

# **Flood Susceptibility Mapping Report**

**Prepared for**

**Whangarei District Council**

by

**CAMPBELL CONSULTING LTD**

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## 1. INTRODUCTION

This report has been commissioned by the Works & Services Department of the Whangarei District Council, as part of the further development of the Whangarei District Plan.

The objective of the report is to, based on available evidence, define the boundaries of flood susceptible areas and then to prepare flood hazard maps. These maps are to be used to revise the flood susceptible areas on the Resource Planning Maps that form part of the District Plan.

## 2. BACKGROUND

The District Council and its predecessors have undertaken flood hazard identification for many years. The Catchment Drainage Plans that were first produced in the early 1980s introduced the concept of drainage classifications. These included floodway areas, possibly flood prone areas, stormwater sensitive areas, potential flood cause areas, additional flood way areas and rural floodway areas. A selection of these classifications is understood to have been the basis for flood hazard areas in the Whangarei City District Scheme.

The preparation of the District Plan has been underway for a number of years following a process set out by the Resource Management Act. In the draft District Plan, a non-statutory document, flood hazard areas 1 & 2 were shown. In the subsequent proposed District Plan flood susceptible areas replaced the flood hazard areas. The flood susceptible areas were based on the Drainage Classifications from available Catchment Drainage Plans, Land Use Capability maps and other information held by the District Council.

The Council received a large number of submissions and further submissions with respect to the resource area maps – flood susceptibility. These resource maps were presented in two formats reflecting the general intensity of development. For the urban areas and settlements maps are at a scale of 1 to 10,000 and for rural areas maps are at a scale of 1 to 50,000.

## 3. METHODOLOGY

The approach taken in the review the of the urban and settlement flood susceptible area maps was to assemble all the available information, analyse it and produce revised flood hazard maps. The flood susceptible areas were developed in three stages. The first stage considered flooding caused by rainfall within catchments, the second stage inundation due to elevated sea levels and then a final stage which combined the mapping of stages one and two.

Three sets of plans were produced to reflect the requirements of the statutory planning process. The first set showed the flood susceptible areas as recommended to be revised by

Council decision. Any changes to maps contained within the proposed District Plan were restricted to responding to the submissions to that plan. The second set of plans showed additional changes to maps that would be subject to a variation to the proposed plan. These changes generally would extend the flood susceptible areas beyond that shown in the proposed plan and outside changes associated with submissions. Third set of maps is a composite of map sets one and two. This reflects the expected final flood susceptible areas. These are however be subject to further submission and appeal processes. They can be used to assist Council in assessing subdivision and building applications.

The following sub sections provide more detail on the process used.

### **3.1 Available Information**

- Collation and examination of available reports on flooding events, flood levels and stormwater improvement works. These included Catchment Drainage Plans, resource consent reports, Council records of residents' calls during the March 1995 flooding, and the Kamo Bypass Major Culvert Design report.
- Review of various coastal flood hazard reports in the Whangarei District undertaken by Coastal Management Consultancy (Jeremy Gibb).
- Aerial photographs at a scale of 1 to 2,500 overlaid with 2m interval ground contours and property boundaries covering the urban areas and settlements. (flown 1998 and 1999)
- Aerial photographs at a scale of 1 to 10,000 for rural areas. (flown 1979)
- The submissions and further submissions made on the resource area maps - flood susceptible.
- Information held by staff from the Whangarei District Council (G Oldcorn, G Manzano, A Young, D Ewen & G Wakelin), Kennedy & Associates (S Gwilliam, J Smith), and the Northland Regional Council (R Cathcart, G Heaps & D Coates).

### **3.2 Mapping of Flood Susceptible Areas**

The mapping process was broken into three sections. The first section being the "urban" areas (those covered by 1:10,000 resource maps), the second being the rural areas (those covered by 1:50,000 resource maps) and the third coastal areas subject to seawater inundation.

#### **3.2.1 Urban Land**

For the urban sections a five-step process was adopted.

- The first step was to divide the district into that part covered by a stormwater catchment management or drainage plan (SCMP) and that not. These Catchment Management Plans identified flood hazard areas either via drainage classification or flood hazard maps. The maps identified areas where flooding was likely to occur in the 1 in 50 year storm event or 2% AEP (annual exceedence probability).
- The next step involved examining those areas covered by SCMPs. A high level comparison was made with other existing information held including submissions. Where a submission was received in an area covered by a SCMP it was assessed and if required a site visit was made and interview with the submitter undertaken. In a number of instances this lead to a recommended change to the SCMP hazard areas. In the case of the Springs Flat area (part of the Waitaua SCMP), due to the number of submissions received, further analysis was undertaken. This is outlined in step three.
- The third step for those areas not covered by SCMPs and the Springs Flat area involved a more detailed analysis. This entailed reviewing existing information conducting a series of structured interviews with Steve Gwilliam (Kennedy & Associates) and Alan Young (Whangarei District Council) and plotting flood susceptible areas on the 1 to 2,500 aerial photographs. This process enabled the capture of a significant body of knowledge held by these two people.
- The fourth step involved a site inspection of the all areas not covered by SCMPs. Although SCMPs were available for Ngunguru and Springs Flat it was decided to include them in the site inspections. This was due to the large number of submissions received from residents in these two areas. The site inspection is involved walkovers of areas to verify those areas as being flood susceptible in the third stage. In a number of instances discussions with property owners when available was undertaken to gain any first hand experience they may have had.
- The fifth stage was to compile the information under the headings of individual resource maps numbers for data capture and the production of the Flood Susceptible Area Maps (2001). The maps are available in printed A3 format and in an electronic format that will enable updating of the Resource Area Maps. The electronic format includes an audit trail as to the source of information for each map. This is also recorded in a spreadsheet in the appendix of this report.

### **3.2.2 Rural Land**

For the rural areas the process adopted was more limited.

- The first step was to identify the maps for which submissions had been received on the flood susceptible areas. These submissions were limited to maps 7,15, 16, 18 and 19.
- These submissions were then assessed, relevant aerial photographs and topographical maps examined and site visits typically with property owners, undertaken. If required, revised flood susceptible areas were generated.

- Finally this information was digitised to produce the Flood Susceptible Area Maps (2001). The maps are available in printed A3 format (at a scale of 1 to 50,000) and in an electronic format that will enable updating of the Resource Area Maps.

### 3.2.3 Coastal Land

The coastal section covers largely urban land where there is the likelihood of flooding attributable to seawater overtopping adjoining land. The following process was used to establish areas of susceptible to flooding.

- In conjunction with Jeremy Gibb review the coastal flood hazard zone assessments his consultancy had undertaken on behalf of the Whangarei District Council and the Northland Regional Council over the last 13 years. The most detailed of these reports cover Matapouri Bay and estuary, Pataua North Beach and Pataua estuary and Marsden Bay and One Tree Point. Less detailed reports cover selected beaches in the district from Ohawini Beach in the north to Waipu Cove in the south.
- The detailed reports defined a coastal flood hazard zone based on a contour elevation. This contour was determined by estimating the combined storm wave runup (SWRU) for each location. This incorporated components of sea level rise, mean high water, storm surges, wave runup and a safety factor. The estimated SWRU varied for each location depending on such factors as beach slope and estuary configuration.
- In areas not covered by detailed reports a preliminary assessment was undertaken based on local knowledge, previous site inspections and discussions with residents. There is a lower of confidence in the assessment in these areas. This is relevant particularly to Ngunguru where there is significant residential development.
- An assessment was then undertaken of the coinciding effect of the SWRU and a heavy rainfall event on the coastal areas. This exercise took into account available information on rainfall based flooding and the likely cumulative effect of elevated sea levels due to SWRU. This required a degree of engineering judgement taking into account the topography of the flood susceptible areas, the hydraulics of the streams in the area and the shape of their catchments. The combined effect of the two events was considered to be less than a simple addition of the maximum water levels associated with elevated sea levels and rainwater induced flooding occurring independently.
- Site inspections by Jeremy Gibb and Fraser Campbell were then undertaken of the beaches and adjoining land at One Tree Point/ Marsden Bay, Pataua North and South, Ngunguru and Matapouri. This enabled more detailed mapping of the extent of the combined flooding effect.
- Revised flood susceptible areas were then plotted on the aerial photographs and other maps to produce a series of maps suitable for digitizing.

- Finally this information was digitised to produce the Flood Susceptible Area Maps (2001). The maps are available in printed A3 format (at a scale of 1 to 10,000) and in an electronic format that will enable updating of the Resource Area Maps.

### 3.3 Advice on Submissions

As indicated earlier all submissions were reviewed as part of the development of flood susceptible areas. Against each submission and further submission relating to the flood susceptible areas a recommendation has been made. The submissions could be divided into those who were seeking changes to the flood susceptible area on a particular property and more general one seeking a general review of the areas.

Where a submission relates to a specific property a recommendation is made as to whether it should be accepted, accepted in part or not accepted. The recommendation is based on a comparison of the flood susceptible areas recorded in the proposed district plan with those presented in the Flood Susceptible Area maps (2001). These maps have also included the flood susceptible areas as per the proposed District Plan.

The more general submissions, which have requested a review of the flood susceptible areas, have been responded to by noting that this study has been commissioned. It should be noted that these general submissions have been used as the basis for making changes to flood susceptible areas not covered by property specific submissions.

The recommendations have been listed against each individual submission in a table. The recommendations could be grouped for each resource map depending on the whether the submission should be accepted, accepted in part or not accepted. In addition they could be reformatted into Access or Word files if required.



## **4. GENERAL ISSUES**

There were a number of issues that arose as part of the review that may require some further examination

### **4.1 Accuracy of the Stormwater Catchment Drainage Plans**

The first matter related to the accuracy of the flood hazard areas identified in the various stormwater catchment drainage plans. The first of these plans which was produced in 1980 had a major emphasis on stormwater drainage improvements and less emphasis on landuse controls. The drainage classifications were mapped at a fairly coarse scale. In many cases the early plans have been updated and new plans produced for those areas not initially covered.

It is apparent that the level of detail at which the mapping has been undertaken can present problems when using the maps for land use planning at an individual property level within an urbanised environment. It may be appropriate to review the level at which such mapping is being undertaken for future plans. The mapping exercise outlined in this report did not examine in detail each sub-catchment of the urban areas but focussed only on those properties where a specific submission was made. Thus it is likely that the Flood Susceptible Areas as identified on the revised maps may still include some properties that are not entirely or in part flood susceptible and conversely exclude some properties that are flood susceptible.

### **4.2 Accuracy of Rural Land flood mapping**

As earlier indicated this exercise only examined the flood susceptible areas in the rural areas when a specific submission called into question the accuracy of the areas. It is evident from reviewing these areas and providing recommendations on changes that there will be similar inaccuracies in the notation of other properties not covered by submissions.

It is understood that the flood susceptibility areas in the rural areas were largely based on interpretation of landuse capability maps. Land with a wetness limitation of 3W or greater were classified as being flood prone. In reality the limitation may be more one of poor draining soils. Further to this the mapping was at a scale that was not accurate enough to be able to define flood susceptibility at a property level particularly with the advent of the smaller rural residential properties.

It is therefore important that when assessing subdivisions or building consent application and providing information to the public that this issue of accuracy is recognised and disclosed. Further information will in many cases be required to be provided by the applicant on issues of flood susceptibility.

### 4.3 Perceptions of Flood Susceptibility

Many of the submissions from rural landowners included statements in their submissions that their land did not flood. When their reasoning was more closely examined it was evident that what they were meaning was that they didn't have fast moving water moving out of streams and river and covering the land. One submitter noted that some of the flood susceptible areas never have floodwater and none have water for more than a matter of hours and no more than 150mm deep. There were no stock or property losses and damage to pasture or fences. This submitter clearly believes this type of event does not constitute flooding.

The term flood susceptible has a specific understanding with respect to resource and building consents in the urban situation. In the rural scene it is more relevant to the location of buildings and in particular those for residential uses. The distinction becomes more blurred when dealing with lots down to 1 ha in area in the Countryside environment.

This issue may be dealt best by a clear definition of what is flood susceptible and what are implications from a landuse perspective.

### 4.4 Coastal Flood Hazards

As noted earlier the incorporation of seawater inundation in to the flood susceptible area assessment was based on available data. For areas other than Marsden Bay, One Tree Point, Pataua North & South and Matapouri, this information is very limited. This has a direct bearing on the accuracy of the flood susceptible areas identified in coastal areas. This is particularly relevant to Ngunguru, Ohawini/Parataki Beach, Oakura, Whananaki, Tutukaka Harbour, Whangaumu Bay, Teal Bay/Helena Bay, Waipu Cove, Bland Bay, Sandy Bay/Wooleys Bay and Ocean Beach. It is recommended that more detailed assessment of coastal flood hazards be undertaken in these areas in the short term

As with rural land it is important that when assessing subdivisions or building consent application and providing information to the public that this issue of accuracy is recognised and disclosed. Further information will in many cases be required to be provided by the applicant on issues of flood susceptibility until such time as improved coastal hazard information is available.

## 5. RECOMMENDATIONS

1. That the Flood Susceptible Area Maps 2001 (Scale 1 to 10,000) for urban area and settlements be accepted as the basis for the revised flood susceptible area on the resource maps.
2. That the Flood Susceptible Area Maps 2001 (Scale 1 to 50,000) for rural areas be accepted as the basis for the revised flood susceptible area on the resource maps.
3. That the advice on how the submissions be addressed on flood susceptible areas be accepted.
4. That the general issues in Section 4 be noted.

## 6. LIMITATIONS

This report has been prepared for the Whangarei District Council for the purpose of revising the flood susceptible areas as part of the process of making the District Plan operative. There are a number of limitations as to the accuracy of the revised flood susceptible areas that are related to the availability of existing information, the limitations of that information and the time available to undertake the review.

In particular the review has been limited to the land covered by

- Resource maps 22-27, 29-32, part 33, 44, 46-50, 52-53, and 58-62 of the proposed District Plan to the extent of aerial photo interpretation, interviews with landowners and current and previous staff and site walkovers
- Resource maps 7,15,15,16,18,19, 28, part 33, 34-43, 45, 51 and 54-57 of the proposed District Plan to the extent required to respond to property specific submissions

The flood susceptible areas detailed in the 1:50,000 maps and that are based on catchment management plans in the 1:10,000 maps have not been reviewed other than when required to respond to a property specific submissions

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**Director**

March 2001

## Appendix 3

### Sources of Information in the assessment of Flood Susceptible Areas

Whangarei District Council										
Flood Susceptible Areas										
Map No	Map Name	Basis for assessing Flood Susceptible Areas					Site Inspection F Campbell (FC)	Site Inspection J Gibb & FC	Catchment Management Plans and Assessments	Coastal Flood Hazard
		Aerial Photos	Contours (m) at specified interval	Cadastral	Discussions with S G William and A Young	Discussion with other sources as noted				
22	Whangaruru Nth	Yes	2	Yes	Yes	RC	13/12/00		Utilised NRC Coastal Resources Map 2163/1	
23A	Ohawini & Oakura	Yes	2	Yes	Yes	RC	13/12/00 & 4/01/01		Utilised NRC Coastal Resources Map 2163/23 and Coastal Management Report CR 98/4	
23B	Helena & Teai Bay	Yes	2	Yes	Yes	RC	13/12/00 & 4/01/02		Utilised NRC Coastal Resources Map 2163/1	
24	Moureres Bay	Yes	2	Yes	Yes	RC	4/01/01			
25	Whananaki	Yes	2	Yes	Yes	RC	16/11/00			
26A	Whananaki Sth	Yes	2	Yes	Yes	RC	4/01/01			
26B	Sandy Bay	Yes	2	Yes	Yes	RC	4/01/01			
27	Matapouri Bay	Yes	2	Yes	Yes		8/01/01	8/05/01	Coastal Management Report CR 98/8	
28	Hikurangi								Hikurangi Stormwater Catchment Management Plan June 2000. GHID	
29	Tutukaka	Yes	2	Yes	Yes		8/01/01			
30	Ngunguru	Yes and topographic map	1 & 2	Yes	Yes	Draft Ngunguru CMP and property owners	8/01/01	8/05/01	Draft Ngunguru Stormwater Catchment Management Plan January 2001 GHID	
31	Whangaumu Bay	Yes	2	Yes	Yes		8/01/01			
32A	Pataua Nth & Sth	Yes	2 & 0.25	Yes	Yes	Property owners	9/01/01	8/05/01	Coastal Management Report CR 99/7	
32B	Taiharuru	Yes	2	Yes	Yes	RC	9/01/01			
33	Kamo East	Yes	2	Yes	Yes	Property owners	23,24,26,27,31/01/01 and 12/02/01		Waitaia Catchment Drainage Plan September 1995 Tonkin & Taylor, Kamo Bypass State Highway Major Culverts Preliminary Design Report CER 98/82 December 1998 Opus International Consultants Kamo Bypass State Highway Construction Plans April 1999 1998 Opus International Consultants	
34	Tikipunga Nth	Yes	2	Yes	Yes				Waitaia Catchment Drainage Plan September 1995 Tonkin & Taylor	
35	Kamo West						12 & 13/02/2001		Hatea River Catchment Drainage Plan November 1997 Harrison Grierson Consultants Ltd Waitaia Catchment Drainage Plan September 1995 Tonkin & Taylor, Waiarohia Catchment Drainage Plan December 1983 Brickell Moss & Partners Waiarohia Stream Catchment Drainage Plan December 1998 City Design Taik Street Flood Modelling Works Consultancy Services September 1994	
36	Tikipunga						14/02/01		Hatea River Catchment Drainage Plan November 1997 Harrison Grierson Consultants Ltd	
37	Whangarei City								Kiripaka Culvert Flood Mitigation Study June 1999 Harrison Grierson Consultants Ltd Waiarohia Stream Catchment Drainage Plan December 1998 City Design Kirikiri Stream Catchment Drainage Plan August 1984 Brickell Moss & Partners	
38	Parahaki								City Catchment Management Plan Becc Steven Waiarohia Stream Catchment Drainage Plan December 1998 City Design	
39	Inner City						15/02/01		Hatea River Catchment Drainage Plan November 1997 Harrison Grierson Consultants Ltd Awaroa Catchment Drainage Plan Brickell Moss & Partners December 1985 City Catchment Management Plan Becc Steven Awaroa Catchment Drainage Plan Brickell Moss & Partners December 1985 Kirikiri Stream Catchment Drainage Plan August 1984 Brickell Moss & Partners	
40	Maungatapere	No	2	Yes	Yes	RC	12/01/01		Raumanga Stream Catchment Drainage Plan December 1985 Brickell Moss & Partners Waiarohia Stream Catchment Drainage Plan December 1998 City Design	
41	Maunu						13/02/01		Subdivision report re Beverley Cres Maungatapere September 1998 Hawthorn Geddes Raumanga Stream Catchment Drainage Plan December 1985 Brickell Moss & Partners	
42	Raumanga								Te Hape/ Austins Rd Catchment Drainage Report April 1997 Whangarei District Council Raumanga Stream Catchment Drainage Plan December 1985 Brickell Moss & Partners	
									Te Hape/ Austins Rd Catchment Drainage Report April 1997 Whangarei District Council Kirikiri Stream Catchment Drainage Plan August 1984 Brickell Moss & Partners	
									Flooding Potential at Highfield Subdivision Stage V March 1999, Cook Costello Ltd	

Whangarei District Council										
Flood Susceptible Areas										
Map No	Map Name	Basis for assessing Flood Susceptible Areas					Site Inspection F Campbell (FC)	Site Inspection J Gibb & FC	Catchment Management Plans and Assessments	Coastal Flood Hazard
		Aerial Photos	Contours (m) at specified interval	Cadastral	Discussions with S G William and A Young	Discussion with other sources as noted				
43	Morningside						13/02/01		Engineering Suitability Report Lot 10 Stage V Highfield Subdivision October 2000 Cook Costello Ltd Lineburners Creek Catchment Drainage Plan May 1980 Brickell Moss & Partners Raunanga Stream Catchment Drainage Plan December 1985 Brickell Moss & Partners Awaroa Catchment Drainage Plan Brickell Moss & Partners December 1985 Kiri-kiri Stream Catchment Drainage Plan August 1984 Brickell Moss & Partners City Catchment Management Plan Beza Steven Lower Port Rd (as per Proposed District Plan) Flooding Investigation of Proposed Rewarewa Rd Subdivision Stage 1 December 1999 Cook Costello Ltd	
44	Onerahi (Nth)	Yes	2	Yes	Yes		26 & 27/01/01		Part Awaroa Catchment Drainage Plan Brickell Moss & Partners December 1985 Lower Port Rd (as per Proposed District Plan)	
45	Otaika	Yes	2	Yes	Yes		23/01/01		Lineburners Creek Catchment Drainage Plan May 1980 Brickell Moss & Partners	
46	Onerahi (Sth)	Yes	2	Yes	Yes		26 & 27/01/01			
47	Waikaraka	Yes	2	Yes	Yes	RC	10/01/01		Pt Waikaraka Catchment Management Plan January 1998 Cook Costello Ltd	
48	Manganese Pt	Yes	2	Yes	Yes		10/01/01			
49	Parua Bay	Yes	2	Yes	Yes	RC	10/01/01			
50	Portland	Yes	2	Yes	Yes		12/01/01			
51	One Tree Pt	Yes and topographic maps	Part 0.6, 1 & 2					7/05/01	→ One Tree Point Stormwater Catchment Management Plan (Draft) August 2000 GHD, Coastal Management Report CR 98/8	
52A	McLeod Bay	Yes	2	Yes	Yes	RC	10/01/01		McLeod Bay Whangarei Heads Stormwater Catchment Management Plan April 1994 Cook Costello Ltd	
53B	Urquhart Bay	Yes	2	Yes	Yes	RC	9/01/01			
53	Reotahi	Yes	2	Yes	Yes	RC	10/01/01		Pt McLeod Bay Whangarei Heads Stormwater Catchment Management Plan April 1994 Cook Costello Ltd	
54	Marsden Point	Yes and topographic maps	Part 0.6, 1 & 2					7/05/01	One Tree Point Stormwater Catchment Management Plan (Draft) August 2000 GHD, Coastal Management Report CR 98/8	
55	Marsden								Ruakaka Stormwater Catchment Management Plan (Draft) June 2000 GHD	
56	Ruakaka Nth								Ruakaka Stormwater Catchment Management Plan (Draft) June 2000 GHD	
57	Ruakaka Sth								Ruakaka Stormwater Catchment Management Plan (Draft) June 2000 GHD	
58	Waipu	Yes	2	Yes	Yes	RC, DE	12/01/01			
59A	Waipu River Mouth	Yes	2	Yes	Yes	RC, DE	12/01/01			
59B	Waipu Cove	Yes	2	Yes	Yes	RC, DE	12/01/01			
60	Langa Beach	Yes	2	Yes	Yes	RC, DE	12/01/01			
61A	Pipiwai	No	not available	Yes			15/01/01			
61B	Ruatangata	No	not available	Yes			15/01/01			
61C	Pakotai	No	not available	Yes			15/01/01			
61D	Titoki	No	not available	Yes			15/01/01			
62A	Manungakarama	No	2	Yes	Yes	RC	12/01/01			
62B	Mangapai	No	not available	Yes			17/01/01			
62C	Ocean Beach	Yes	2	Yes	Yes	RC	9/01/01			
62D	Waiotira	No	not available	Yes			17/01/01			
Notes										
1 FSA is the Flood Susceptible Area as defined in the Proposed District Plan and FHA refers to a Flood Hazard Area described in draft District Plan										
2 Other Sources were Bob Cathcart (RC) Northland Regional Council, Don Ewes (DE) and George Wakelin (GW) both of Whangarei District Council										