maintenance of the river berms to clear rubbish and fill in holes that have been created. | It is proposed that improved river management be part of any option chosen, some of this work is underway. |
| Continue to upgrade the stormwater drainage system. | Flood management options seem to prevent river flood waters reaching urban areas. Stormwater drainage is considered outside the scope of this project. However, it is noted that the improvements in stormwater within Motueka has reduced flooding issues from surface water. |
| Use planning to reduce risks (e.g. don't allow buildings or structures to be built close to the river). | Planning controls are, and will continue to be, one of the strategies that Council employs to manage the ongoing risks from flooding for new developments. |

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| Create a spill way | This is the basis of options 3 and 4 considered in the assessment |
| Have certain points on the banks that can be broken through to release pressure in a major flood. | Spillways specifically designed for the purpose are considered preferable to engineered 'weak spots' which may fail in a less controlled manner. |
| Do more at the top of the river to reduce volumes of water downstream. | Modelling shows that management of the upper river reaches alone has no significant effect in reducing the flood impacts in the lower reaches of the river. |

4.2 It should be noted that the Council newsletter "Protecting Your Community from Floods" issued in July 2010 identified and addressed many of these issues. This Newsletter provided information of the issues. There is a need now to go to the community and consult on the options identified as reasonable and practicable.

5 IDENTIFICATION OF FLOOD MANAGEMENT OPTIONS

- 5.1 To gain a proper understanding of how the Motueka River would behave under different flood conditions a time varying flood prediction model was generated. For a chosen high rainfall event and current or future sea level the model provided predictions of flood water depth and velocity throughout the inundated area. In using a time varying model it was possible to predict the rise and fall of flood waters dynamically during the rainfall event and take account of the tidal cycle.
- 5.2 The effects of climate change were simulated by appropriate increases in rainfall and sea level as recommended in national guidance, "Preparing for Climate Change: A guide for local government in New Zealand", Ministry for the Environment (MfE), July 2004. This report presents guidelines on how to incorporate climate change into planning for the next 100 years, especially rainfall statistics and sea level rise. The flood modelling indicated that the current stopbanks would begin to overtop with flood waters at a sub-1% Annual Exceedance Probability (AEP) event level. Annual Exceedance Probability is the probability that one or more events of a defined scale occurs in a year. Under these conditions there would be no free-board at some locations and it is likely that action would need to be taken to prevent localised slumping and overtopping as had been the case in the past.
- 5.3 A simulation of a flood with the current stopbanks removed was performed to explore where flood waters would go if the river was unconstrained, or if there was catastrophic failure of the current stopbanks.
- 5.4 The results showed that flood waters would inundate land either side of the river and tend to flow along old river channels. These predictions showed that flood water could reach Motueka CBD under some conditions and that this situation will to be exacerbated by the effects of climate change.
- 5.5 Drill core samples had previously been taken of the stopbanks to investigate their integrity. These core samples confirmed that the stopbank structural integrity was poor at the points investigated. Given that the same construction method was used over the length of the banks, it is likely that these samples are reasonable representative of the stopbanks in general.

- 5.6 A geotechnical study was more recently undertaken to further analyse and assess the state of the stopbanks. The study confirmed that the central zone of the stopbanks had been insufficiently compacted during construction and the potential for failure due to piping and slumping for flood events lasting in excess of six hours was quite high.
- 5.7 The community views summarised in the section above along with the findings from the flood modelling and from the geotechnical study were all used to derive a number of different flood management options presented below.

Short-listed Options

- 5.8 Initially five options were developed and short-listed for assessment using the MCA process these listed in Table 4.1 below and shown diagrammatically in Appendix B.
- 5.9 Following review of these options at the MCA workshop, Option 3 was split into two variants representing two possible locations for the spillway, either at Woodman's Bend (Option 3A) or opposite Fry's Island (Option 3B).
- 5.10 To ensure that options could be compared in the MCA the following overarching design objectives were imposed:
- All schemes would be considered to be designed to 1% AEP flood event level of protection with 600mm freeboard. The exception being that land and property within secondary flow paths (options 3A, 3B and 5) would be at a lower level of protection.
 - Mitigation from the impacts of possible marine flooding was to be excluded from consideration at this stage, but options should not unduly restrict future plans for protection from marine flooding.
 - The potential for staging of flood management works should be considered.
 - Each option would include an improved river maintenance strategy.

Short-listed Options for Assessment

- 5.11 The following table outlines the five reasonably practicable options for improving the flood protection to the lower Motueka Valley:

| Ref | Proposed Scheme | Comments |
|-----|--|---|
| 1 | Rebuild the right and left stopbanks. | Approximately equivalent to the stopbank option previously proposed to the community. |
| 2 | Refurbish the right and left stopbanks. | Would need to include all feasible and cost effective options for improving bank structure. |
| 3 | Spillway over right bank, and provide secondary banks set back to create channel for overland flow and take the pressure off existing stopbanks. Do minimum refurbishment of the existing stopbanks. This option was split into two at the MCA workshop to represent the spillway located either at Woodman's Bend (Option 3A) or opposite Fry's | Likely to be complications around land ownership and transport routes within the secondary flow path. Land and property within the secondary flow path would be at a lower level of protection. |

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| | Island (Option 3B). | |
| 4 | Spillway over left bank and provide secondary banks set back to create flow path to west of Riwaka. Do minimum refurbishment of the existing stopbanks. | Possible, but the influence of other streams and rivers will need to be considered. Likely to require significant ground works to create secondary flow path. Land and property within the secondary flow path would be at a lower level of protection. |
| 5 | Secondary stopbanks on both sides of the river, and create secondary flow paths. Do minimum refurbishment work on original stopbanks and crest levels to meet 100 ARI design standard. | Additional protection to Riwaka town likely to be required. Land and property within the secondary flow path would be at a lower level of protection. |

6 OTHER MATTERS

6.1 Improved River Maintenance Strategy

In considering possible options it was recognised that a number of the issues identified by the community relate more to the maintenance of the river environment rather than flood control directly. In response to these issues it proposed that a more formal improvement strategy for the on-going maintenance of the river would be developed. This improved river maintenance strategy would be part of any flood control option that will eventually be chosen.

6.2 Generic elements of such a strategy might include formalising the following, for example:

- On-going removal of debris and illegally dumped materials from river flood path.
- The continued removal of Crack Willow which tends to break in a storm event.
- The monitoring and redistribution of gravels within the river berms.
- Inspection and rectification of damage caused to rock wall and stopbank footings caused by erosion and or human activity.
- Improvement to the efficiency and effectiveness of the secondary overflow path on the western side of Peach Island. (The optimised level of improvement to the overflow needs to be established).

6.3 It is also likely that an improved flood warning systems would be set up, including improved communications and coordination with affected parties.

7 OPTIONS CONSIDERS BUT REJECTED

7.1 A number of other options were considered by the study team from both the Council and MWH, but eventually rejected for a variety of reasons. These options and why they were rejected are listed in the table below.

Rejected Scheme options

| Possible Option | Comments |
|--|---|
| Rebuild the right stopbank, but not the left stopbank. | This would reduce costs, but was rejected on the grounds that a different level of protection on the two sides of the river was not acceptable. |
| Refurbish the right stop bank, but not the left stopbank. | This would reduce costs, but was rejected on the grounds that a different level of protection on the two sides of the river was not acceptable. |
| Spillway over left bank and secondary flow path to the east of Riwaka. Do minimum refurbishment on existing stopbanks. | This option was considered possible but rejected because of the difficulty in providing adequate secondary flow path east of Riwaka. |
| Improved and formalised river maintenance only. | This was rejected as an option in its own right, but an improved river maintenance strategy would form part of any scheme eventually selected. |
| Any of the viable scheme options with improved weather warning systems. | Considered to be an in-complete solution on its own, but likely to be included in any scheme eventually selected. |
| Use of demountable floodwalls/structures in specific high risk locations or to protect specific high value assets. | Considered to be an in-complete solution on its own, but included in the refurbishment scheme option. |

8 COMPARISONS WITH THE STATUS QUO

- 8.1 All options are developed on the basis of a nominal 1% AEP flood design level of protection. Maintaining the *status quo* is not seen to provide this level of protection. Thus, although maintaining the *status quo* is considered to be an option, it is too different from the other five schemes to provide a fair comparison if it were included within the MCA. Instead the best options identified from the MCA will be compared with maintaining the *status quo* on the basis of a balance of costs and benefits in the next stage of work
- 8.2 The Multi Criteria Analysis has indicated that there are clear differences between the *status quo* and the five alternative options remaining from the process noted above. The public consultation on these five options is required on these proposals. It is also important for the community to understand the rationale behind the suggested five options and the discarded suggested methods of addressing the issues raised by the community.
- 7.3 The next step in the process is for Council undertake consultation to seek the community's view on the five indentified options. It is proposed to prepare a Newsletter with the options that were considered and the analysis of these options. As part of this process it will be necessary to hold some meetings in an "open day" format to discuss any matters with the community. These meetings will be for anyone in the community who is interested in providing opinion and feedback on any and all aspects of the proposals.

9 RECOMMENDATION

THAT the Engineering Services Committee:

- 9.1 receives the report, RESC-11-02-06 Motueka Flood Control;**
- 9.2 notes the outcomes of consultation on the process to identify the reasonably practicable options for the project;**
- 9.3 agrees to the five reasonably practicable options for the project outlined in paragraph 5.11 of this report;**
- 9.4 authorised Council officers to consult with the community on the five reasonably practicable options outlined in paragraph 5.11 of this report;
and**
- 9.5 asks Council officers to report back on the outcomes of the consultation.**

Gary Clark
Transportation Manager