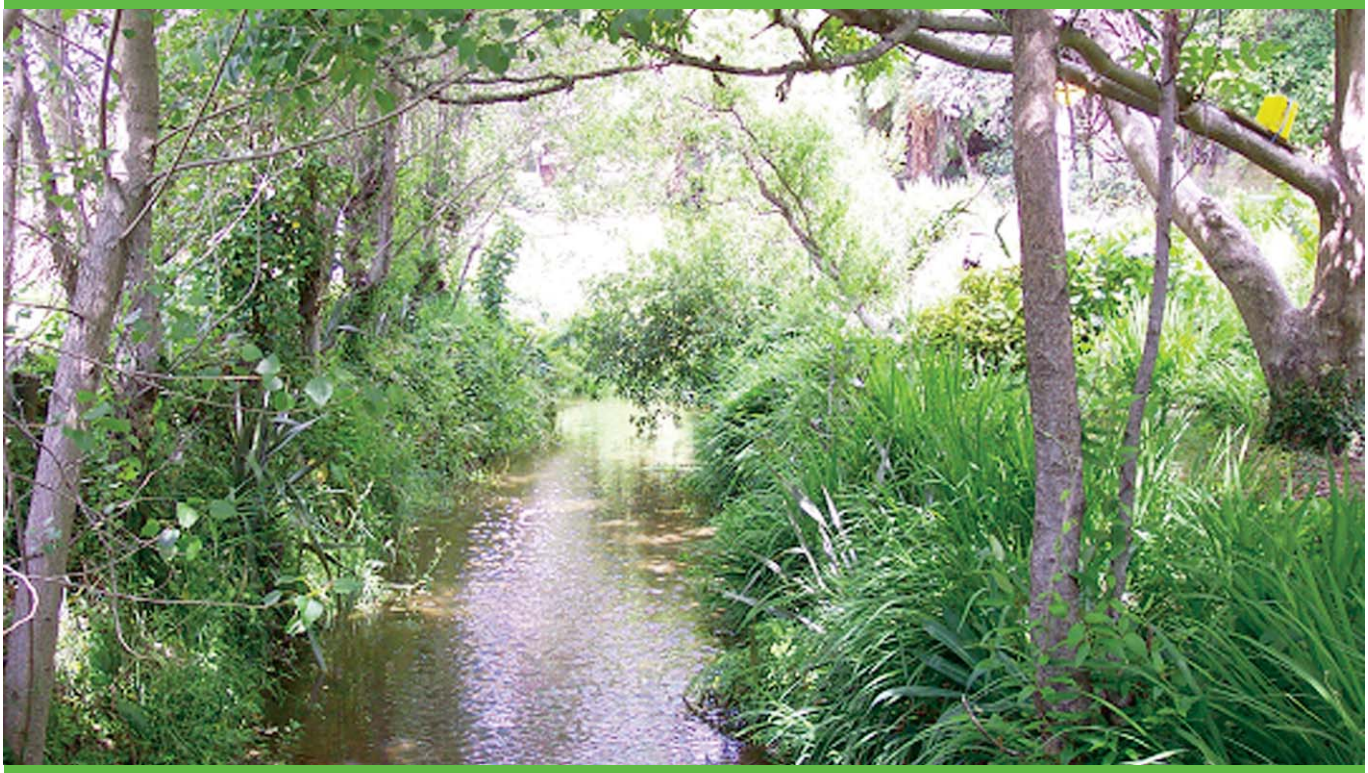
Maraetotara Stream Flood Risk Report

Prepared by Ingrid Pak, Environmental Engineer



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Cover photo: Maraetotara Stream looking upstream towards cross-section 3 (photographed by Jason Power)

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Chapter 1: Introduction

A hydraulic model of the Maraetotara Stream in Ohope has been developed in order to simulate improvement options on the current flooding problems in the vicinity of the stream and its floodplains.

In recent years, water has come up close to floor levels around the Ohope Christian Fellowship Church, the Ohope Garden Centre, and the Ohope Sports Hall during small to medium events (refer Figure 1). Considerable flows have been observed on the floodplain and on Bluett Road. Further, development of the land within the floodplain is desired by property owners for the future.

This project has been carried out to investigate various options to improve the flooding situation and their effect on upstream and downstream water levels and flows.

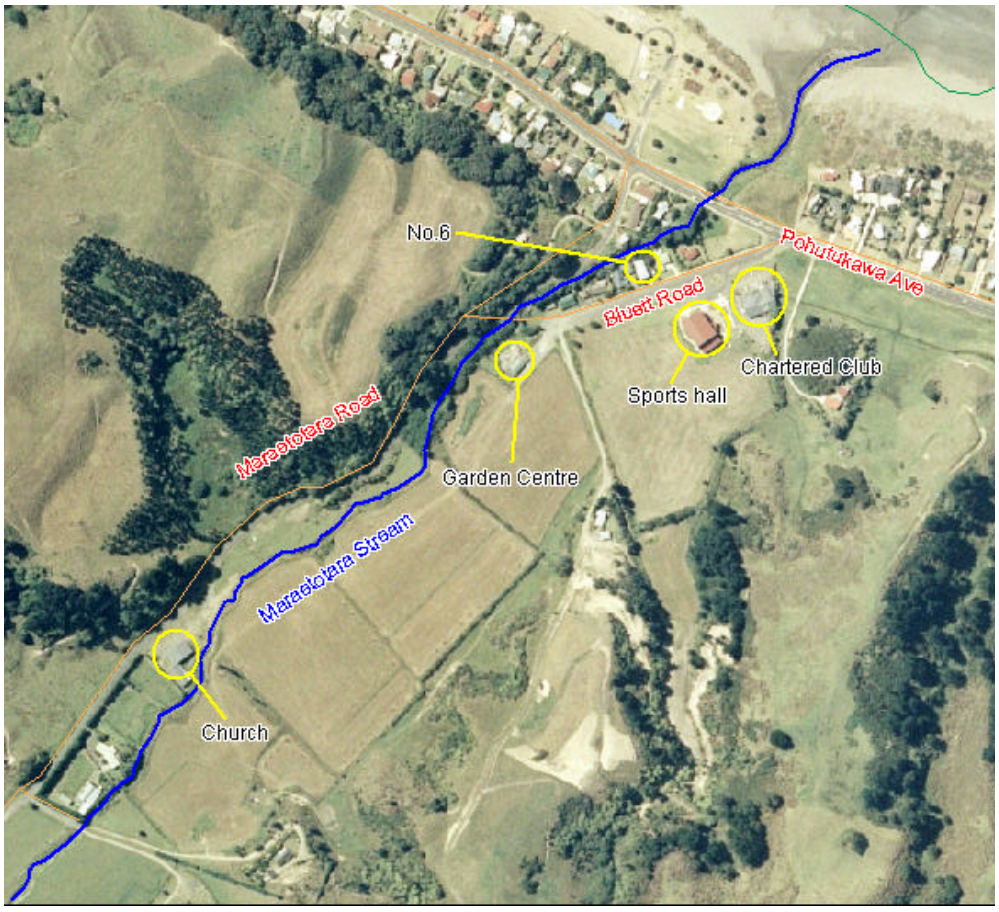


Figure 1 Sites of interest

Chapter 2: Hydraulic Analysis

Mike 11 hydraulic modelling software (version 2001) was used to firstly generate a status quo model of the Maraetotara Stream and its floodplain, and secondly to model various scenarios and options. A detailed description of Mike11 can be found in Reference Manual (DHI, 2000) and User Guide (DHI, 2000). All files used in the model are listed in Appendix 7.

Chapter 3: Model Area

The model area extends from the sea to just upstream of Robert Lane Bridge, 1.1 km from the river mouth, including the right floodplain and the Bluett Road area. The left floodplain has been ignored in the model as it is too narrow to have a significant effect on the model scenarios. Flow from the hill catchments behind the Chartered Club (south and east) have been included in the model since it contributes to the ponding effects in the area around the Chartered Club and the Ohope sports hall.

Chapter 4: Calibration

Records of flood levels are very limited on this stream, and no flow records exist. A few river level observations have been made during events in relation to existing floor levels, and a debris mark has been levelled. The event on 22 July 1992 was estimated to have been around a 20 year (5% AEP) event, and the event in June 1998 was estimated as a 5 year (20% AEP) event.

The first step in developing a hydraulic model was to build a model for the 5 year event – a calibration model.

4.1 Network and cross-sections

The calibration model uses the 1998 cross-section survey to define the Maraetotara Stream. Floodplains and the area around the Bluett Road have been ignored as for the 5 year event used for the calibration the flow is essentially contained within the stream channel and runoff from the hill catchments behind the Chartered Club has no effect on stream levels in the upper model reach of Maraetotara Stream.

The network is shown in Figure 2 and branch details are listed in Table 1.

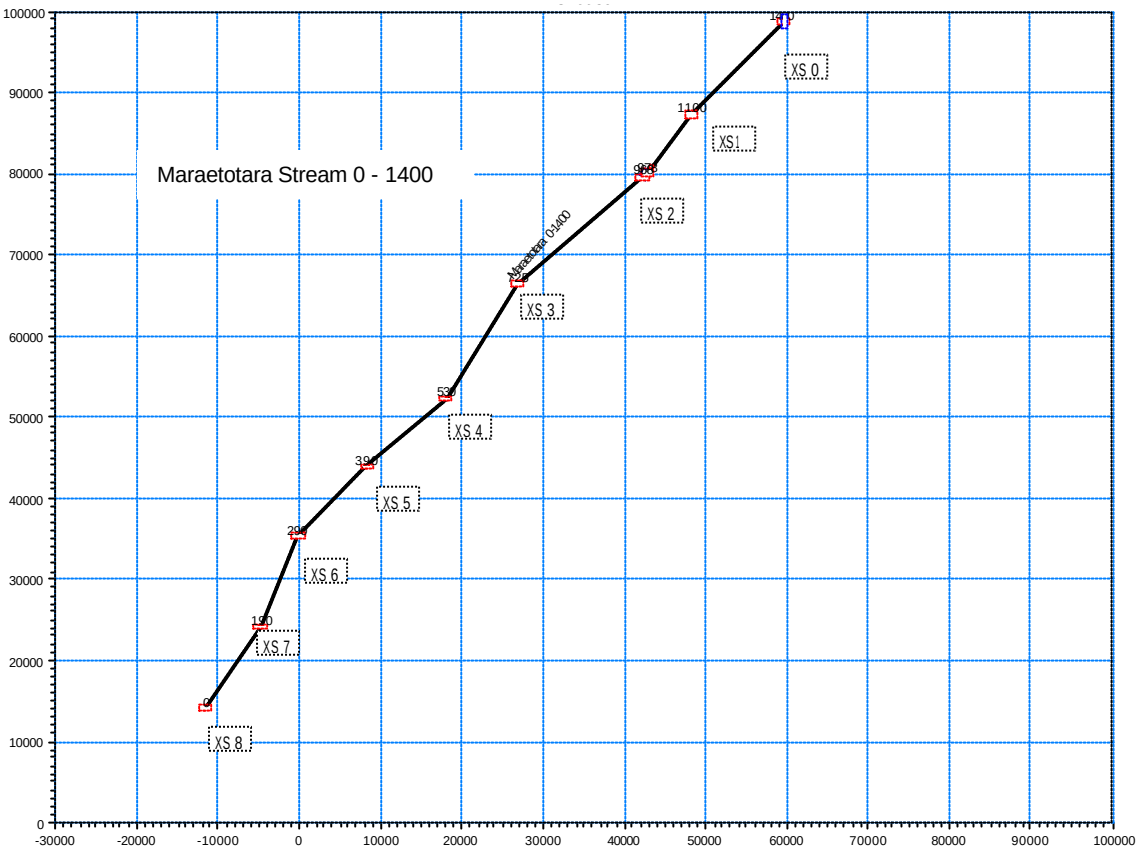


Figure 2 Calibration model network

Table 1 Branch details for calibration model

Branch Name	Chainage	Cross-sections	Description
Maraetotara	0 – 1400	XS 8 (Robert Lane bridge) to XS 0 (at mouth)	branch representing the main channel of the stream

Eight cross-sections were surveyed on the Maraetotara Stream in June 1998 between the river mouth and Robert Lane bridge. These cross-sections covered the whole width of the river channel and berm area, but not necessarily the entire width of the floodplain.

Cross-sections used in the calibration model are listed in Table 2.

Table 2 Cross-sections used in the calibration model

Branch	Cross-section	Chainage	Survey date	Comment
Maraetotara	XS 0	1400	-	Artificial cross-section
	XS 1	1100	June 98	
	XS 2	973	June 98	Pohutukawa Ave bridge (culvert & weir)
	XS 3	725	June 98	Garden Centre
	XS 4	530	June 98	
	XS 5	390	June 98	
	XS 6	290	June 98	
	XS 7	190	June 98	Church
	XS 8	0	June 98	Robert Lane bridge

4.2 Structures

The Pohutukawa Ave bridge at XS 2 has been modelled as a culvert and weir.

At XS 8 (Robert Lane bridge) the bridge has been ignored and the cross-section modelled as an open cross-section. This is because the model is not examining flood risks upstream of XS 8 and any downstream effects from ignoring the bridge are small.

Details of the culvert and weir are listed in Table 3.

Table 3 Details of culvert and weir used in the calibration model

Branch	Chainage	Structure	RL	Width	Length	Resistance
Maraetotara	973	Culvert	0.835 m		15 m	0.03
	973	Weir	3.85 m	20 m	-	0.055

4.3 Boundary Conditions

The upstream boundary condition at XS 8 of the Maraetotara Stream is the flow for a 5 year (20%AEP) event, which is 15.7 m^3/s. This has been derived by graphical interpolation from flows calculated by Peter Blackwood based on the average of the TM61 and Rational methods (BLACKWOOD, 1999). The hydrograph has been assumed based on the concentration time of 90 minutes.

The downstream boundary conditions at Maraetotara Stream are the spring tide levels (max. RL = 0.93 m) used in the Rangitaiki River model. The exact magnitude of the tide is not pertinent as the calibration point is a long way upstream. An artificial cross-section has been placed at the downstream branch end to accommodate the boundary condition.

The peak levels of upstream and downstream boundary conditions are timed to have coinciding peaks at the downstream end of the Maraetotara Stream.

The flows from the catchments behind the Chartered Club have been ignored in the calibration model, as the observed flood level used for calibration is substantially upstream.

4.4 Resistance

The resistance factor Manning's *n* has been chosen for each channel reach depending on the channel condition as shown in Table 4 (NIWA, 1998):

Table 4 Resistance factors

Branch	Chainage	Manning's *n*
Maraetotara	-20 - 530	0.055
	667 - 972	0.07
	974 - 1400	0.04
Culvert	973	0.03

Mike 11 interpolates the resistance values in between cross-sections, i.e. chainages of different resistance values.

4.5 Computational Parameters

- Initial conditions: water level = 0 m; discharge = 0 m^3/s
- Wave approximation: High order fully dynamic
- Radius type: Total area, Hydraulic radius
- Time step Δt = 10 s
- Delta = 1.0

Other values were as the Mike11 defaults.

Chapter 5: Calibration Results

Records from previous flood events include:

- June 1998 (~ 5yr event):
- Debris mark at XS 7 at church, 14/06/1998: RL = 5.78 m
- Some time prior 1998:

Observation that water level twice came close to the floor level of the old church hall (floor level RL = 6.60 m). There is some uncertainty as to whether the flooding was caused by the stream or possibly by runoff from the hill slopes west of the church.

- July 1992 (~ 20yr event):

Photos showing that the area around the Chartered Club was under water.

Photos showing that water spilled onto the floodplain in the area upstream of the church.

Some time in 2000 an observation was made that the water level came close to the floor level of the Garden Centre Cafe (floor level RL = 4.29m), but date and frequency of this event are unknown.

As the debris mark from the June 1998 event is the only firm calibration mark available, the calibration model has very much focused on this mark. The calibration model run on the parameters described above results in a water level at XS 7 (church) of RL = 5.78 m. Details of results are shown in Table 5.

Table 5 Results from calibration model: water level (m RL)

Branch	Chainage	Cross-section	Water level (m)	Comment
Maraetotara	0	XS 8	7.25	Bridge
	190	XS 7	**5.78**	Church
	290	XS 6	5.30	
	390	XS 5	4.84	
	530	XS 4	4.00	
	725	XS 3	3.49	Near Garden Centre
	972	XS 2 upstream	2.22	Bridge (culvert)
	974	XS 2 downstream	2.18	Bridge (culvert)
	1100	XS 1	1.70	
	1400	XS 0	0.93	Sea (artificial XS)

The 5 year flow is mostly contained within the given channel apart from a little overflow around cross-section 4, some distance upstream of the Garden Centre. This overflow has been ignored in the calibration model due to the lack of floodplain survey data and the expected insignificance of this overflow on the instream water levels. It is assumed that no significant flow occurs on the wider floodplain or onto Bluett Road.

Chapter 6: Design Model

Once the calibration was completed, some of the river cross-sections were replaced or extended by new surveys and additional channels were incorporated to allow larger flood scenarios to be modelled; i.e. a design model was developed.

6.1 Network and Cross-sections

The calibration model has been altered and extended to allow for modelling scenarios of larger events. Additional survey has been carried out to extend the model onto the floodplain and the area around Bluett Road.

The design model's network is shown in Figure 3 and branch details are listed in Table 6.

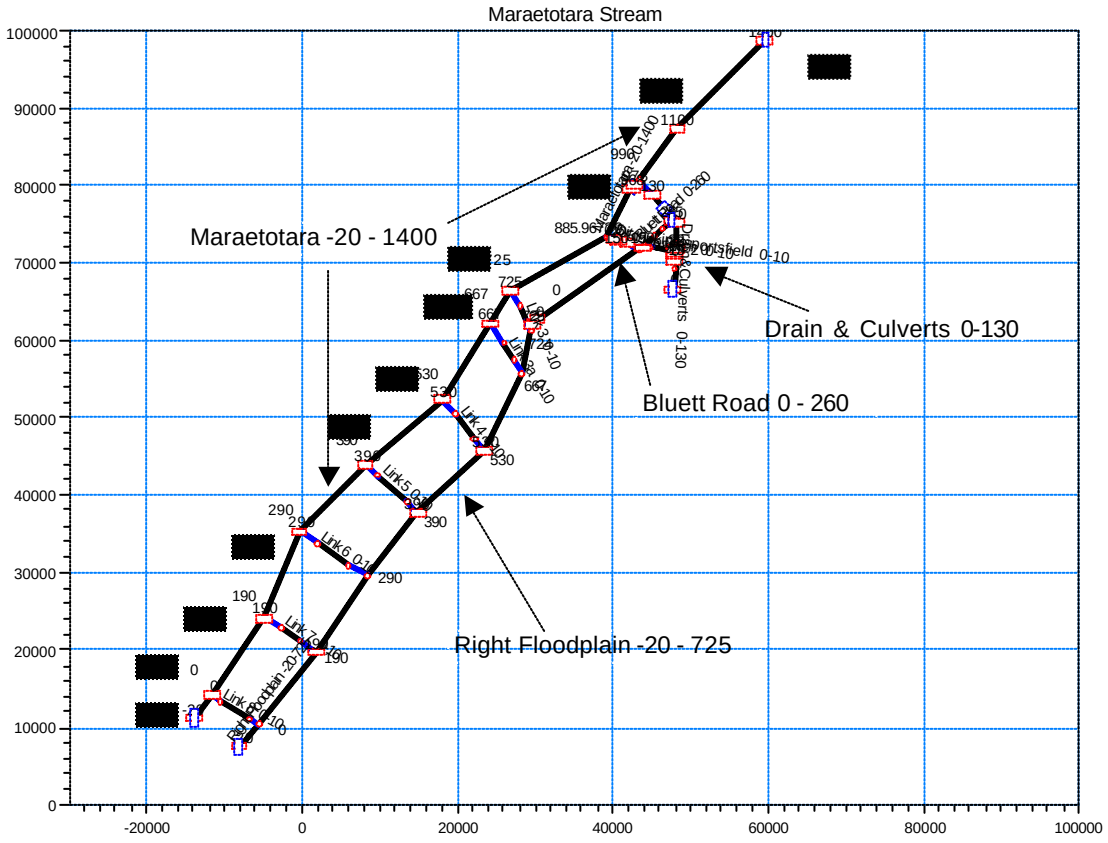


Figure 3 Design Model Network

Table 6 Branch details for design model

Branch Name	Chainage	Cross-sections	Description
Maraetotara Stream	-20 – 1400	XS 9 (Robert Lane bridge) to XS 0 (mouth)	representing the main channel of the stream
Right Floodplain	-20 – 725	XS 7 (church) to XS 3 (near Garden Centre)	representing the floodplain on the right hand side of the stream
Bluett Road	0 – 260	One cross-section at sports hall	representing Bluett Road from its end at the Garden Centre to the Pohutukawa Ave intersection
Link 3 - 8	0-10	-	representing the flow from the stream onto the floodplain
Ditch	0-30	4 cross-sections from the footpath to the stream end of the ditch	representing an overland flow path from Bluett Road into Maraetotara Stream between houses Bluett Rd no. 4 and 6
Link ditch	0 – 10	-	representing the footpath between Bluett Road and Ditch
Drain & Culverts	0 – 130	Several cross-sections	representing the drain by the Chartered Club and the culvert underneath Pohutukawa Ave; also contains additional storage to represent the area between the drain and Bluett Road
Link sports field	0 – 10	-	representing overland flow from Bluett Road to the drain by the Chartered Club and vice versa

An additional survey was carried out in early 2003 to determine some ground levels around Bluett Road and the Ohope sports hall, and an additional 3 cross-sections were surveyed in January 2003 over the whole width of the right floodplain. This 2003 survey indicated that the streambed had changed in parts of the stream since the 1998 survey, and in February 2003 three of the original cross-sections were resurveyed. A combination of these surveys has been used in the design model.

The cross-section at Bluett Road has been assumed from the ground levels taken in early 2003. There is no connection from Bluett Road straight out to sea as the intersection with Pohutukawa Ave is high enough to block this.

Three cross-sections have been surveyed through the ditch connecting Bluett Road with the Maraetotara stream.

Two intersecting drains at the Ohope Chartered Club drain the hill catchments to the south and east. Both these drains feed into the two inlets of a y-shaped culvert (corrugated iron, 900mm) which is situated underneath the Club building. The culvert under the Club building has been ignored in the model as flooding in the wider area is going to occur independently of the culvert's performance. Downstream of this culvert is about 20 metres of open drain, and then a 100m long culvert (concrete, 900mm). The culvert starts at the Bluett Road/Pohutukawa Ave intersection by the Chartered Club carpark and joins the Maraetotara Stream just downstream from the Pohutukawa Ave bridge (XS2).

For the Drain & Culverts branch, two cross-sections were surveyed in the drain by the Chartered Club in August 2003, one downstream of the culvert under the building and one upstream of this culvert. Additional cross-sections as required by the model have been based on these surveyed cross-sections but shifted vertically. The concrete culvert underneath Pohutukawa Ave has been set up with the upstream invert surveyed and the downstream invert (at Maraetotara Stream) estimated using a 0.5% slope. Due to the delicate issues around the Urupa site on the right bank of Maraetotara Stream downstream from the Pohutukawa Ave bridge, access to the outlet of the culvert to survey its invert has not been attempted. Also the location of the outlet could not be verified, but Whakatane District Council as-built stormwater plans show the outlet is located just downstream from the bridge.

Additional storage representing the carpark and the area around the sports hall has been estimated and incorporated into the model in the drain and culverts branch at chainage 20.

Cross-sections and survey dates are listed in Table 7.

Table 7 Cross-sections and survey dates used in the design model

Branch	Cross-section	Chainage	Survey date	Comment
Maraetotara	XS 0	1400	-	Artificial cross-section
	XS 1	1100	June 98	
	XS 2	973	June 98, new inverts Feb 03	Pohutukawa Ave bridge (culvert & weir)
	XS 3	725	Combined Feb 98, Jan 03, Feb 03	Garden Centre
	XS 3a	667	Jan 03	
	XS 4	530	Feb 03	
	XS 5	390	Feb 03	
	XS 6	290	June 98	
	XS 7	190	Jan 03	Church
	XS 8	0	June 98	Robert Lane bridge
	XS 9	-20	Jan 03	
Right Floodplain	FPxs3	725	Feb 03	Near Garden Centre
	FPxs4	530	Feb 03	
	FPxs5	390	Feb 03	
	FPxs7	190	Jan 03	
	FPxs9	-20	Jan 03	
Bluett Road	BXS 1	0	-	Same as FPxs3
	BXS 2	150	Jan 03	Near sports hall
	BXS 3	260	-	Same as BXS2
Ditch	DXS 1	0	-	Footpath
	DXS 2	5	Mar 03	Near footpath
	DXS 3	15	Mar 03	Between houses
	DXS 4	25	Mar 03	Near stream
Drain & Culverts		0	-	
		15	Aug 2003	
		18	-	
		20	Aug 2003	Additional storage
		22	-	
		30	-	u/s culvert1
		130	-	d/s culvert 1

Link channels are used in the model to represent the spillage from the main channel out onto the floodplain. They simulate a weir at a given RL at which the bank is overtopped.

Further link channels are set up to determine the level at which water flows between certain branches of the model. “Link ditch” determines the flow from Bluett Road into the ditch between No.4 and No.6 Bluett Road and is defined by the level of the footpath. “Link sports field” represents overland flow from Bluett Road to the drain by the Chartered Club (and vice versa) which is determined by the ground level in the area.

Details of the structures are listed in Table 8.

Table 8 Details of structures used in the design model

Branch	Chainage	Structure	RL	Width	Length	Diameter	Resistance
Maraetotara	973	Culvert	0.835 m		15 m	irregular	0.03
	973	Weir	3.85 m	20 m	-		0.055
Bluett Road	260	Weir	3.93 m	10 m	-		0.055
Drain & Culverts	80	Culvert	1.303 m		100	900 mm	
Link 3	725	Link channel	4.140 m	30 m	10		0.055
Link 3a	667	Link channel	4.449 m	98 m	10		0.055
Link 4	530	Link channel	4.334 m	138.5 m	10		0.055
Link 5	390	Link channel	4.895 m	120 m	10		0.055
Link 6	290	Link channel	5.870 m	95 m	10		0.055
Link 7	190	Link channel	6.247 m	150 m	10		0.055
Link 8	0	Link channel	8.070 m	115 m	10		0.055
Link ditch	150	Link channel	3.320 m	20 m	10		0.05
Link sports field	150	Link channel	3.092 m	200 m	10		0.05

6.2 Boundary Conditions

The upstream boundary conditions at XS 9 of the Maraetotara Stream are the flows calculated by Peter Blackwood based on the average of the TM61 and Rational methods (BLACKWOOD, 1999). These are:

- 50 % AEP (2 year): 12.0 m^3/s
- 20 % AEP (5 year): 15.7 m^3/s
- 10 % AEP (10year): 18.5 m^3/s
- 5 % AEP (20 year): 21.3 m^3/s
- 2 % AEP (50 year): 24.9 m^3/s
- 1 % AEP (100 year): 27.8 m^3/s

(The 5 year, 10 year and 20 year flows have been graphically interpolated)

The hydrographs used as boundary conditions have been assumed based on the concentration time of 90 minutes.

The boundary condition for the upstream end of the Right Floodplain required by the model is set to be Zero.

The downstream boundary condition at Maraetotara Stream is the spring tide level (max. RL = 0.93 m) and the 10year tide level (max. RL = 1.82m) used in the Rangitaiki River model. An artificial cross-section has been placed at the downstream branch end to accommodate the boundary condition.

The downstream boundary condition at Bluett Road is set to Zero as there is no flow beyond the Pohutukawa Ave intersection due to high ground levels.

The flow off the hills behind the Chartered Club and along Pohutukawa Ave have been calculated using the TM61 method and form the upstream boundary conditions to branch Drain & Culverts. These are:

- 50 % AEP (2 year): 1.4 m3/s
- 20 % AEP (5 year): 2.0 m3/s
- 10 % AEP (10year): 2.4 m3/s
- 5 % AEP (20 year): 2.7 m3/s
- 2 % AEP (50 year): 3.2 m3/s
- 1 % AEP (100 year): 3.5 m3/s

The hydrographs used as this boundary condition have been assumed based on the concentration time of 30 minutes.

It has also been assumed that events of equal frequency occur in the Maraetotara catchment and these hill catchments, i.e. a 50 year flow in the Maraetotara has been combined with a 50 year flow off the hills behind the Chartered Club.

The hydrographs of upstream and downstream boundary conditions are timed to have coinciding peaks at the downstream end of the Maraetotara Stream.

6.3 Resistance

The resistance factor Manning's *n* has been chosen for each channel reach depending on the channel condition as shown in Table 9 (NIWA, 1998):

Table 9 Resistance factors

Branch	Chainage	Manning's *n*
Maraetotara	-20 - 530	0.055
	667 - 972	0.07
	974 - 1400	0.04
Culvert at XS2 (bridge)	973	0.03
Link 3 – 8	0 - 10	0.055
Right Floodplain	-20 - 725	0.08
Bluett Road	0 - 560	0.03
Ditch	0 - 30	0.055
Drain & Culverts	0 - 130	0.055
Culvert1 (underneath Pohutukawa Ave)	80	0.013

Mike 11 interpolates the resistance values in between cross-sections (i.e. chainages of different resistance values).

6.4 Computational Parameters

A time step of 30 seconds has been used in the design model. Other computational parameters have not been altered from the calibration model.

6.5 Design Model Summary

In the design model as described above, water will move down Maraetotara Stream, spilling out onto the right floodplain at certain locations when levels are high enough. From the floodplain water will flow onto Bluett Road.

The area around Bluett Road, the Chartered Club and the sports field has two water sources: water coming off the floodplain and the runoff from the hill catchments behind the Chartered Club. Water from these two sources will initially drain through the culvert underneath Pohutukawa Ave. Once the amount of water from these sources exceeds the capacity of the culvert it will fill up the available storage, that is the road, the carpark area around the Chartered Club and the sports hall, and parts of the sports field. Once levels rise to the level of the footpath on the north-western side of Bluett Road it will start spilling over into the ditch between No.4 and No.6 Bluett Road and flow through the ditch into Maraetotara Stream until the levels on Bluett Road drop below the level of the footpath. Once levels recede the culvert underneath Pohutukawa Ave is again the only outlet from that area.

In the design scenarios described below, several options are investigated as to how the flow onto the area around Bluett Road can be reduced, and how the draining of this area can be improved.

Chapter 7: Design Scenarios

Various scenarios have been modelled to show the effects these will have on water levels in the modelled area. These scenarios are (see Table 10 for details):

Status Quo 1: Status Quo with spring tide, full bridge area

Status Quo 2: Status Quo with spring tide, bridge area partially blocked

Scenario 1: Status Quo with 10 year tide

Scenario 2: Scenario 1 with culvert blocked by debris

Scenario 3: Scenario 1 plus walnut trees between XS 3 and XS 4 cleared

Scenario 4: Scenario 2 plus walnut trees between XS 3 and XS 4 cleared

Scenario 5: Scenario 4 plus stopbank on floodplain at XS 3 (around Garden Centre)

Scenario 6: Scenario 4 plus stopbank on floodplain up to XS 4

Scenario 7: Scenario 4 plus stopbank on floodplain up to XS 5

Scenario 8: Scenario 4 plus stopbank on floodplain up to XS 6

Scenario 9: Scenario 4 plus stopbank on floodplain up to XS 7

Scenario 10: Scenario 4 plus overflow at Medical Centre

Scenario 11: Scenario 9 plus overflow at Medical Centre

Scenario 12: Scenario 4 plus culvert1 blocked

Scenario 13: Scenario 9 plus culvert1 blocked

Scenario 14: Scenario 4 plus culvert1 diameter increased (1.5m)

Scenario 15: Scenario 9 plus culvert1 diameter increased (1.5m)

Scenario 16: Scenario 4 plus culvert1 plus an additional culvert under Bluett Road

Scenario 17: Scenario 9 plus culvert1 plus an additional culvert under Bluett Road

Table 10 Predictive Scenarios - Details

Design Scenarios	Spring tide	10 yr tide	Bridge area blocked	Walnut trees cleared	Stopbank	Overflow at Med centre	Culvert1 blocked	Culvert1* increased diameter	Additional culvert**
Status Quo 1	✓								
Status Quo 2	✓		✓						
Scenario 1		✓							
Scenario 2		✓	✓						
Scenario 3		✓		✓					
Scenario 4		✓	✓	✓					
Scenario 5		✓	✓	✓	✓ @ XS 3				
Scenario 6		✓	✓	✓	✓ @ XS 4				
Scenario 7		✓	✓	✓	✓ @ XS 5				
Scenario 8		✓	✓	✓	✓ @ XS 6				
Scenario 9		✓	✓	✓	✓ @ XS 7				
Scenario 10		✓	✓	✓		✓			
Scenario 11		✓	✓	✓	✓ @ XS 7	✓			
Scenario 12		✓	✓	✓			✓		
Scenario 13		✓	✓	✓	✓ @ XS 7		✓		
Scenario 14		✓	✓	✓				✓	
Scenario 15		✓	✓	✓	✓ @ XS 7			✓	
Scenario 16		✓	✓	✓					✓
Scenario 17		✓	✓	✓	✓ @ XS 7				✓

* Culvert1 ... beneath Pohutukawa Ave; inflow near Chartered Club, outflow into Maraetotara Stream d/s of bridge.
** Additional culvert under Bluett Road; inflow at carpark; outflow into Maraetotara Stream.

All Scenarios are run for the 2yr, 5yr, 10yr, 20yr, 50yr, and 100yr events.

7.1 Boundary Conditions

Peak values for flows and tides modelled are as listed in Table 11:

Table 11 Peak flows and tides

	Event	**Peak Value**
Maraetotara (upstream)	Q2: 50 % AEP (2 year) flow	12.0 m^3/s
	Q5: 20 % AEP (5 year) flow	15.7 m^3/s
	Q10: 10 % AEP (10year) flow	18.5 m^3/s
	Q20: 5 % AEP (20 year) flow	21.3 m^3/s
	Q50: 2 % AEP (50 year) flow	24.9 m^3/s
	Q100: 1 % AEP (100 year) flow	27.8 m^3/s
Maraetotara (downstream)	T10: 10% AEP (10 year) tide	1.82 m
	Ts: spring tide	0.93 m
Drain & Culverts (upstream)	Q2: 50 % AEP (2 year) flow	1.4 m^3/s
	Q5: 20 % AEP (5 year) flow	2.0 m^3/s
	Q10: 10 % AEP (10year) flow	2.4 m^3/s
	Q20: 5 % AEP (20 year) flow	2.7 m^3/s
	Q50: 2 % AEP (50 year) flow	3.2 m^3/s
	Q100: 1 % AEP (100 year) flow	3.5 m^3/s

7.2 Bridge Blockage

It has been taken into account that in the event of a flood the floodway under the bridge at Pohutukawa Ave (XS 2) is prone to partial debris blockage. This has been incorporated into the model by lowering the bridge soffit level by 600 mm.

7.3 Stopbanks

The stopbank options investigated in the design scenarios assume the stopbank being placed at the highest ground level between the channel and the right floodplain. This is modelled by deleting the link channels connecting the channel branch to the right floodplain branch. If the stopbanks were placed closer to the channel the cross-sectional area and flood flow capacity would be reduced.

Chapter 8: Results

In this chapter, all scenarios run will be discussed in detail as to why they have been run, how they have been modelled, and what the impacts on flooding are.

Due to the lack of detailed calibration data a required freeboard of 500 mm is seen to be appropriate (NZS 4404, Land Development and Subdivision Engineering). The results of the modelling work will be assessed by comparing them to this standard in a 50 year event.

A detailed summary of maximum flood levels (excluding freeboard) and discharge for each scenario modelled can be found in Appendix 1.

Key findings of the model runs are as follows.

8.1 Status Quo 1: Status Quo with spring tide, full bridge area

This scenario represents the present situation without any alterations done. It illustrates the magnitude of flooding problems in rainfall events of ranging frequencies combined with a spring tide, and where they occur.

The shape of the Maraetotara riverbed has changed slightly over the period between 1998 and early 2003, improving water levels around the church to some extent.

In a 50 year event, the water level at the church will rise to 6.13m, which gives an available freeboard of 470 mm to the current floor level of the church building (6.60 m). This is marginally below the standard of a minimum available freeboard of 500 mm. There will be flows of up to $3m^3/s$ in the lower reaches of the right floodplain and onto Bluett Road. Water levels on Bluett Road will reach 3.51 m. The floor level of house no. 6 has been levelled at 3.86m, which with a freeboard of only 350mm is insufficient to meet the required freeboard standard. Up to 1.2 m^3/s will flow from Bluett Road back into the stream via the ditch between houses No. 4 and No. 6, resulting in a water level at 3.40 m in the ditch.

The maximum flow carrying capacity of the culvert with the given water levels upstream and downstream is 1.85 m^3/s, which is not enough to prevent flooding in the Bluett Road and Chartered Club area.

In a 20 year event, only minor flows of less than 1 m^3/s will occur on the right floodplain and on Bluett Road. Water levels on Bluett Road don't reach the footpath, therefore no flow will occur through the ditch.

In a 100 year event, water levels around the church will rise up to 6.26 m, reducing available freeboard to 340 mm. A flow of up to 5.5 m^3/s will occur on the lower reaches of the right floodplain and on Bluett Road. Water levels on Bluett Road at house No.6 will reach 3.66 m, leaving a freeboard of only 200 mm to the floor level of house No.6. Up to 3.5 m^3/s will flow back into Maraetotara Stream through the ditch.

8.2 Status Quo 2: Status Quo with spring tide, bridge area partially blocked

In the case that the flow area under the bridge at XS2 gets partially blocked by debris, the levels in the Maraetotara Stream in the reach of the Bluett Road houses rise by up to 410 mm immediately upstream of the bridge compared to the previous scenario. In a 50 year event, this will push up the level in the ditch by 20 mm to 3.42 m, but does not increase flood levels on Bluett Road (3.51 m) as these are due to upstream and hillside overflows. For a comparison between water levels with unblocked and blocked area at the bridge refer to Appendix 2. The partially blocked bridge area has no effect on the water levels at the church.

8.3 Scenario 1: Status Quo with 10 year tide

In this scenario, the tide level has been raised to the 10 year tide in order to show how far upstream the tide affects water levels, assuming the full bridge area is available to flow. The scenario also investigates whether the tide affects water levels on Bluett Road as the culvert's capacity will vary depending on downstream water levels.

A 10 year tide has its effect only up to the bridge at XS2. Upstream of the bridge the higher tide only raises the water levels insignificantly (e.g. 10 mm in a 50 year event). The tide has no effect on water levels upstream of the culvert underneath Pohutukawa Ave.

8.4 Scenario 2: Scenario 1 with culvert blocked by debris

As the higher tide has no effect on the reaches upstream of the bridge (XS2), this scenario is no different to the Status Quo 2 scenario for the water levels upstream of the bridge. A comparison of Scenario 2 to Status Quo 2 is shown in Appendix 3.

In the following scenarios the 10 year tide is used in order to provide for the "worst case scenario".

8.5 Scenario 3: Scenario 1 plus walnut trees between XS 3 and XS 4 cleared

Along the Garden Centre and upstream to about XS 4 the stream is lined with Japanese walnut trees, which may well affect the efficiency of the channel at higher flows. Figure 4 illustrates the location of the tree lined reach.

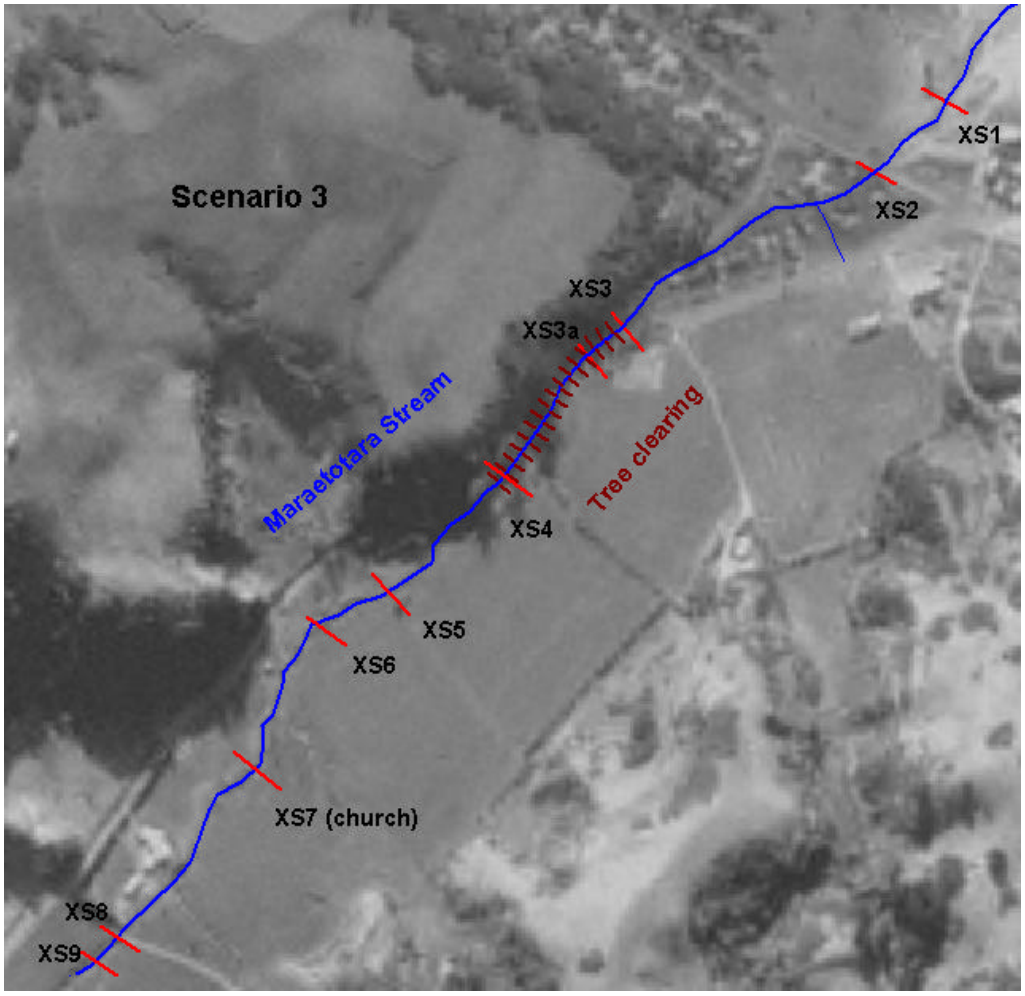


Figure 4 Scenario 3 – Tree clearing

Scenario 3 investigates to what extent clearing the trees would increase flood capacity and impact on the water levels upstream and downstream of the cleared reach.

The clearing of these trees has been modelled by reducing Manning's *n* between XS 3 and XS 4. See Table 12 for details.

Table 12 Resistance factors – trees cleared

Branch	Chainage	Manning's *n*
Maraetotara	-20 - 667	0.055
	725 - 972	0.07
	974 - 1400	0.04

Clearing the walnut trees reduces water levels in the reach between XS 4 and XS 3, but only to a minor extent of up to 30 mm at XS 3a. Other issues such as erosion risk and provision of shade to the stream would need to be considered before clearing the trees.

8.6 Scenario 4: Scenario 2 plus walnut trees between XS 3 and XS 4 cleared

In the case of the bridge area being partially blocked by debris, again the clearing of the walnut trees has hardly any effect on the water levels compared to Scenario 2; see comparison in Appendix 4.

8.7 Scenario 5: Scenario 4 plus stopbank on floodplain at XS 3 (around Garden Centre)

This scenario investigates the impact of a stopbank at the downstream end of the right floodplain as shown in Figure 5. The stopbank would be situated along the upstream side of the private road and around the Garden Centre, and is designed to stop flow onto Bluett Road. The area under the bridge at XS 2 is assumed to be partially blocked by debris.

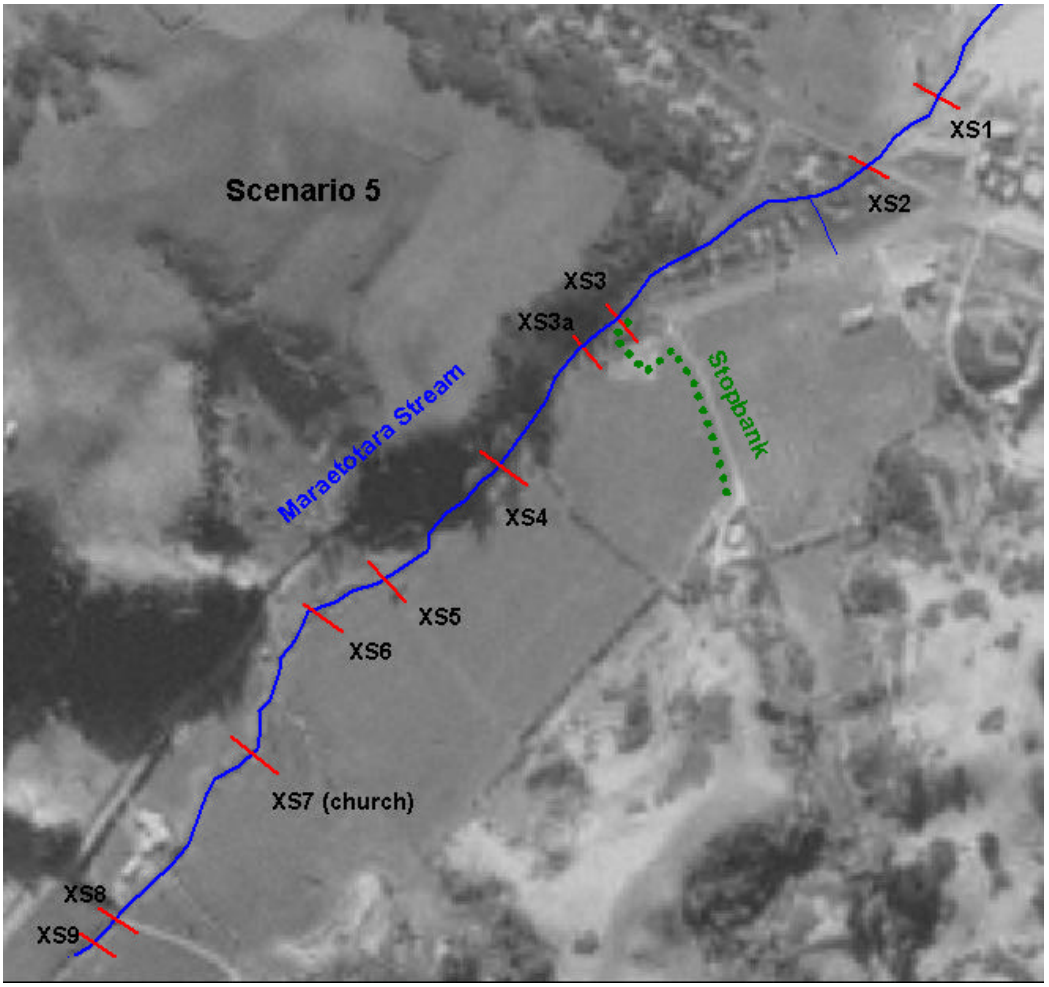


Figure 5 Scenario 5 – Stopbank at XS 3

The stopbank is modelled as a link channel between the right floodplain and Bluett Road with RL = 4.6 m.

While the stopbank stops any flow from the floodplain onto Bluett Road, the impact of the stopbank on the river levels in Maraetotara Stream is dependant of the magnitude of the event.

In a 50 year event (and in smaller events) it has no affect on the stream water levels. This is because the flow that comes out onto the floodplain further upstream (through link 4 and 5) goes into storage on the floodplain behind the stopbank as higher ground prevents it from flowing back into the stream. The ponding upstream of the stopbank will reach a water level of 4.15 m. This underlines the importance of the stopbank surrounding the Garden Centre (floor level RL = 4.29 m) as water levels in the area around it will be too high to leave it unprotected.

In a 100 year event water levels in the stream will rise at XS3 by up to 40 mm. This is due to flow (2.7 m^3/s) going from the floodplain back into the stream at XS3, caused by higher water levels on the floodplain behind the stopbank. Further downstream towards the bridge water levels are now lower than in Scenario 4 (no stopbank) by up to 50 mm. This is caused by decreased inflow from the ditch which now only drains the surplus from the hill runoff as there is no flow coming down Bluett Road.

Although the stopbank prevents flow onto Bluett Road from the floodplain, ponding in the Bluett Road area will still occur due to flow coming off the hills behind the Chartered Club. In a 50 year event, water levels on Bluett Road will reach 3.36 m, which leaves just sufficient available freeboard of 500 mm to the floor level of house no. 6 (3.86 m). This is an increase in freeboard by 130 mm compared to Scenario 4 – no stopbank. Flow back into Maraetotara Stream through the ditch will be minor with approximately 100 l/s.

8.8 Scenario 6: Scenario 4 plus stopbank on floodplain at XS 4

This scenario investigates the impact of a stopbank placed across the right floodplain at XS 4 and down along the right bank to the Garden Centre, as shown in Figure 6. Again, the area under the bridge at XS 2 is assumed to be partially blocked by debris.

The stopbank is modelled by placing a link channel with RL = 5.0m between the right floodplain at XS 4 and Bluett Road, and by deleting links 3 and 3a.

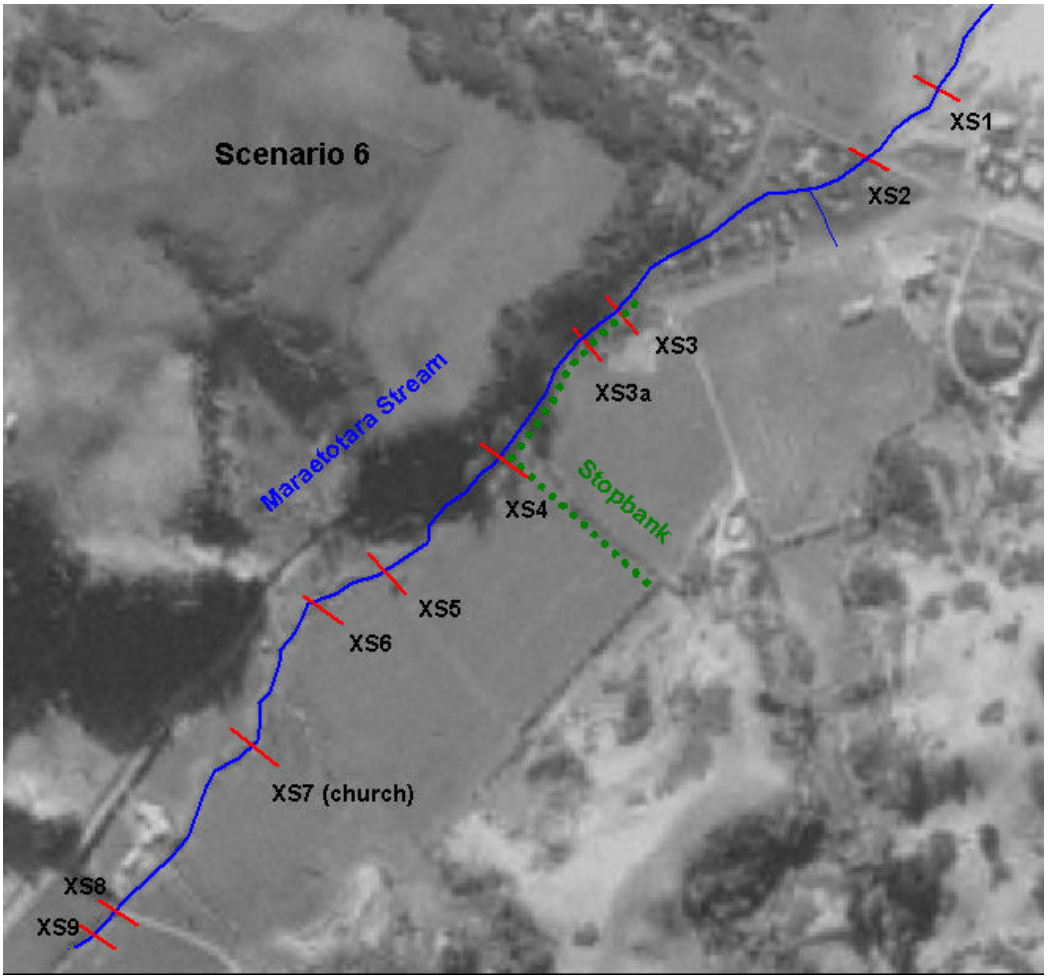


Figure 6 Scenario 6 – Stopbank at XS 4

While the stopbank stops any flow going further down the floodplain and onto Bluett Road, it raises the water levels in the stream from XS 5 down to the bridge at XS2 by up to 90 mm in a 50 year event compared to Scenario 4 – no stopbank. While some of the water on the floodplain will go into storage, some will flow back into the stream at XS4 increasing the flows and rising the water levels downstream. Available freeboard to house no. 6 from Maraetotara Stream is greater than the standard required (740 mm).

As for the water levels and available freeboard on Bluett Road the same comments as in Scenario 5 apply, as these are dependant on the hill runoff rather than stream levels. Therefore, the required available freeboard for house no. 6 is only just achieved (500 mm).

In a 100 year event water levels from XS 5 downstream are raised by 150 mm at XS3, and by 190 mm at the bridge. Available freeboard to house no. 6 is reduced to 470mm by water levels on Bluett.

8.9 Scenario 7: Scenario 4 plus stopbank on floodplain at XS 5

This scenario investigates the impact of a stopbank placed across the right floodplain at XS 5 and down along the right bank to the Garden Centre, as shown in Figure 7. Again, the area under the bridge at XS 2 is assumed to be partially blocked by debris.

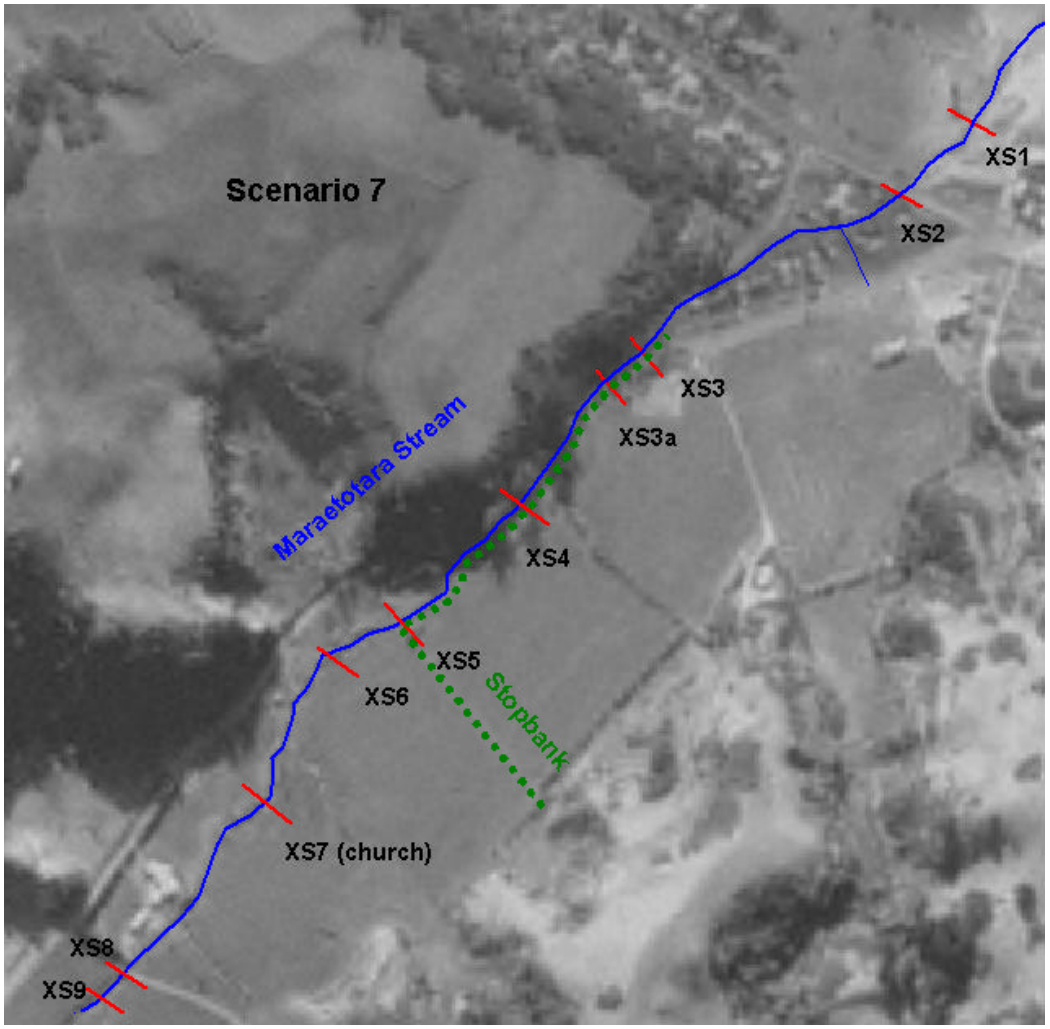


Figure 7 Scenario 7 – Stopbank at XS 5

The stopbank is modelled by placing a link channel with RL = 6.0m between the right floodplain at XS 5 and Bluett Road, and by deleting links 3, 3a, and 4.

This stopbank will protect the area downstream XS5 down to the Garden Centre from flooding, while raising water levels in the Maraetotara Stream from XS 6 downstream. Water levels are raised by flow being prevented to go onto the floodplain at XS4. Also, part of the flow that has gone onto the floodplain at XS5 will flow back into the stream once water levels recede there.

In a 50 year event, this will increase water levels in the reach above the Garden Centre by up to 80 mm, and in the reach of the houses along Bluett Road water levels will be increased by up to 190 mm (at XS2) compared to Scenario 4 – no stopbank. The standard of available freeboard to house no. 6 is met with 660 mm available (from the stream).

On the Right Floodplain, ponding will occur upstream of the stopbank, but to a lesser extent than it does on areas further down in the previous stopbank scenarios. The reason for this is that most of the flow onto the floodplain spills from the channel downstream of XS 5, if not prevented by a stopbank.

As for the water levels and available freeboard on Bluett Road the same comments as in Scenario 5 apply, as these are dependant on the hill runoff rather than stream levels. Therefore, the required available freeboard for house no. 6 is only just achieved.

In a 100 year event, water levels will increase by up to 170 mm in the reach above the Garden Centre at XS3, and by up to 220 mm at the bridge at XS2.

Water levels by the church (XS7) are not affected.

8.10 Scenario 8: Scenario 4 plus stopbank on floodplain at XS 6

This scenario investigates the impact of a stopbank placed across the right floodplain from XS 6 down along the right bank to the Garden Centre, as shown in Figure 8. Again, the area under the bridge at XS 2 is assumed to be partially blocked by debris.

The stopbank is modelled by placing a link channel with RL = 7.0 m between the right floodplain at XS 6 and Bluett Road, and by deleting links 3, 3a, 4, and 5.

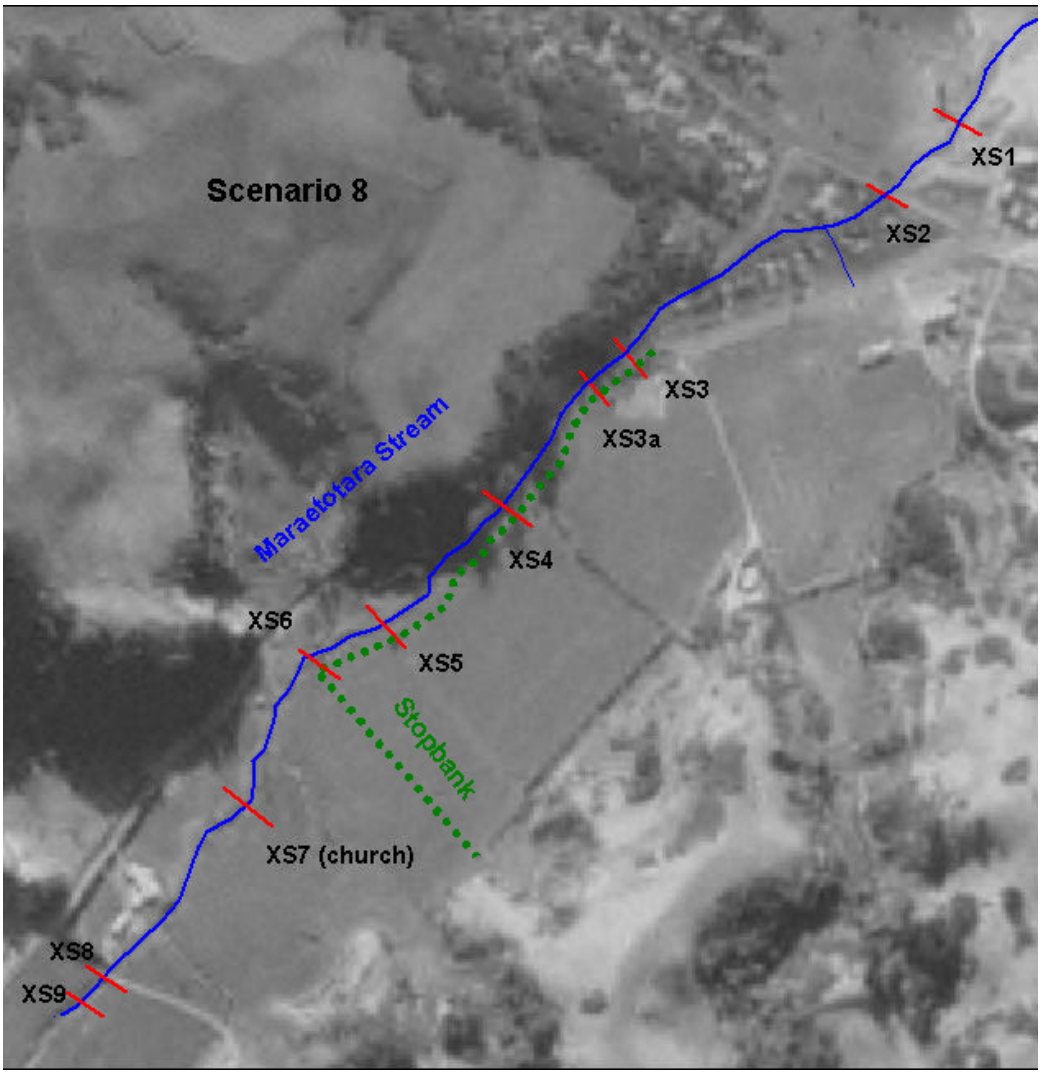


Figure 8 Scenario 8 – Stopbank at XS 6

This stopbank will protect the right floodplain area from cross-section XS 6 down to the Garden Centre and prevent flow from the floodplain onto Bluett Road, while raising the water levels in the stream from XS 6 downstream.

In a 50 year event, this will increase water levels in the Maraetotara Stream reach from XS6 downstream by up to 100 mm at the Garden Centre, and further

downstream along the houses by up to 240 mm, compared to Scenario 4 – no stopbank. Available freeboard at the Garden Centre is 510mm and at house no. 6, 620 mm (from the stream).

In a 100 year event, water levels at the Garden Centre will increase by approximately 180 mm, reducing available freeboard to the floor level of the Garden Centre to 400 mm, and along the houses further downstream by up to 230 mm, compared to Scenario 4 – no stopbank.

As for the water levels and available freeboard on Bluett Road the same comments as in Scenario 5.

On the Right Floodplain, minor ponding may occur upstream of the stopbank, but generally the entire flow will be contained within the channel in the reach upstream from XS 6.

Water levels by the church (XS7) are not affected.

Note: The cross-section across the right floodplain at XS 6 has not been surveyed but has been assumed for this scenario based on the floodplain cross-sections upstream and downstream. This shouldn't have any effect on the stream water levels as there is no flow onto the floodplain.

8.11 Scenario 9: Scenario 4 plus stopbank on floodplain at XS 7

This scenario investigates the impact of a stopbank placed across the right floodplain opposite the church at XS 7 and down along the right bank to the Garden Centre, as shown in Figure 9. Again, the area under the bridge at XS 2 is assumed to be partially blocked by debris.

The stopbank is modelled by placing a link channel with RL = 8.0 m between the right floodplain at XS 7 and Bluett Road, and by deleting links 3, 3a, 4, 5, and 6.

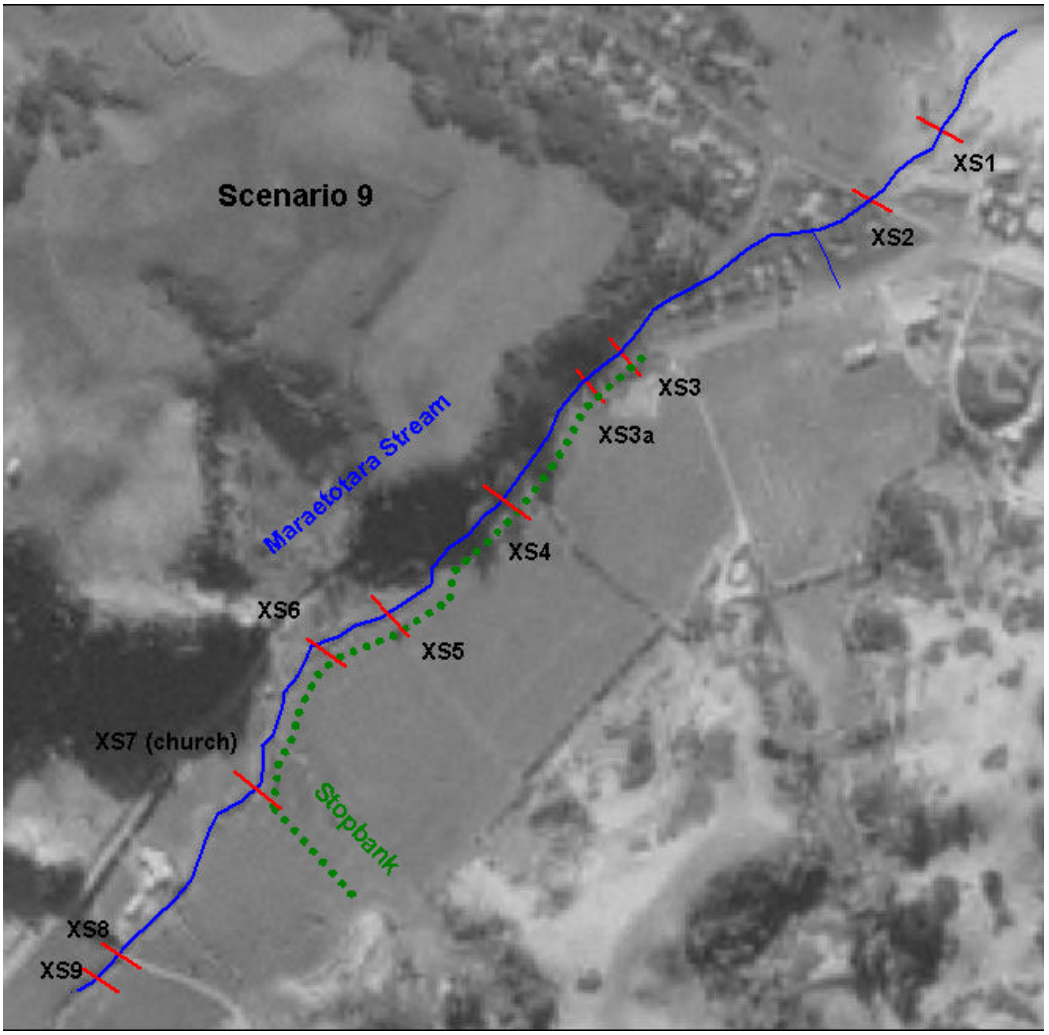


Figure 9 Scenario 9 - Stopbank at XS 7

This scenario shows no difference to Scenario 8 in a 50 year event. In Scenario 8 (stopbank at XS 6) the entire flow in the reach upstream from XS 6 is contained within the channel, so a stopbank further upstream is ineffective. A more detailed survey would be required to confirm this to make sure that the stopbank is returned into higher ground.

In a 100 year event, some minor flows may leave the channel at XS 8 and travel down the right floodplain to potentially pond the area upstream from the stopbank.

A comparison of water levels in the Maraetotara Stream for scenarios 4, 5, 6, 7, 8 and 9 is shown in Appendix 5 for both the 50 year and 100 year events.

Also, water levels on the Right Floodplain for scenarios 4, 5, 6, 7, 8 and 9 have been compared in Appendix 6.

8.12 Scenario 10: Scenario 4 plus overflow at Medical Centre

While the previous Scenarios 5 – 9 have looked at different stopbank options and their impact on flood levels in the Maraetotara Stream, the following Scenarios are looking at options to mitigate the flooding problems around the Bluett Road and Chartered Club area.

Scenario 10 investigates an overflow from Bluett Road into Maraetotara Stream via the corner property 262 Pohutukawa Ave. The property is currently being developed as a medical centre. The resource consent states a double lane commercial vehicle crossing (7m wide) onto Bluett Road with an invert level not in excess of RL 3.39 m in order to provide for overflow at the southern end of the property.

The overflow has been modelled as a link channel with RL = 3.39 and a width of 7 metres, connecting the additional storage at Drain & Culverts chainage 20 and Maraetotara Stream chainage 990.

In a 50 year event, the overflow occurring on the medical centre vehicle crossing is so small (100l/s) that is has no impact on water levels on Bluett Road.

In a 100 year event overflows on the vehicle crossing peak at 700l/s, reducing water levels on Bluett Road insignificantly by 20 mm.

8.13 Scenario 11: Scenario 9 plus overflow at Medical Centre

Scenario 11 investigates an overflow from Bluett Road into Maraetotara Stream via the corner property 262 Pohutukawa Ave, but this time a stopbank is assumed to be implemented on the floodplain preventing flow onto Bluett Road.

The vehicle crossing has no effect in any of the events modelled as the water levels on Bluett Road don't get high enough to spill over, due to the inflow from the floodplain being blocked off.

8.14 Scenario 12: Scenario 4 plus culvert1 blocked

This scenario investigates the consequences of the culvert underneath Pohutukawa Ave being entirely blocked, so there is no outlet of the Bluett Road and Chartered club area other than the ditch between houses no. 4 and no. 6. This scenario assumes flow from the hill catchments behind the Chartered Club as well as flow coming off the floodplain onto Bluett Road, i.e. there is no stopbank preventing flow onto the floodplain and onto Bluett Road.

The culvert blockage has been modelled by increasing the resistance (Manning's *n*) in the culvert to a value where there is no flow through the culvert.

With the culvert blocked water levels on Bluett Road rise up to 3.60 m in a 50 year event, reducing the available freeboard to house no. 6 to 260 mm, which is just over half the required freeboard standard of 500mm. Flows of up to 2.4 m^3/s will occur in the ditch and raise water levels in the Maraetotara Stream from the confluence to the bridge by up to 60 mm.

This scenario underlines the importance of keeping the culvert and the drains upstream well maintained to guarantee its full capacity in an event.

Water levels in Maraetotara Stream above the ditch confluence are not affected.

8.15 Scenario 13: Scenario 9 plus culvert1 blocked

This scenario investigates the consequences of the Pohutukawa Ave culvert being blocked, as in Scenario 11, but this time a stopbank is assumed to be implemented on the floodplain preventing flow onto Bluett Road. A stopbank from XS7 down to XS3 has been used as this creates the highest water levels in Maraetotara Stream of all stopbanks scenarios modelled previously. This offers the "worst case scenario" for levels in Maraetotara Stream. If a shorter version of stopbank were to be implemented resulting water levels in Maraetotara Stream would be slightly lower.

The culvert blockage has been modelled by increasing the resistance (Manning's *n*) in the culvert to a value where there is no flow through the culvert.

With the culvert blocked and a stopbank in place water levels on Bluett Road rise up to 3.53 m in a 50 year event, reducing the available freeboard to house no. 6 to 330 mm, which is still significantly lower than the required freeboard standard of 500 mm. The stopbank prevents flow onto Bluett Road, lowering water levels there compared to Scenario 12 – no stopbank, but this is not enough to compensate for the blocked culvert and does not provide adequate freeboard to house no. 6.

Flows of up to 1.7 m^3/s will occur in the ditch and slightly raise water levels in Maraetotara between the ditch confluence and the bridge.

Water levels in Maraetotara Stream above the ditch confluence are not affected.

8.16 Scenario 14: Scenario 4 plus culvert1 diameter increased (1.5m)

In this scenario the diameter of the culvert underneath Pohutukawa Ave has been increased from 900 mm to 1500 mm (invert stays the same). Replacing the existing culvert with one of greater size is one of the possible, but costly, options of increasing the outflow from the Bluett Road and Chartered Club area in order to reduce flood levels on Bluett Road and provide adequate freeboard to house no. 6. This scenario assumes flow from the hill catchments behind the Chartered Club as well as flow coming off the floodplain onto Bluett Road, i.e. there is no stopbank preventing flow onto the floodplain and onto Bluett Road.

The increased flow capacity of the larger culvert size reduces water levels on Bluett Road to 3.20 m, providing a freeboard of 660 mm to the house no. 6 in a 50 year event. As the levels don't get high enough to spill over the footpath there is no flow in the ditch. There may still be some ponding in the area between Bluett Road and the Chartered Club and sports hall, but this will be limited to the low lying ground including the parking areas.

The peak flow in the Pohutukawa Ave culvert in a 50 year event is 4.3 m^3/s.

Water levels in the Maraetotara Stream upstream from the culvert outlet are slightly raised up to about the ditch confluence.

8.17 Scenario 15: Scenario 9 plus culvert1 diameter increased (1.5m)

In this scenario the diameter of the culvert underneath Pohutukawa Ave has been increased from 900 mm to 1500 mm, but this time a stopbank is assumed to be implemented on the floodplain preventing flow onto Bluett Road. A stopbank from XS7 down to XS3 has been used as this creates the highest water levels in Maraetotara Stream of all stopbanks scenarios modelled previously. This offers the "worst case scenario" for levels in Maraetotara Stream. If a shorter version of stopbank were to be implemented resulting water levels in Maraetotara Stream would be slightly lower.

With no flow coming onto Bluett Road from the floodplain there will be no flow on Bluett Road (other than stormwater runoff) and the culvert would be able to transport the entire flow off the hill catchments behind the Chartered Club (3.2 m^3/s) into Maraetotara Stream. Due to constrictions by the existing drain channel and the culvert underneath the Chartered Club building flooding would still occur around the Chartered Club area. This would need to be addressed when replacing the culvert underneath Pohutukawa Ave is to be considered.

8.18 Scenario 16: Scenario 4 plus culvert1 and an additional culvert under Bluett Road

As a possible alternative to replacing the existing Pohutukawa Ave culvert with a culvert of greater size, this scenario investigates the option of an additional culvert under Bluett Road draining the Bluett Road area out to Maraetotara Stream. The exact location of where such a culvert would be feasible would need to be investigated. In this scenario the culvert outlet has been assumed in the vicinity of the corner property 262 Pohutukawa Ave. The outlet would require a flap gate to prevent back flow from the Maraetotara Stream.

The culvert has been modelled as an additional branch ("Add Culvert") with a 40 m long concrete culvert, diameter 600mm, at chainage 20. A link channel connects this branch to the storage area in Drain & Culverts chainage 20 defining the level at which flow gets into the culvert (RL = 3.092 m). The culvert inlet has been assumed as a manhole of 1 metre diameter. At the outlet a flap gate is defined by only allowing positive flow through the culvert.

This scenario assumes flow from the hill catchments behind the Chartered Club as well flow coming off the floodplain onto Bluett Road, i.e. there is no stopbank preventing flow onto the floodplain and onto Bluett Road.

The flow through the additional culvert under Bluett Road is limited by the head loss between the water level on Bluett Road (inlet) and in Maraetotara Stream (outlet). The maximum flow in the culvert in a 50 year event is 0.6 m^3/s. Water levels on Bluett Road reach 3.46 m and provide insufficient freeboard of only 400 mm to house no. 6.

This shows to be an expensive option with little positive effect.

8.19 Scenario 17: Scenario 9 plus culvert1 and an additional culvert under Bluett Road

In this scenario an additional culvert is included as in Scenario 16, but this time a stopbank is assumed to be implemented on the floodplain preventing flow onto Bluett Road.

The maximum flow through the additional culvert under Bluett Road is 0.3 m^3/s in a 50 year event. Water levels on Bluett Road reach 3.34 m and provide sufficient freeboard of 520 mm to house no. 6. It has to be noted though that the sufficient freeboard is achieved by the stopbank rather than the additional culvert.

Chapter 9: Conclusion

Since the first survey in 1998 the stream bed has altered and improved the flow capacity of Maraetotara Stream.

The current situation (Status Quo 1 scenario) does not provide adequate protection from a 50 year event with available freeboard lower than required at the house no. 6 on Bluett Road (350 mm freeboard) and marginally low at the Church (470 mm freeboard).

Assuming a partial blockage at the bridge (XS2) (Status Quo 2 scenario), available freeboard to the floor levels at the Church (XS7), at the Garden Centre (FPXS3), and at the house no. 6 on Bluett Road (BXS2), are unchanged from Status Quo 1 scenario in a 50 year event. Water levels will be raised in the reach upstream of the bridge to about up to the ditch.

The existing culvert underneath Pohutukawa Ave is not capable of transporting the entire flow off the hill catchments behind the Chartered Club away from the Bluett Road and Chartered Club area into Maraetotara Stream downstream of the bridge.

In a 20 year event (5% AEP) water is spilling out onto the floodplain on the right hand side of the stream and flowing down Bluett Road (Status Quo 2). If development on the floodplain is desired, this will have to be improved.

The tide has only marginal effect on the water levels in the Maraetotara Stream upstream of the bridge and no effect on water levels in the Bluett Road area (Scenario 1 and 2).

Clearing the walnut trees on the stream banks above the Garden Centre will have minor effect on water levels (Scenario 3 and 4). While the tree clearing may lessen the chances of debris blockage at the bridge downstream, it may increase bank erosion in the reach cleared.

The placement of a stopbank preventing flow onto Bluett Road decreases water levels on Bluett Road by approximately 130mm compared to having no stopbank, and therefore increases the freeboard to the adjacent houses by this amount, resulting in a freeboard of 500mm at house no. 6 on Bluett Road (Scenario 5 – 9). This is independant of the length of the stopbank. The length of the stopbank only affects water levels in Maraetotara Stream.

From the different scenarios of stopbanking modelled, it can be concluded that the stopbank up to opposite the church at XS 7 (Scenario 9) will benefit the protection of the floodplain the most while still maintaining acceptable water levels in the adjacent reach and in the developed reaches downstream. The freeboard at the church (470mm) does not change with a stopbank in place, but take note of the assumptions made for modelling the stopbanks (refer 7.3 Stopbanks). Advantages of this scenario are:

- Flood protection for the right bank area downstream of XS 7 (church) to Bluett Road (Waimana Trust property) including the Garden Centre.

- Preventing flows onto Bluett Road and the area around the Chartered Club and the sports hall from the stream and floodplain.

- Minimising flow through the ditch and increasing freeboard to the houses on Bluett Road.

Disadvantages of this scenario are:

- Raised water levels in the reach downstream, which are still within the freeboard standards required (NZS 4404) during a 50 year event, but may affect the gardens along the stream. They may also increase the risk of unforeseen problems such as total blockage of the bridge (i.e. debris will hit the bridge soffit earlier) or other parts of the stream, and during over design floods.

- Increased costs of stopbanking due to the stopbank length required (across the floodplain and along the stream from XS 7 to XS 3).

- Loss of land for berm area and stopbank.

- Possible decrease in available freeboard to the church building if stopbank placed too close to the stream and for over design floods.

Note that for choosing the most effective stopbanking a more detailed survey of the right bank and floodplain will be required. Note also, that an outlet drain would be required to allow the ponding area to self drain back into the stream.

With stopbanks in place to prevent flow onto Bluett Road from the floodplain, ponding in the area around the sports hall and Chartered Club will still occur due to runoff from the hills behind the Chartered Club (Scenarios 5 – 9). The available freeboard to house no. 6 is just within the required standard (500 mm).

An overflow from Bluett Road via the Medical Centre into Maraetotara Stream at the level defined in the consent for this property is not sufficient to reduce ponding levels in the Bluett Road area (Scenarios 10 and 11).

This ponding could be reduced or even prevented by replacing the existing culvert with a culvert of a larger diameter, capable of carrying the entire runoff from the hill catchments into Maraetotara Stream downstream of the bridge.

In the case of the Pohutukawa Ave culvert being blocked during an event, water levels on Bluett Road rise significantly reducing available freeboard to house no. 6 to 260 mm, assuming there is no stopbank preventing flow onto Bluett Road (Scenario 12). Although the chances of the culvert area being entirely blocked may be low, this scenario underlines the importance of keeping the drains and culvert well maintained in order to provide the full culvert capacity during an event. With the culvert blocked and a stopbank reducing flow onto Bluett Road, the minimum available freeboard required at house no. 6 is met (Scenario 13).

Replacing the existing culvert underneath Pohutukawa Ave with a culvert of increased diameter is the most effective way of reducing ponding levels in the Bluett Road and Chartered Club area (Scenario 14 and 15), but also costly. The required diameter is dependant on the flows off the floodplain as well as off the hill catchments. The cost will therefore be influenced by the decision whether a stopbank on the floodplain will go ahead or not.

An additional culvert underneath Bluett Road to drain water from the Bluett Road area into Maraetotara Stream has limited effects on the ponding levels due to the small height difference between the water levels on Bluett Road and in Maraetotara Stream (Scenario 16 and 17). It may not justify the costs it would take to install it.

Detention dam storage options to reduce the flooding problems in Maraetotara Stream and its floodplains have been considered. The option of a dam in the Left Branch of Maraetotara Stream upstream of the model area has not been entirely discounted but little attenuation is likely. The option of restoring a dam and storage pond in the gully behind the Chartered Club has been dismissed as the available storage volume is very limited due to the steep catchment slopes.

A summary of available freeboard at locations of known floor levels is given in Table 13.

Table 13 Available freeboard

Available freeboard (mm) at model locations in a 50 year event					
Design Scenarios	Church (XS7)	Garden Centre (XS3)	house no. 6 (BXS2)	Sport hall (BXS2)	Medical Centre (XS2) *
	FL = 6.60 m	FL = 4.29 m	FL = 3.86 m	FL = 3.97 m	FL = 4.08 m
Status Quo 1	470	610	350	460	1650
Status Quo 2	470	610	350	460	1390
Scenario 1	470	610	350	460	1640
Scenario 2	470	610	350	460	1360
Scenario 3	470	630	370	480	1630
Scenario 4	470	610	370	480	1340
Scenario 5	470	610	500	610	1340
Scenario 6	470	580	500	610	1250
Scenario 7	470	530	500	610	1150
Scenario 8	470	510	500	610	1100
Scenario 9	470	510	500	610	1100
Scenario 10	470	530	370	480	1340
Scenario 11	470	510	500	610	1100
Scenario 12	470	600	260	370	1280
Scenario 13	470	510	500	610	1110
Scenario 14	470	610	660	770	1250
Scenario 15	470	500	500	610	1050
Scenario 16	470	620	400	510	1320
Scenario 17	470	510	500	610	1080

* freeboard reduced by 50mm from levels at XS2 as building is a distance upstream from bridge.

The modelling has underlined the importance of keeping the stream channel as well as the culverts and drains well maintained to guarantee their full capacity during an event.

Chapter 10: References

National Institute of Water and Atmosphere (1998); *Roughness Characteristics of New Zealand Rivers*, reprinted 1998.

P. Blackwood (1999); "*Channel Improvements to the Maraetotara Stream, Proposal 1999*", Environment Bay of Plenty.

Appendices

Appendix 1 ..... Results in Full Detail

Appendix 2 ..... Water Levels in Maraetotara Stream of Status Quo 1 and Status Quo 2; Q50

Appendix 3 ..... Water Levels in Maraetotara Stream of Status Quo 2 and Scenario 2; Q50

Appendix 4 ..... Water Levels in Maraetotara Stream of Scenario 2 and Scenario 4; Q50

Appendix 5 ..... Water Levels in Maraetotara Stream of Scenarios 4, 5, 6, 7, 8 & 9; Q50

Appendix 5a ..... Water Levels in Maraetotara Stream – Scenarios 4, 5,6, 7, 8 & 9; Q100

Appendix 6 ..... Water Levels on the right floodplain of Scenarios 4, 5, 6, 7, 8 and 9; Q50

Appendix 7 ..... Files Used

Appendix 1 - Results in Full Detail

Status Quo 1, spring tide, full bridge area							
		Q2	Q5	Q10	Q20	Q50	Q100
Branch & Chainage	Cross-section	RL (m)					
Water Level		Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -20.00	XS 9	7.03	7.37	7.61	7.83	8.11	8.31
MARAETOTARA 0.00	XS 8	6.86	7.19	7.42	7.63	7.91	8.11
MARAETOTARA 190.00	XS 7	5.41	5.62	5.76	5.89	6.13	6.26
MARAETOTARA 290.00	XS 6	4.98	5.17	5.29	5.38	5.48	5.55
MARAETOTARA 390.00	XS 5	4.69	4.84	4.94	5.00	5.05	5.09
MARAETOTARA 530.00	XS 4	4.20	4.32	4.39	4.43	4.46	4.48
MARAETOTARA 667.00	XS 3a	3.59	3.73	3.83	3.87	3.91	3.92
MARAETOTARA 725.00	XS 3	3.34	3.48	3.57	3.61	3.64	3.67
MARAETOTARA 885.97	at ditch	2.52	2.70	2.81	2.88	2.92	3.05
MARAETOTARA 968.00	XS 2 u/s	2.06	2.20	2.29	2.34	2.38	2.48
MARAETOTARA 978.00	XS 2 d/s	2.03	2.16	2.24	2.28	2.32	2.40
MARAETOTARA 990.00		2.02	2.16	2.24	2.28	2.32	2.40
MARAETOTARA 1100.00	XS 1	1.64	1.74	1.80	1.83	1.85	1.91
MARAETOTARA 1250.00		0.99	1.02	1.04	1.05	1.06	1.07
MARAETOTARA 1400.00	XS 0	0.93	0.93	0.93	0.93	0.93	0.93
RIGHT FLOODPLAIN -20.00	FPxs 9	6.55	6.55	6.55	6.55	6.55	6.58
RIGHT FLOODPLAIN 0.00	FPxs 8	6.45	6.45	6.45	6.45	6.45	6.58
RIGHT FLOODPLAIN 190.00	FPxs 7	5.48	5.48	5.48	5.48	5.48	5.53
RIGHT FLOODPLAIN 290.00	FPxs 6	5.03	5.03	5.03	5.03	5.03	5.07
RIGHT FLOODPLAIN 390.00	FPxs 5	4.57	4.57	4.66	4.84	4.92	4.97
RIGHT FLOODPLAIN 530.00	FPxs 4	3.79	3.79	3.83	3.98	4.15	4.27
RIGHT FLOODPLAIN 667.00	FPxs 3a	3.37	3.37	3.40	3.73	3.87	3.98
RIGHT FLOODPLAIN 724.00		3.19	3.19	3.25	3.59	3.69	3.80
RIGHT FLOODPLAIN 725.00	FPxs 3	3.19	3.19	3.25	3.57	3.68	3.79
BLUETT ROAD 0.00	BXS 1	3.19	3.19	3.25	3.57	3.68	3.79
BLUETT ROAD 150.00	BXS 2	3.09	3.18	3.25	3.32	3.51	3.66
BLUETT ROAD 255.00	BXS 3	3.09	3.13	3.24	3.32	3.51	3.66
BLUETT ROAD 260.00		3.09	3.13	3.24	3.32	3.51	3.66
DITCH 0.00		2.65	2.65	2.65	2.65	3.40	3.57
DITCH 5.00	DXS 1	2.65	2.65	2.65	2.65	3.40	3.56
DITCH 20.00	DXS 2	3.01	3.01	3.01	3.01	3.39	3.55
DITCH 25.00	DXS 3	2.52	2.70	2.81	2.88	2.93	3.06
DITCH 30.00	DXS 4	2.52	2.70	2.81	2.88	2.92	3.05
LINK 7 0.00		5.41	5.62	5.76	5.89	6.13	6.26
LINK 7 10.00		5.48	5.48	5.48	5.48	5.48	5.53
LINK 4 0.00		4.20	4.32	4.39	4.43	4.46	4.48
LINK 4 10.00		3.79	3.79	3.83	3.98	4.15	4.27
LINK 5 0.00		4.69	4.84	4.94	5.00	5.05	5.09
LINK 5 10.00		4.57	4.57	4.66	4.84	4.92	4.97
LINK 6 0.00		4.98	5.17	5.29	5.38	5.48	5.55
LINK 6 10.00		5.03	5.03	5.03	5.03	5.03	5.07
LINK 8 0.00		6.86	7.19	7.42	7.63	7.91	8.11
LINK 8 10.00		6.45	6.45	6.45	6.45	6.45	6.58
LINK 3A 0.00		3.59	3.73	3.83	3.87	3.91	3.92
LINK 3A 10.00		3.37	3.37	3.40	3.73	3.87	3.98
LINK 3 0.00		3.19	3.19	3.25	3.59	3.69	3.80
LINK 3 10.00		3.34	3.48	3.57	3.61	3.64	3.67
DRAIN&CULVERTS 0.00		2.81	3.19	3.26	3.32	3.51	3.66
DRAIN&CULVERTS 15.00		2.76	3.18	3.25	3.32	3.51	3.66
DRAIN&CULVERTS 18.00		2.76	3.18	3.25	3.32	3.51	3.66
DRAIN&CULVERTS 20.00		2.76	3.18	3.25	3.32	3.51	3.66
DRAIN&CULVERTS 22.00		2.76	3.18	3.25	3.32	3.51	3.66
DRAIN&CULVERTS 30.00		2.75	3.18	3.25	3.32	3.51	3.66
DRAIN&CULVERTS 130.00		2.02	2.16	2.24	2.28	2.32	2.40
LINK SPORTSFIELD 0.00		2.76	3.18	3.25	3.32	3.51	3.66
LINK SPORTSFIELD 10.00		3.09	3.18	3.25	3.32	3.51	3.66
LINK DITCH 0.00		3.09	3.18	3.25	3.32	3.51	3.66
LINK DITCH 10.00		2.64	2.64	2.64	2.64	3.40	3.57

Status Quo 1, spring tide, full bridge area						
	Q2	Q5	Q10	Q20	Q50	Q100
flow (m3/s)						
Discharge	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -10.00	11.99	15.68	18.48	21.28	24.84	27.75
MARAETOTARA 95.00	11.97	15.65	18.45	21.24	24.80	27.70
MARAETOTARA 240.00	11.94	15.61	18.41	21.16	24.70	27.60
MARAETOTARA 340.00	11.91	15.58	18.33	21.10	24.61	27.56
MARAETOTARA 460.00	11.89	15.54	18.24	20.32	22.15	23.38
MARAETOTARA 598.50	11.80	15.48	18.08	19.60	20.59	21.17
MARAETOTARA 696.00	11.79	15.46	18.06	19.59	20.58	21.16
MARAETOTARA 805.48	11.76	15.40	18.03	19.57	20.57	21.13
MARAETOTARA 926.98	11.75	15.36	17.99	19.54	20.69	23.88
MARAETOTARA 973.00	11.75	15.36	17.99	19.54	20.69	23.88
MARAETOTARA 984.00	11.75	15.36	17.99	19.54	20.69	23.88
MARAETOTARA 1045.00	12.98	16.88	19.49	21.03	22.30	25.54
MARAETOTARA 1175.00	12.97	16.87	19.48	21.02	22.30	25.54
MARAETOTARA 1325.00	13.03	16.90	19.50	21.03	22.37	25.60
RIGHT FLOODPLAIN -10.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 95.00	0.00	0.00	0.00	0.00	0.00	0.01
RIGHT FLOODPLAIN 240.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 340.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 460.00	0.00	0.00	0.02	0.54	2.07	3.98
RIGHT FLOODPLAIN 598.50	0.00	0.00	0.00	0.85	3.11	5.75
RIGHT FLOODPLAIN 695.50	0.00	0.00	0.00	0.69	2.92	5.57
RIGHT FLOODPLAIN 724.50	0.00	0.00	0.00	0.67	2.88	5.48
BLUETT ROAD 75.00	0.00	0.00	0.00	0.64	2.78	5.22
BLUETT ROAD 202.50	0.00	0.01	0.04	0.06	0.27	0.46
BLUETT ROAD 257.50	0.00	0.00	0.00	0.00	0.01	0.02
DITCH 2.50	0.00	0.00	0.00	0.00	1.18	3.57
DITCH 12.50	0.00	0.00	0.00	0.00	1.19	3.57
DITCH 22.50	0.00	0.00	0.00	0.00	1.19	3.57
DITCH 27.50	0.00	0.00	0.00	0.01	1.19	3.57
LINK 7 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 4 5.00	0.00	0.00	0.12	0.70	1.55	2.20
LINK 5 5.00	0.00	0.00	0.05	0.76	2.44	4.18
LINK 6 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 8 5.00	0.00	0.00	0.00	0.00	0.00	0.05
LINK 3A 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 3 5.00	0.00	0.00	0.00	0.00	0.00	0.00
DRAIN&CULVERTS 7.50	1.40	2.00	2.40	2.70	3.20	3.49
DRAIN&CULVERTS 16.50	1.39	1.99	2.39	2.69	3.19	3.48
DRAIN&CULVERTS 19.00	1.38	1.99	2.39	2.69	3.19	3.48
DRAIN&CULVERTS 21.00	1.38	1.81	1.90	1.89	1.85	1.83
DRAIN&CULVERTS 26.00	1.38	1.78	1.86	1.85	1.81	1.83
DRAIN&CULVERTS 80.00	1.34	1.53	1.54	1.65	1.77	1.85
LINK SPORTSFIELD 5.00	0.00	0.14	0.21	0.25	0.29	0.25
LINK DITCH 5.00	0.00	0.00	0.00	0.00	1.18	3.57

Status Quo 2, spring tide, blocked bridge							
		Q2	Q5	Q10	Q20	Q50	Q100
RL (m)	Cross-section						
Water Level		Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -20.00	XS 9	7.03	7.37	7.61	7.83	8.11	8.31
MARAETOTARA 0.00	XS 8	6.86	7.19	7.42	7.63	7.91	8.11
MARAETOTARA 190.00	XS 7	5.41	5.62	5.76	5.89	6.13	6.26
MARAETOTARA 290.00	XS 6	4.98	5.17	5.29	5.38	5.48	5.55
MARAETOTARA 390.00	XS 5	4.69	4.84	4.94	5.00	5.05	5.09
MARAETOTARA 530.00	XS 4	4.20	4.32	4.39	4.43	4.46	4.48
MARAETOTARA 667.00	XS 3a	3.59	3.73	3.83	3.88	3.91	3.93
MARAETOTARA 725.00	XS 3	3.34	3.48	3.57	3.62	3.66	3.69
MARAETOTARA 885.97	at ditch	2.52	2.72	2.86	2.95	3.02	3.21
MARAETOTARA 968.00	XS 2 u/s	2.06	2.27	2.44	2.55	2.64	2.89
MARAETOTARA 978.00	XS 2 d/s	2.03	2.16	2.24	2.28	2.32	2.39
MARAETOTARA 990.00		2.02	2.16	2.24	2.28	2.32	2.40
MARAETOTARA 1100.00	XS 1	1.64	1.74	1.80	1.83	1.85	1.91
MARAETOTARA 1250.00		0.99	1.02	1.04	1.05	1.06	1.07
MARAETOTARA 1400.00	XS 0	0.93	0.93	0.93	0.93	0.93	0.93
RIGHT FLOODPLAIN -20.00	FPxs 9	6.55	6.55	6.55	6.55	6.55	6.58
RIGHT FLOODPLAIN 0.00	FPxs 8	6.45	6.45	6.45	6.45	6.45	6.58
RIGHT FLOODPLAIN 190.00	FPxs 7	5.48	5.48	5.48	5.48	5.48	5.53
RIGHT FLOODPLAIN 290.00	FPxs 6	5.03	5.03	5.03	5.03	5.03	5.07
RIGHT FLOODPLAIN 390.00	FPxs 5	4.57	4.57	4.66	4.84	4.92	4.97
RIGHT FLOODPLAIN 530.00	FPxs 4	3.79	3.79	3.83	3.99	4.15	4.27
RIGHT FLOODPLAIN 667.00	FPxs 3a	3.37	3.37	3.40	3.73	3.87	3.98
RIGHT FLOODPLAIN 724.00		3.19	3.19	3.25	3.59	3.69	3.80
RIGHT FLOODPLAIN 725.00	FPxs 3	3.19	3.19	3.25	3.58	3.68	3.79
BLUETT ROAD 0.00	BXS 1	3.19	3.19	3.25	3.58	3.68	3.79
BLUETT ROAD 150.00	BXS 2	3.09	3.18	3.25	3.32	3.51	3.67
BLUETT ROAD 255.00	BXS 3	3.09	3.13	3.24	3.32	3.51	3.67
BLUETT ROAD 260.00		3.09	3.13	3.24	3.32	3.51	3.67
DITCH 0.00		2.65	2.65	2.65	2.65	3.42	3.59
DITCH 5.00	DXS 1	2.65	2.65	2.65	2.65	3.42	3.58
DITCH 20.00	DXS 2	3.01	3.01	3.01	3.01	3.41	3.57
DITCH 25.00	DXS 3	2.52	2.72	2.86	2.95	3.02	3.21
DITCH 30.00	DXS 4	2.52	2.72	2.86	2.95	3.02	3.21
LINK 7 0.00		5.41	5.62	5.76	5.89	6.13	6.26
LINK 7 10.00		5.48	5.48	5.48	5.48	5.48	5.53
LINK 4 0.00		4.20	4.32	4.39	4.43	4.46	4.48
LINK 4 10.00		3.79	3.79	3.83	3.99	4.15	4.27
LINK 5 0.00		4.69	4.84	4.94	5.00	5.05	5.09
LINK 5 10.00		4.57	4.57	4.66	4.84	4.92	4.97
LINK 6 0.00		4.98	5.17	5.29	5.38	5.48	5.55
LINK 6 10.00		5.03	5.03	5.03	5.03	5.03	5.07
LINK 8 0.00		6.86	7.19	7.42	7.63	7.91	8.11
LINK 8 10.00		6.45	6.45	6.45	6.45	6.45	6.58
LINK 3A 0.00		3.59	3.73	3.83	3.88	3.91	3.93
LINK 3A 10.00		3.37	3.37	3.40	3.73	3.87	3.98
LINK 3 0.00		3.19	3.19	3.25	3.59	3.69	3.80
LINK 3 10.00		3.34	3.48	3.57	3.62	3.66	3.69
DRAIN&CULVERTS 0.00		2.81	3.19	3.26	3.32	3.51	3.67
DRAIN&CULVERTS 15.00		2.76	3.18	3.25	3.32	3.51	3.67
DRAIN&CULVERTS 18.00		2.76	3.18	3.25	3.32	3.51	3.67
DRAIN&CULVERTS 20.00		2.76	3.18	3.25	3.32	3.51	3.67
DRAIN&CULVERTS 22.00		2.76	3.18	3.25	3.32	3.51	3.67
DRAIN&CULVERTS 30.00		2.75	3.18	3.25	3.32	3.51	3.67
DRAIN&CULVERTS 130.00		2.02	2.16	2.24	2.28	2.32	2.40
LINK SPORTSFIELD 0.00		2.76	3.18	3.25	3.32	3.51	3.67
LINK SPORTSFIELD 10.00		3.09	3.18	3.25	3.32	3.51	3.67
LINK DITCH 0.00		3.09	3.18	3.25	3.32	3.51	3.67
LINK DITCH 10.00		2.64	2.64	2.64	2.64	3.42	3.59

Status Quo 2, spring tide, blocked bridge						
	Q2	Q5	Q10	Q20	Q50	Q100
flow (m3/s)						
Discharge	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -10.00	11.99	15.68	18.48	21.28	24.84	27.75
MARAETOTARA 95.00	11.97	15.65	18.45	21.24	24.80	27.70
MARAETOTARA 240.00	11.94	15.61	18.41	21.16	24.70	27.60
MARAETOTARA 340.00	11.91	15.58	18.33	21.10	24.61	27.56
MARAETOTARA 460.00	11.89	15.54	18.24	20.32	22.15	23.38
MARAETOTARA 598.50	11.80	15.48	18.07	19.58	20.56	21.13
MARAETOTARA 696.00	11.79	15.45	18.06	19.57	20.55	21.12
MARAETOTARA 805.48	11.76	15.38	18.01	19.54	20.52	21.09
MARAETOTARA 926.98	11.75	15.32	17.95	19.49	20.66	23.71
MARAETOTARA 973.00	11.75	15.32	17.94	19.48	20.65	23.70
MARAETOTARA 984.00	11.75	15.31	17.94	19.48	20.65	23.70
MARAETOTARA 1045.00	12.98	16.84	19.45	20.98	22.27	25.38
MARAETOTARA 1175.00	12.97	16.83	19.44	20.97	22.27	25.38
MARAETOTARA 1325.00	13.03	16.89	19.49	21.01	22.34	25.44
RIGHT FLOODPLAIN -10.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 95.00	0.00	0.00	0.00	0.00	0.00	0.01
RIGHT FLOODPLAIN 240.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 340.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 460.00	0.00	0.00	0.02	0.54	2.07	3.99
RIGHT FLOODPLAIN 598.50	0.00	0.00	0.00	0.86	3.14	5.80
RIGHT FLOODPLAIN 695.50	0.00	0.00	0.00	0.70	2.94	5.62
RIGHT FLOODPLAIN 724.50	0.00	0.00	0.00	0.69	2.91	5.52
BLUETT ROAD 75.00	0.00	0.00	0.00	0.65	2.81	5.26
BLUETT ROAD 202.50	0.00	0.01	0.04	0.06	0.27	0.47
BLUETT ROAD 257.50	0.00	0.00	0.00	0.00	0.01	0.02
DITCH 2.50	0.00	0.00	0.00	0.00	1.20	3.54
DITCH 12.50	0.00	0.00	0.00	0.00	1.20	3.54
DITCH 22.50	0.00	0.00	0.00	0.00	1.20	3.55
DITCH 27.50	0.00	0.00	0.01	0.01	1.21	3.55
LINK 7 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 4 5.00	0.00	0.00	0.12	0.72	1.58	2.24
LINK 5 5.00	0.00	0.00	0.05	0.76	2.44	4.18
LINK 6 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 8 5.00	0.00	0.00	0.00	0.00	0.00	0.05
LINK 3A 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 3 5.00	0.00	0.00	0.00	0.00	0.00	0.00
DRAIN&CULVERTS 7.50	1.40	2.00	2.40	2.70	3.20	3.49
DRAIN&CULVERTS 16.50	1.39	1.99	2.39	2.69	3.19	3.48
DRAIN&CULVERTS 19.00	1.38	1.99	2.39	2.69	3.19	3.48
DRAIN&CULVERTS 21.00	1.38	1.81	1.90	1.90	1.88	1.83
DRAIN&CULVERTS 26.00	1.38	1.78	1.86	1.86	1.84	1.83
DRAIN&CULVERTS 80.00	1.34	1.53	1.54	1.65	1.77	1.86
LINK SPORTSFIELD 5.00	0.00	0.14	0.21	0.25	0.28	0.32
LINK DITCH 5.00	0.00	0.00	0.00	0.00	1.20	3.54

Scenario 1, 10 year tide, full bridge area							
		Q2	Q5	Q10	Q20	Q50	Q100
RL (m)	Cross-section						
Water Level		Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -20.00	XS 9	7.03	7.37	7.61	7.83	8.11	8.31
MARAETOTARA 0.00	XS 8	6.86	7.19	7.42	7.63	7.91	8.11
MARAETOTARA 190.00	XS 7	5.41	5.62	5.76	5.89	6.13	6.26
MARAETOTARA 290.00	XS 6	4.98	5.17	5.29	5.38	5.48	5.55
MARAETOTARA 390.00	XS 5	4.69	4.84	4.94	5.00	5.05	5.09
MARAETOTARA 530.00	XS 4	4.20	4.32	4.39	4.43	4.46	4.48
MARAETOTARA 667.00	XS 3a	3.59	3.73	3.83	3.87	3.91	3.92
MARAETOTARA 725.00	XS 3	3.34	3.48	3.57	3.61	3.64	3.67
MARAETOTARA 885.97	at ditch	2.54	2.71	2.82	2.88	2.93	3.05
MARAETOTARA 968.00	XS 2 u/s	2.12	2.24	2.32	2.36	2.39	2.49
MARAETOTARA 978.00	XS 2 d/s	2.10	2.20	2.27	2.31	2.34	2.41
MARAETOTARA 990.00		2.10	2.20	2.27	2.31	2.34	2.42
MARAETOTARA 1100.00	XS 1	1.92	1.97	2.00	2.02	2.03	2.07
MARAETOTARA 1250.00		1.82	1.82	1.83	1.83	1.83	1.83
MARAETOTARA 1400.00	XS 0	1.82	1.82	1.82	1.82	1.82	1.82
RIGHT FLOODPLAIN -20.00	FPxs 9	6.55	6.55	6.55	6.55	6.55	6.58
RIGHT FLOODPLAIN 0.00	FPxs 8	6.45	6.45	6.45	6.45	6.45	6.58
RIGHT FLOODPLAIN 190.00	FPxs 7	5.48	5.48	5.48	5.48	5.48	5.53
RIGHT FLOODPLAIN 290.00	FPxs 6	5.03	5.03	5.03	5.03	5.03	5.07
RIGHT FLOODPLAIN 390.00	FPxs 5	4.57	4.57	4.66	4.84	4.92	4.97
RIGHT FLOODPLAIN 530.00	FPxs 4	3.79	3.79	3.83	3.98	4.15	4.27
RIGHT FLOODPLAIN 667.00	FPxs 3a	3.37	3.37	3.40	3.73	3.87	3.98
RIGHT FLOODPLAIN 724.00		3.19	3.19	3.25	3.59	3.69	3.80
RIGHT FLOODPLAIN 725.00	FPxs 3	3.19	3.19	3.25	3.57	3.68	3.79
BLUETT ROAD 0.00	BXS 1	3.19	3.19	3.25	3.57	3.68	3.79
BLUETT ROAD 150.00	BXS 2	3.09	3.19	3.25	3.32	3.51	3.67
BLUETT ROAD 255.00	BXS 3	3.09	3.15	3.25	3.32	3.51	3.67
BLUETT ROAD 260.00		3.09	3.15	3.25	3.32	3.51	3.67
DITCH 0.00		2.65	2.65	2.65	2.65	3.40	3.57
DITCH 5.00	DXS 1	2.65	2.65	2.65	2.65	3.40	3.56
DITCH 20.00	DXS 2	3.01	3.01	3.01	3.01	3.40	3.55
DITCH 25.00	DXS 3	2.53	2.71	2.82	2.88	2.93	3.06
DITCH 30.00	DXS 4	2.54	2.71	2.82	2.88	2.93	3.05
LINK 7 0.00		5.41	5.62	5.76	5.89	6.13	6.26
LINK 7 10.00		5.48	5.48	5.48	5.48	5.48	5.53
LINK 4 0.00		4.20	4.32	4.39	4.43	4.46	4.48
LINK 4 10.00		3.79	3.79	3.83	3.98	4.15	4.27
LINK 5 0.00		4.69	4.84	4.94	5.00	5.05	5.09
LINK 5 10.00		4.57	4.57	4.66	4.84	4.92	4.97
LINK 6 0.00		4.98	5.17	5.29	5.38	5.48	5.55
LINK 6 10.00		5.03	5.03	5.03	5.03	5.03	5.07
LINK 8 0.00		6.86	7.19	7.42	7.63	7.91	8.11
LINK 8 10.00		6.45	6.45	6.45	6.45	6.45	6.58
LINK 3A 0.00		3.59	3.73	3.83	3.87	3.91	3.92
LINK 3A 10.00		3.37	3.37	3.40	3.73	3.87	3.98
LINK 3 0.00		3.19	3.19	3.25	3.59	3.69	3.80
LINK 3 10.00		3.34	3.48	3.57	3.61	3.64	3.67
DRAIN&CULVERTS 0.00		2.89	3.20	3.27	3.32	3.51	3.66
DRAIN&CULVERTS 15.00		2.84	3.19	3.26	3.32	3.51	3.66
DRAIN&CULVERTS 18.00		2.85	3.19	3.26	3.32	3.51	3.66
DRAIN&CULVERTS 20.00		2.84	3.19	3.25	3.32	3.51	3.66
DRAIN&CULVERTS 22.00		2.84	3.19	3.25	3.32	3.51	3.66
DRAIN&CULVERTS 30.00		2.84	3.19	3.25	3.32	3.51	3.66
DRAIN&CULVERTS 130.00		2.10	2.20	2.27	2.31	2.34	2.42
LINK SPORTSFIELD 0.00		2.84	3.19	3.25	3.32	3.51	3.66
LINK SPORTSFIELD 10.00		3.09	3.19	3.25	3.32	3.51	3.67
LINK DITCH 0.00		3.09	3.19	3.25	3.32	3.51	3.67
LINK DITCH 10.00		2.64	2.64	2.64	2.64	3.40	3.57

Scenario 1, 10 year tide, full bridge area						
	Q2	Q5	Q10	Q20	Q50	Q100
flow (m3/s)						
Discharge	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -10.00	11.99	15.68	18.48	21.28	24.84	27.75
MARAETOTARA 95.00	11.97	15.65	18.45	21.24	24.80	27.70
MARAETOTARA 240.00	11.94	15.61	18.41	21.16	24.70	27.60
MARAETOTARA 340.00	11.91	15.58	18.33	21.10	24.61	27.56
MARAETOTARA 460.00	11.89	15.54	18.24	20.32	22.15	23.38
MARAETOTARA 598.50	11.80	15.48	18.08	19.60	20.59	21.17
MARAETOTARA 696.00	11.79	15.46	18.06	19.59	20.58	21.16
MARAETOTARA 805.48	11.77	15.40	18.03	19.57	20.57	21.13
MARAETOTARA 926.98	11.75	15.36	18.00	19.54	20.71	23.89
MARAETOTARA 973.00	11.75	15.36	17.99	19.54	20.71	23.89
MARAETOTARA 984.00	11.75	15.36	17.99	19.54	20.71	23.89
MARAETOTARA 1045.00	12.99	16.85	19.47	21.01	22.30	25.54
MARAETOTARA 1175.00	12.98	16.84	19.46	21.00	22.31	25.55
MARAETOTARA 1325.00	13.08	16.91	19.52	21.05	22.39	25.63
RIGHT FLOODPLAIN -10.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 95.00	0.00	0.00	0.00	0.00	0.00	0.01
RIGHT FLOODPLAIN 240.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 340.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 460.00	0.00	0.00	0.02	0.54	2.07	3.98
RIGHT FLOODPLAIN 598.50	0.00	0.00	0.00	0.85	3.12	5.76
RIGHT FLOODPLAIN 695.50	0.00	0.00	0.00	0.69	2.92	5.57
RIGHT FLOODPLAIN 724.50	0.00	0.00	0.00	0.67	2.88	5.48
BLUETT ROAD 75.00	0.00	0.00	0.00	0.64	2.78	5.22
BLUETT ROAD 202.50	0.00	0.02	0.05	0.06	0.27	0.46
BLUETT ROAD 257.50	0.00	0.00	0.00	0.00	0.01	0.02
DITCH 2.50	0.00	0.00	0.00	0.00	1.21	3.58
DITCH 12.50	0.00	0.00	0.00	0.00	1.21	3.58
DITCH 22.50	0.00	0.00	0.00	0.00	1.21	3.58
DITCH 27.50	0.00	0.00	0.00	0.01	1.21	3.59
LINK 7 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 4 5.00	0.00	0.00	0.12	0.70	1.55	2.20
LINK 5 5.00	0.00	0.00	0.05	0.76	2.44	4.18
LINK 6 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 8 5.00	0.00	0.00	0.00	0.00	0.00	0.05
LINK 3A 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 3 5.00	0.00	0.00	0.00	0.00	0.00	0.00
DRAIN&CULVERTS 7.50	1.39	2.00	2.40	2.70	3.20	3.49
DRAIN&CULVERTS 16.50	1.38	1.99	2.39	2.69	3.19	3.48
DRAIN&CULVERTS 19.00	1.38	1.99	2.39	2.69	3.19	3.48
DRAIN&CULVERTS 21.00	1.38	1.77	1.83	1.82	1.79	1.81
DRAIN&CULVERTS 26.00	1.37	1.75	1.80	1.78	1.75	1.81
DRAIN&CULVERTS 80.00	1.33	1.50	1.52	1.61	1.73	1.84
LINK SPORTSFIELD 5.00	0.00	0.15	0.22	0.25	0.28	0.27
LINK DITCH 5.00	0.00	0.00	0.00	0.00	1.21	3.58

Scenario 2, 10 year tide, blocked bridge							
		Q2	Q5	Q10	Q20	Q50	Q100
RL (m)	Cross-section						
Water Level		Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -20.00	XS 9	7.03	7.37	7.61	7.83	8.11	8.31
MARAETOTARA 0.00	XS 8	6.86	7.19	7.42	7.63	7.91	8.11
MARAETOTARA 190.00	XS 7	5.41	5.62	5.76	5.89	6.13	6.26
MARAETOTARA 290.00	XS 6	4.98	5.17	5.29	5.38	5.48	5.55
MARAETOTARA 390.00	XS 5	4.69	4.84	4.94	5.00	5.05	5.09
MARAETOTARA 530.00	XS 4	4.20	4.32	4.39	4.43	4.46	4.48
MARAETOTARA 667.00	XS 3a	3.59	3.74	3.83	3.88	3.91	3.93
MARAETOTARA 725.00	XS 3	3.34	3.49	3.58	3.63	3.66	3.70
MARAETOTARA 885.97	at ditch	2.54	2.73	2.88	2.96	3.03	3.22
MARAETOTARA 968.00	XS 2 u/s	2.13	2.32	2.48	2.58	2.67	2.91
MARAETOTARA 978.00	XS 2 d/s	2.10	2.20	2.27	2.31	2.34	2.41
MARAETOTARA 990.00		2.10	2.20	2.27	2.31	2.34	2.41
MARAETOTARA 1100.00	XS 1	1.92	1.97	2.00	2.02	2.03	2.07
MARAETOTARA 1250.00		1.82	1.82	1.83	1.83	1.83	1.83
MARAETOTARA 1400.00	XS 0	1.82	1.82	1.82	1.82	1.82	1.82
RIGHT FLOODPLAIN -20.00	FPxs 9	6.55	6.55	6.55	6.55	6.55	6.58
RIGHT FLOODPLAIN 0.00	FPxs 8	6.45	6.45	6.45	6.45	6.45	6.58
RIGHT FLOODPLAIN 190.00	FPxs 7	5.48	5.48	5.48	5.48	5.48	5.53
RIGHT FLOODPLAIN 290.00	FPxs 6	5.03	5.03	5.03	5.03	5.03	5.07
RIGHT FLOODPLAIN 390.00	FPxs 5	4.57	4.57	4.66	4.84	4.92	4.97
RIGHT FLOODPLAIN 530.00	FPxs 4	3.79	3.79	3.83	3.99	4.15	4.27
RIGHT FLOODPLAIN 667.00	FPxs 3a	3.37	3.37	3.40	3.73	3.87	3.98
RIGHT FLOODPLAIN 724.00		3.19	3.19	3.25	3.59	3.69	3.80
RIGHT FLOODPLAIN 725.00	FPxs 3	3.19	3.19	3.25	3.58	3.68	3.79
BLUETT ROAD 0.00	BXS 1	3.19	3.19	3.25	3.58	3.68	3.79
BLUETT ROAD 150.00	BXS 2	3.09	3.19	3.25	3.32	3.51	3.67
BLUETT ROAD 255.00	BXS 3	3.09	3.15	3.25	3.32	3.51	3.67
BLUETT ROAD 260.00		3.09	3.15	3.25	3.32	3.51	3.67
DITCH 0.00		2.65	2.65	2.65	2.65	3.43	3.59
DITCH 5.00	DXS 1	2.65	2.65	2.65	2.65	3.43	3.58
DITCH 20.00	DXS 2	3.01	3.01	3.01	3.01	3.41	3.57
DITCH 25.00	DXS 3	2.54	2.73	2.88	2.96	3.03	3.22
DITCH 30.00	DXS 4	2.54	2.73	2.88	2.96	3.03	3.22
LINK 7 0.00		5.41	5.62	5.76	5.89	6.13	6.26
LINK 7 10.00		5.48	5.48	5.48	5.48	5.48	5.53
LINK 4 0.00		4.20	4.32	4.39	4.43	4.46	4.48
LINK 4 10.00		3.79	3.79	3.83	3.99	4.15	4.27
LINK 5 0.00		4.69	4.84	4.94	5.00	5.05	5.09
LINK 5 10.00		4.57	4.57	4.66	4.84	4.92	4.97
LINK 6 0.00		4.98	5.17	5.29	5.38	5.48	5.55
LINK 6 10.00		5.03	5.03	5.03	5.03	5.03	5.07
LINK 8 0.00		6.86	7.19	7.42	7.63	7.91	8.11
LINK 8 10.00		6.45	6.45	6.45	6.45	6.45	6.58
LINK 3A 0.00		3.59	3.74	3.83	3.88	3.91	3.93
LINK 3A 10.00		3.37	3.37	3.40	3.73	3.87	3.98
LINK 3 0.00		3.19	3.19	3.25	3.59	3.69	3.80
LINK 3 10.00		3.34	3.49	3.58	3.63	3.66	3.70
DRAIN&CULVERTS 0.00		2.89	3.20	3.27	3.32	3.51	3.67
DRAIN&CULVERTS 15.00		2.84	3.19	3.25	3.32	3.51	3.67
DRAIN&CULVERTS 18.00		2.85	3.19	3.26	3.32	3.51	3.67
DRAIN&CULVERTS 20.00		2.84	3.19	3.25	3.32	3.51	3.67
DRAIN&CULVERTS 22.00		2.84	3.19	3.25	3.32	3.51	3.67
DRAIN&CULVERTS 30.00		2.84	3.19	3.25	3.32	3.51	3.67
DRAIN&CULVERTS 130.00		2.10	2.20	2.27	2.31	2.34	2.41
LINK SPORTSFIELD 0.00		2.84	3.19	3.25	3.32	3.51	3.67
LINK SPORTSFIELD 10.00		3.09	3.19	3.25	3.32	3.51	3.67
LINK DITCH 0.00		3.09	3.19	3.25	3.32	3.51	3.67
LINK DITCH 10.00		2.64	2.64	2.64	2.64	3.43	3.59

Scenario 2, 10 year tide, blocked bridge						
	Q2	Q5	Q10	Q20	Q50	Q100
flow (m3/s)						
Discharge	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -10.00	11.99	15.68	18.48	21.28	24.84	27.75
MARAETOTARA 95.00	11.97	15.65	18.45	21.24	24.80	27.70
MARAETOTARA 240.00	11.94	15.61	18.41	21.16	24.70	27.60
MARAETOTARA 340.00	11.91	15.58	18.33	21.10	24.61	27.56
MARAETOTARA 460.00	11.89	15.54	18.24	20.32	22.15	23.38
MARAETOTARA 598.50	11.80	15.47	18.07	19.58	20.55	21.13
MARAETOTARA 696.00	11.79	15.45	18.06	19.57	20.54	21.12
MARAETOTARA 805.48	11.76	15.38	18.01	19.54	20.52	21.08
MARAETOTARA 926.98	11.74	15.32	17.95	19.48	20.68	23.72
MARAETOTARA 973.00	11.75	15.32	17.94	19.48	20.68	23.71
MARAETOTARA 984.00	11.75	15.31	17.94	19.48	20.68	23.71
MARAETOTARA 1045.00	12.98	16.81	19.42	20.95	22.28	25.38
MARAETOTARA 1175.00	12.97	16.80	19.41	20.94	22.29	25.38
MARAETOTARA 1325.00	13.07	16.90	19.51	21.03	22.36	25.46
RIGHT FLOODPLAIN -10.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 95.00	0.00	0.00	0.00	0.00	0.00	0.01
RIGHT FLOODPLAIN 240.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 340.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 460.00	0.00	0.00	0.02	0.54	2.07	3.99
RIGHT FLOODPLAIN 598.50	0.00	0.00	0.00	0.86	3.15	5.81
RIGHT FLOODPLAIN 695.50	0.00	0.00	0.00	0.70	2.95	5.62
RIGHT FLOODPLAIN 724.50	0.00	0.00	0.00	0.69	2.91	5.53
BLUETT ROAD 75.00	0.00	0.00	0.00	0.65	2.81	5.27
BLUETT ROAD 202.50	0.00	0.02	0.05	0.06	0.28	0.47
BLUETT ROAD 257.50	0.00	0.00	0.00	0.00	0.01	0.02
DITCH 2.50	0.00	0.00	0.00	0.00	1.22	3.56
DITCH 12.50	0.00	0.00	0.00	0.00	1.22	3.56
DITCH 22.50	0.00	0.00	0.00	0.00	1.22	3.56
DITCH 27.50	0.00	0.00	0.01	0.01	1.22	3.56
LINK 7 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 4 5.00	0.00	0.00	0.12	0.72	1.59	2.24
LINK 5 5.00	0.00	0.00	0.05	0.76	2.44	4.18
LINK 6 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 8 5.00	0.00	0.00	0.00	0.00	0.00	0.05
LINK 3A 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 3 5.00	0.00	0.00	0.00	0.00	0.00	0.00
DRAIN&CULVERTS 7.50	1.39	2.00	2.40	2.70	3.20	3.49
DRAIN&CULVERTS 16.50	1.38	1.99	2.39	2.69	3.19	3.48
DRAIN&CULVERTS 19.00	1.38	1.99	2.39	2.69	3.19	3.48
DRAIN&CULVERTS 21.00	1.38	1.78	1.85	1.82	1.79	1.81
DRAIN&CULVERTS 26.00	1.37	1.75	1.82	1.78	1.75	1.82
DRAIN&CULVERTS 80.00	1.33	1.50	1.51	1.60	1.73	1.84
LINK SPORTSFIELD 5.00	0.00	0.15	0.22	0.26	0.29	0.34
LINK DITCH 5.00	0.00	0.00	0.00	0.00	1.22	3.56

Scenario 3, 10 year tide, full bridge area, walnut trees cleared							
		Q2	Q5	Q10	Q20	Q50	Q100
RL (m)	Cross-section						
Water Level		Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -20.00	XS 9	7.03	7.37	7.61	7.83	8.11	8.31
MARAETOTARA 0.00	XS 8	6.86	7.19	7.42	7.63	7.91	8.11
MARAETOTARA 190.00	XS 7	5.41	5.62	5.76	5.89	6.13	6.26
MARAETOTARA 290.00	XS 6	4.98	5.17	5.29	5.38	5.48	5.55
MARAETOTARA 390.00	XS 5	4.69	4.85	4.94	5.00	5.05	5.09
MARAETOTARA 530.00	XS 4	4.19	4.31	4.38	4.42	4.45	4.46
MARAETOTARA 667.00	XS 3a	3.55	3.69	3.78	3.83	3.87	3.89
MARAETOTARA 725.00	XS 3	3.34	3.48	3.57	3.62	3.66	3.68
MARAETOTARA 885.97	at ditch	2.54	2.71	2.82	2.89	2.94	3.06
MARAETOTARA 968.00	XS 2 u/s	2.12	2.24	2.32	2.37	2.40	2.49
MARAETOTARA 978.00	XS 2 d/s	2.10	2.20	2.27	2.32	2.35	2.42
MARAETOTARA 990.00		2.10	2.20	2.27	2.32	2.35	2.42
MARAETOTARA 1100.00	XS 1	1.92	1.97	2.00	2.02	2.04	2.07
MARAETOTARA 1250.00		1.82	1.82	1.83	1.83	1.83	1.83
MARAETOTARA 1400.00	XS 0	1.82	1.82	1.82	1.82	1.82	1.82
RIGHT FLOODPLAIN -20.00	FPxs 9	6.55	6.55	6.55	6.55	6.55	6.58
RIGHT FLOODPLAIN 0.00	FPxs 8	6.45	6.45	6.45	6.45	6.45	6.58
RIGHT FLOODPLAIN 190.00	FPxs 7	5.48	5.48	5.48	5.48	5.48	5.53
RIGHT FLOODPLAIN 290.00	FPxs 6	5.03	5.03	5.03	5.03	5.03	5.07
RIGHT FLOODPLAIN 390.00	FPxs 5	4.57	4.57	4.67	4.84	4.92	4.97
RIGHT FLOODPLAIN 530.00	FPxs 4	3.79	3.79	3.81	3.95	4.12	4.25
RIGHT FLOODPLAIN 667.00	FPxs 3a	3.37	3.37	3.38	3.70	3.84	3.96
RIGHT FLOODPLAIN 724.00		3.19	3.19	3.26	3.57	3.67	3.77
RIGHT FLOODPLAIN 725.00	FPxs 3	3.19	3.19	3.26	3.56	3.66	3.77
BLUETT ROAD 0.00	BXS 1	3.19	3.19	3.26	3.56	3.66	3.77
BLUETT ROAD 150.00	BXS 2	3.09	3.19	3.25	3.31	3.49	3.65
BLUETT ROAD 255.00	BXS 3	3.09	3.15	3.25	3.31	3.49	3.64
BLUETT ROAD 260.00		3.09	3.15	3.25	3.31	3.49	3.64
DITCH 0.00		2.65	2.65	2.65	2.65	3.37	3.68
DITCH 5.00	DXS 1	2.65	2.65	2.65	2.65	3.37	3.67
DITCH 20.00	DXS 2	3.01	3.01	3.01	3.01	3.37	3.67
DITCH 25.00	DXS 3	2.54	2.71	2.82	2.89	2.94	6.38
DITCH 30.00	DXS 4	2.54	2.71	2.82	2.89	2.94	3.06
LINK 7 0.00		5.41	5.62	5.76	5.89	6.13	6.26
LINK 7 10.00		5.48	5.48	5.48	5.48	5.48	5.53
LINK 4 0.00		4.19	4.31	4.38	4.42	4.45	4.46
LINK 4 10.00		3.79	3.79	3.81	3.95	4.12	4.25
LINK 5 0.00		4.69	4.85	4.94	5.00	5.05	5.09
LINK 5 10.00		4.57	4.57	4.67	4.84	4.92	4.97
LINK 6 0.00		4.98	5.17	5.29	5.38	5.48	5.55
LINK 6 10.00		5.03	5.03	5.03	5.03	5.03	5.07
LINK 8 0.00		6.86	7.19	7.42	7.63	7.91	8.11
LINK 8 10.00		6.45	6.45	6.45	6.45	6.45	6.58
LINK 3A 0.00		3.55	3.69	3.78	3.83	3.87	3.89
LINK 3A 10.00		3.37	3.37	3.38	3.70	3.84	3.96
LINK 3 0.00		3.19	3.19	3.26	3.57	3.67	3.77
LINK 3 10.00		3.34	3.48	3.57	3.62	3.66	3.68
DRAIN&CULVERTS 0.00		2.89	3.20	3.27	3.31	3.49	3.77
DRAIN&CULVERTS 15.00		2.85	3.19	3.26	3.31	3.49	3.80
DRAIN&CULVERTS 18.00		2.85	3.19	3.26	3.31	3.49	3.80
DRAIN&CULVERTS 20.00		2.84	3.19	3.26	3.31	3.49	3.64
DRAIN&CULVERTS 22.00		2.84	3.19	3.25	3.31	3.49	4.07
DRAIN&CULVERTS 30.00		2.84	3.19	3.25	3.31	3.48	13.03
DRAIN&CULVERTS 130.00		2.10	2.20	2.27	2.32	2.35	2.42
LINK SPORTSFIELD 0.00		2.84	3.19	3.26	3.31	3.49	3.64
LINK SPORTSFIELD 10.00		3.09	3.19	3.25	3.31	3.49	3.65
LINK DITCH 0.00		3.09	3.19	3.25	3.31	3.49	3.65
LINK DITCH 10.00		2.64	2.64	2.64	2.64	3.37	3.68

Scenario 3, 10 year tide, full bridge area, walnut trees cleared						
	Q2	Q5	Q10	Q20	Q50	Q100
flow (m3/s)						
Discharge	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -10.00	11.99	15.68	18.48	21.28	24.84	27.75
MARAETOTARA 95.00	11.97	15.65	18.45	21.24	24.80	27.70
MARAETOTARA 240.00	11.94	15.61	18.41	21.16	24.70	27.60
MARAETOTARA 340.00	11.91	15.58	18.33	21.10	24.61	27.56
MARAETOTARA 460.00	11.89	15.54	18.24	20.32	22.16	23.39
MARAETOTARA 598.50	11.81	15.48	18.15	19.91	21.13	21.76
MARAETOTARA 696.00	11.80	15.46	18.14	19.90	21.12	21.76
MARAETOTARA 805.48	11.77	15.40	18.10	19.88	21.10	21.74
MARAETOTARA 926.98	11.76	15.36	18.07	19.85	21.08	24.00
MARAETOTARA 973.00	11.76	15.36	18.06	19.85	21.08	24.00
MARAETOTARA 984.00	11.76	15.36	18.06	19.85	21.08	24.00
MARAETOTARA 1045.00	13.00	16.85	19.54	21.31	22.57	25.64
MARAETOTARA 1175.00	12.99	16.84	19.53	21.30	22.56	25.64
MARAETOTARA 1325.00	13.08	16.91	19.57	21.34	22.65	25.72
RIGHT FLOODPLAIN -10.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 95.00	0.00	0.00	0.00	0.00	0.00	0.01
RIGHT FLOODPLAIN 240.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 340.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 460.00	0.00	0.00	0.02	0.54	2.06	3.97
RIGHT FLOODPLAIN 598.50	0.00	0.00	0.00	0.60	2.66	5.14
RIGHT FLOODPLAIN 695.50	0.00	0.00	0.00	0.44	2.47	4.99
RIGHT FLOODPLAIN 724.50	0.00	0.00	0.00	0.44	2.44	4.91
BLUETT ROAD 75.00	0.00	0.00	0.00	0.42	2.35	4.68
BLUETT ROAD 202.50	0.00	0.02	0.05	0.06	0.23	3.95
BLUETT ROAD 257.50	0.00	0.00	0.00	0.00	0.01	0.18
DITCH 2.50	0.00	0.00	0.00	0.00	0.91	3.11
DITCH 12.50	0.00	0.00	0.00	0.00	0.91	9.47
DITCH 22.50	0.00	0.00	0.00	0.00	0.91	9.93
DITCH 27.50	0.00	0.00	0.00	0.01	0.91	26.12
LINK 7 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 4 5.00	0.00	0.00	0.05	0.39	1.02	1.62
LINK 5 5.00	0.00	0.00	0.05	0.76	2.43	4.16
LINK 6 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 8 5.00	0.00	0.00	0.00	0.00	0.00	0.05
LINK 3A 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 3 5.00	0.00	0.00	0.00	0.00	0.00	0.00
DRAIN&CULVERTS 7.50	1.39	2.00	2.40	2.70	3.20	3.49
DRAIN&CULVERTS 16.50	1.38	1.99	2.39	2.69	3.19	3.48
DRAIN&CULVERTS 19.00	1.38	1.99	2.39	2.69	3.19	3.48
DRAIN&CULVERTS 21.00	1.38	1.77	1.83	1.82	1.79	4.13
DRAIN&CULVERTS 26.00	1.37	1.75	1.80	1.78	1.75	3.93
DRAIN&CULVERTS 80.00	1.33	1.50	1.52	1.58	1.71	2.02
LINK SPORTSFIELD 5.00	0.00	0.15	0.22	0.26	0.28	38.15
LINK DITCH 5.00	0.00	0.00	0.00	0.00	0.91	3.11

Scenario 4, 10 year tide, blocked bridge, walnut trees cleared							
		Q2	Q5	Q10	Q20	Q50	Q100
RL (m)	Cross-section						
Water Level		Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -20.00	XS 9	7.03	7.37	7.61	7.83	8.11	8.31
MARAETOTARA 0.00	XS 8	6.86	7.19	7.42	7.63	7.91	8.11
MARAETOTARA 190.00	XS 7	5.41	5.62	5.76	5.89	6.13	6.26
MARAETOTARA 290.00	XS 6	4.98	5.17	5.29	5.38	5.48	5.55
MARAETOTARA 390.00	XS 5	4.69	4.85	4.94	5.00	5.05	5.09
MARAETOTARA 530.00	XS 4	4.19	4.31	4.38	4.42	4.45	4.47
MARAETOTARA 667.00	XS 3a	3.55	3.69	3.78	3.84	3.88	3.90
MARAETOTARA 725.00	XS 3	3.34	3.49	3.58	3.64	3.68	3.71
MARAETOTARA 885.97	at ditch	2.54	2.73	2.88	2.98	3.05	3.23
MARAETOTARA 968.00	XS 2 u/s	2.13	2.32	2.48	2.60	2.69	2.92
MARAETOTARA 978.00	XS 2 d/s	2.10	2.20	2.27	2.31	2.34	2.41
MARAETOTARA 990.00		2.10	2.20	2.27	2.32	2.35	2.42
MARAETOTARA 1100.00	XS 1	1.92	1.97	2.00	2.02	2.04	2.07
MARAETOTARA 1250.00		1.82	1.82	1.83	1.83	1.83	1.83
MARAETOTARA 1400.00	XS 0	1.82	1.82	1.82	1.82	1.82	1.82
RIGHT FLOODPLAIN -20.00	FPxs 9	6.55	6.55	6.55	6.55	6.55	6.58
RIGHT FLOODPLAIN 0.00	FPxs 8	6.45	6.45	6.45	6.45	6.45	6.58
RIGHT FLOODPLAIN 190.00	FPxs 7	5.48	5.48	5.48	5.48	5.48	5.53
RIGHT FLOODPLAIN 290.00	FPxs 6	5.03	5.03	5.03	5.03	5.03	5.07
RIGHT FLOODPLAIN 390.00	FPxs 5	4.57	4.57	4.67	4.84	4.92	4.97
RIGHT FLOODPLAIN 530.00	FPxs 4	3.79	3.79	3.81	3.96	4.12	4.25
RIGHT FLOODPLAIN 667.00	FPxs 3a	3.37	3.37	3.38	3.70	3.85	3.96
RIGHT FLOODPLAIN 724.00		3.19	3.19	3.25	3.57	3.68	3.78
RIGHT FLOODPLAIN 725.00	FPxs 3	3.19	3.19	3.25	3.56	3.66	3.77
BLUETT ROAD 0.00	BXS 1	3.19	3.19	3.25	3.56	3.66	3.77
BLUETT ROAD 150.00	BXS 2	3.09	3.19	3.25	3.31	3.49	3.65
BLUETT ROAD 255.00	BXS 3	3.09	3.15	3.25	3.31	3.49	3.65
BLUETT ROAD 260.00		3.09	3.15	3.25	3.31	3.49	3.65
DITCH 0.00		2.65	2.65	2.65	2.65	3.44	3.57
DITCH 5.00	DXS 1	2.65	2.65	2.65	2.65	3.44	3.57
DITCH 20.00	DXS 2	3.01	3.01	3.01	3.01	3.39	3.55
DITCH 25.00	DXS 3	2.54	2.73	2.88	2.98	3.05	3.23
DITCH 30.00	DXS 4	2.54	2.73	2.88	2.98	3.05	3.23
LINK 7 0.00		5.41	5.62	5.76	5.89	6.13	6.26
LINK 7 10.00		5.48	5.48	5.48	5.48	5.48	5.53
LINK 4 0.00		4.19	4.31	4.38	4.42	4.45	4.47
LINK 4 10.00		3.79	3.79	3.81	3.96	4.12	4.25
LINK 5 0.00		4.69	4.85	4.94	5.00	5.05	5.09
LINK 5 10.00		4.57	4.57	4.67	4.84	4.92	4.97
LINK 6 0.00		4.98	5.17	5.29	5.38	5.48	5.55
LINK 6 10.00		5.03	5.03	5.03	5.03	5.03	5.07
LINK 8 0.00		6.86	7.19	7.42	7.63	7.91	8.11
LINK 8 10.00		6.45	6.45	6.45	6.45	6.45	6.58
LINK 3A 0.00		3.55	3.69	3.78	3.84	3.88	3.90
LINK 3A 10.00		3.37	3.37	3.38	3.70	3.85	3.96
LINK 3 0.00		3.19	3.19	3.25	3.57	3.68	3.78
LINK 3 10.00		3.34	3.49	3.58	3.64	3.68	3.71
DRAIN&CULVERTS 0.00		2.89	3.20	3.27	3.31	3.49	3.65
DRAIN&CULVERTS 15.00		2.84	3.19	3.26	3.31	3.49	3.65
DRAIN&CULVERTS 18.00		2.85	3.19	3.26	3.31	3.49	3.65
DRAIN&CULVERTS 20.00		2.84	3.19	3.25	3.31	3.49	3.65
DRAIN&CULVERTS 22.00		2.84	3.19	3.25	3.31	3.49	3.65
DRAIN&CULVERTS 30.00		2.84	3.19	3.25	3.30	3.49	3.65
DRAIN&CULVERTS 130.00		2.10	2.20	2.27	2.32	2.35	2.42
LINK SPORTSFIELD 0.00		2.84	3.19	3.25	3.31	3.49	3.65
LINK SPORTSFIELD 10.00		3.09	3.19	3.25	3.31	3.49	3.65
LINK DITCH 0.00		3.09	3.19	3.25	3.31	3.49	3.65
LINK DITCH 10.00		2.64	2.64	2.64	2.64	3.44	3.57

Scenario 4, 10 year tide, blocked bridge, walnut trees cleared						
	Q2	Q5	Q10	Q20	Q50	Q100
flow (m3/s)						
Discharge	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -10.00	11.99	15.68	18.48	21.28	24.84	27.75
MARAETOTARA 95.00	11.97	15.65	18.45	21.24	24.80	27.70
MARAETOTARA 240.00	11.94	15.61	18.41	21.16	24.70	27.60
MARAETOTARA 340.00	11.91	15.58	18.33	21.10	24.61	27.56
MARAETOTARA 460.00	11.89	15.54	18.24	20.32	22.16	23.39
MARAETOTARA 598.50	11.81	15.48	18.15	19.90	21.10	21.72
MARAETOTARA 696.00	11.80	15.46	18.13	19.88	21.09	21.71
MARAETOTARA 805.48	11.77	15.39	18.09	19.85	21.06	21.67
MARAETOTARA 926.98	11.75	15.32	18.02	19.78	21.01	23.87
MARAETOTARA 973.00	11.75	15.32	18.01	19.78	21.01	23.86
MARAETOTARA 984.00	11.75	15.32	18.01	19.78	21.01	23.86
MARAETOTARA 1045.00	12.99	16.81	19.49	21.25	22.51	25.51
MARAETOTARA 1175.00	12.98	16.80	19.48	21.24	22.51	25.51
MARAETOTARA 1325.00	13.08	16.90	19.56	21.33	22.61	25.59
RIGHT FLOODPLAIN -10.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 95.00	0.00	0.00	0.00	0.00	0.00	0.01
RIGHT FLOODPLAIN 240.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 340.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 460.00	0.00	0.00	0.02	0.54	2.06	3.97
RIGHT FLOODPLAIN 598.50	0.00	0.00	0.00	0.61	2.68	5.19
RIGHT FLOODPLAIN 695.50	0.00	0.00	0.00	0.45	2.49	5.03
RIGHT FLOODPLAIN 724.50	0.00	0.00	0.00	0.44	2.46	4.95
BLUETT ROAD 75.00	0.00	0.00	0.00	0.43	2.36	4.72
BLUETT ROAD 202.50	0.00	0.02	0.05	0.06	0.23	0.44
BLUETT ROAD 257.50	0.00	0.00	0.00	0.00	0.01	0.02
DITCH 2.50	0.00	0.00	0.00	0.00	0.93	3.11
DITCH 12.50	0.00	0.00	0.00	0.00	0.94	3.12
DITCH 22.50	0.00	0.00	0.00	0.00	0.93	3.12
DITCH 27.50	0.00	0.00	0.01	0.01	0.94	3.12
LINK 7 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 4 5.00	0.00	0.00	0.05	0.40	1.05	1.66
LINK 5 5.00	0.00	0.00	0.05	0.76	2.43	4.16
LINK 6 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 8 5.00	0.00	0.00	0.00	0.00	0.00	0.05
LINK 3A 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 3 5.00	0.00	0.00	0.00	0.00	0.00	0.00
DRAIN&CULVERTS 7.50	1.39	2.00	2.40	2.70	3.20	3.49
DRAIN&CULVERTS 16.50	1.38	1.99	2.39	2.69	3.19	3.48
DRAIN&CULVERTS 19.00	1.38	1.99	2.39	2.69	3.19	3.48
DRAIN&CULVERTS 21.00	1.38	1.78	1.85	1.82	1.79	1.81
DRAIN&CULVERTS 26.00	1.37	1.75	1.81	1.78	1.75	1.81
DRAIN&CULVERTS 80.00	1.33	1.65	1.51	1.58	1.71	1.83
LINK SPORTSFIELD 5.00	0.00	0.15	0.22	0.26	0.28	0.18
LINK DITCH 5.00	0.00	0.00	0.00	0.00	0.93	3.11

Scenario 5, 10 year tide, blocked bridge, walnut trees cleared, stopbank @ XS3							
		Q2	Q5	Q10	Q20	Q50	Q100
RL (m)	Cross-section						
Water Level		Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -20.00	XS 9	7.03	7.37	7.61	7.83	8.11	8.31
MARAETOTARA 0.00	XS 8	6.86	7.19	7.42	7.63	7.91	8.11
MARAETOTARA 190.00	XS 7	5.41	5.62	5.76	5.89	6.13	6.26
MARAETOTARA 290.00	XS 6	4.98	5.17	5.29	5.38	5.48	5.55
MARAETOTARA 390.00	XS 5	4.69	4.85	4.94	5.00	5.05	5.09
MARAETOTARA 530.00	XS 4	4.19	4.31	4.38	4.42	4.45	4.47
MARAETOTARA 667.00	XS 3a	3.55	3.69	3.78	3.84	3.88	3.91
MARAETOTARA 725.00	XS 3	3.34	3.49	3.58	3.64	3.68	3.75
MARAETOTARA 885.97	at ditch	2.54	2.73	2.88	2.98	3.05	3.19
MARAETOTARA 968.00	XS 2 u/s	2.13	2.32	2.48	2.60	2.69	2.87
MARAETOTARA 978.00	XS 2 d/s	2.10	2.20	2.27	2.31	2.34	2.39
MARAETOTARA 990.00		2.10	2.20	2.27	2.32	2.35	2.40
MARAETOTARA 1100.00	XS 1	1.92	1.97	2.00	2.02	2.04	2.06
MARAETOTARA 1250.00		1.82	1.82	1.83	1.83	1.83	1.83
MARAETOTARA 1400.00	XS 0	1.82	1.82	1.82	1.82	1.82	1.82
RIGHT FLOODPLAIN -20.00	FPxs 9	6.55	6.55	6.55	6.55	6.55	6.58
RIGHT FLOODPLAIN 0.00	FPxs 8	6.45	6.45	6.45	6.45	6.45	6.58
RIGHT FLOODPLAIN 190.00	FPxs 7	5.48	5.48	5.48	5.48	5.48	5.53
RIGHT FLOODPLAIN 290.00	FPxs 6	5.03	5.03	5.03	5.03	5.03	5.07
RIGHT FLOODPLAIN 390.00	FPxs 5	4.57	4.57	4.67	4.84	4.92	4.97
RIGHT FLOODPLAIN 530.00	FPxs 4	3.79	3.79	3.81	3.96	4.15	4.38
RIGHT FLOODPLAIN 667.00	FPxs 3a	3.37	3.37	3.39	3.82	4.15	4.37
RIGHT FLOODPLAIN 724.00		3.19	3.19	3.37	3.82	4.15	4.37
RIGHT FLOODPLAIN 725.00	FPxs 3	3.19	3.19	3.37	3.82	4.15	4.37
BLUETT ROAD 0.00	BXS 1	3.19	3.19	3.25	3.30	3.36	3.39
BLUETT ROAD 150.00	BXS 2	3.09	3.19	3.25	3.30	3.36	3.39
BLUETT ROAD 255.00	BXS 3	3.09	3.15	3.25	3.30	3.36	3.39
BLUETT ROAD 260.00		3.09	3.15	3.25	3.30	3.36	3.39
DITCH 0.00		2.65	2.65	2.65	2.65	3.04	3.34
DITCH 5.00	DXS 1	2.65	2.65	2.65	2.65	3.04	3.34
DITCH 20.00	DXS 2	3.01	3.01	3.01	3.01	3.05	3.23
DITCH 25.00	DXS 3	2.54	2.73	2.88	2.98	3.05	3.19
DITCH 30.00	DXS 4	2.54	2.73	2.88	2.98	3.05	3.19
LINK 7 0.00		5.41	5.62	5.76	5.89	6.13	6.26
LINK 7 10.00		5.48	5.48	5.48	5.48	5.48	5.53
LINK 4 0.00		4.19	4.31	4.38	4.42	4.45	4.47
LINK 4 10.00		3.79	3.79	3.81	3.96	4.15	4.38
LINK 5 0.00		4.69	4.85	4.94	5.00	5.05	5.09
LINK 5 10.00		4.57	4.57	4.67	4.84	4.92	4.97
LINK 6 0.00		4.98	5.17	5.29	5.38	5.48	5.55
LINK 6 10.00		5.03	5.03	5.03	5.03	5.03	5.07
LINK 8 0.00		6.86	7.19	7.42	7.63	7.91	8.11
LINK 8 10.00		6.45	6.45	6.45	6.45	6.45	6.58
LINK 3A 0.00		3.55	3.69	3.78	3.84	3.88	3.91
LINK 3A 10.00		3.37	3.37	3.39	3.82	4.15	4.37
LINK 3 0.00		3.19	3.19	3.37	3.82	4.15	4.37
LINK 3 10.00		3.34	3.49	3.58	3.64	3.68	3.75
DRAIN&CULVERTS 0.00		2.89	3.20	3.27	3.31	3.36	3.39
DRAIN&CULVERTS 15.00		2.84	3.19	3.26	3.30	3.36	3.39
DRAIN&CULVERTS 18.00		2.85	3.19	3.26	3.30	3.36	3.39
DRAIN&CULVERTS 20.00		2.84	3.19	3.25	3.30	3.36	3.39
DRAIN&CULVERTS 22.00		2.84	3.19	3.25	3.30	3.36	3.39
DRAIN&CULVERTS 30.00		2.84	3.19	3.25	3.30	3.35	3.39
DRAIN&CULVERTS 130.00		2.10	2.20	2.27	2.32	2.35	2.40
LINK SPORTSFIELD 0.00		2.84	3.19	3.25	3.30	3.36	3.39
LINK SPORTSFIELD 10.00		3.09	3.19	3.25	3.30	3.36	3.39
LINK DITCH 0.00		3.09	3.19	3.25	3.30	3.36	3.39
LINK DITCH 10.00		2.64	2.64	2.64	2.64	3.04	3.34
LINK BLUETT 0.00		2.85	2.85	3.37	3.82	4.15	4.37
LINK BLUETT 10.00		3.19	3.19	3.25	3.30	3.36	3.39

Scenario 5, 10 year tide, blocked bridge, walnut trees cleared, stopbank @ XS3						
	Q2	Q5	Q10	Q20	Q50	Q100
flow (m3/s)						
Discharge	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -10.00	11.99	15.68	18.48	21.28	24.84	27.75
MARAETOTARA 95.00	11.97	15.65	18.45	21.24	24.80	27.70
MARAETOTARA 240.00	11.94	15.61	18.41	21.16	24.70	27.60
MARAETOTARA 340.00	11.91	15.58	18.33	21.10	24.61	27.56
MARAETOTARA 460.00	11.89	15.54	18.24	20.32	22.16	23.39
MARAETOTARA 598.50	11.81	15.48	18.15	19.90	21.10	21.72
MARAETOTARA 696.00	11.80	15.46	18.13	19.88	21.09	21.71
MARAETOTARA 805.48	11.77	15.39	18.09	19.85	21.06	23.20
MARAETOTARA 926.98	11.75	15.32	18.02	19.78	21.01	23.24
MARAETOTARA 973.00	11.75	15.32	18.01	19.78	21.01	23.24
MARAETOTARA 984.00	11.75	15.32	18.01	19.78	21.01	23.24
MARAETOTARA 1045.00	12.99	16.81	19.49	21.25	22.49	24.70
MARAETOTARA 1175.00	12.98	16.80	19.48	21.24	22.48	24.71
MARAETOTARA 1325.00	13.08	16.90	19.57	21.32	22.58	24.78
RIGHT FLOODPLAIN -10.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 95.00	0.00	0.00	0.00	0.00	0.00	0.01
RIGHT FLOODPLAIN 240.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 340.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 460.00	0.00	0.00	0.02	0.54	2.06	3.94
RIGHT FLOODPLAIN 598.50	0.00	0.00	0.00	0.61	2.39	4.19
RIGHT FLOODPLAIN 695.50	0.00	0.00	0.00	0.31	0.90	2.69
RIGHT FLOODPLAIN 724.50	0.00	0.00	0.00	0.01	0.02	0.02
BLUETT ROAD 75.00	0.00	0.00	0.00	0.00	0.00	0.00
BLUETT ROAD 202.50	0.00	0.02	0.05	0.06	0.11	0.15
BLUETT ROAD 257.50	0.00	0.00	0.00	0.00	0.01	0.01
DITCH 2.50	0.00	0.00	0.00	0.00	0.02	0.11
DITCH 12.50	0.00	0.00	0.00	0.00	0.00	0.10
DITCH 22.50	0.00	0.00	0.00	0.00	0.00	0.10
DITCH 27.50	0.00	0.00	0.01	0.01	0.01	0.10
LINK 7 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 4 5.00	0.00	0.00	0.05	0.40	1.05	1.66
LINK 5 5.00	0.00	0.00	0.05	0.76	2.43	4.16
LINK 6 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 8 5.00	0.00	0.00	0.00	0.00	0.00	0.05
LINK 3A 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 3 5.00	0.00	0.00	0.00	0.00	0.00	2.66
DRAIN&CULVERTS 7.50	1.39	2.00	2.40	2.70	3.20	3.50
DRAIN&CULVERTS 16.50	1.38	1.99	2.39	2.69	3.19	3.49
DRAIN&CULVERTS 19.00	1.38	1.99	2.39	2.69	3.19	3.49
DRAIN&CULVERTS 21.00	1.38	1.78	1.85	1.82	1.79	1.66
DRAIN&CULVERTS 26.00	1.37	1.75	1.81	1.78	1.75	1.63
DRAIN&CULVERTS 80.00	1.33	1.50	1.51	1.52	1.52	1.50
LINK SPORTSFIELD 5.00	0.00	0.15	0.22	0.26	0.28	0.32
LINK DITCH 5.00	0.00	0.00	0.00	0.00	0.02	0.11
LINK BLUETT 5.00	0.00	0.00	0.00	0.00	0.00	0.00

Scenario 6, 10 year tide, blocked bridge, walnut trees cleared, stopbank @ XS4							
		Q2	Q5	Q10	Q20	Q50	Q100
RL (m)	Cross-section						
Water Level		Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -20.00	XS 9	7.03	7.37	7.61	7.83	8.11	8.31
MARAETOTARA 0.00	XS 8	6.86	7.19	7.42	7.63	7.91	8.11
MARAETOTARA 190.00	XS 7	5.41	5.62	5.76	5.89	6.13	6.26
MARAETOTARA 290.00	XS 6	4.98	5.17	5.29	5.38	5.48	5.55
MARAETOTARA 390.00	XS 5	4.69	4.85	4.94	5.00	5.05	5.09
MARAETOTARA 530.00	XS 4	4.19	4.31	4.38	4.42	4.48	4.59
MARAETOTARA 667.00	XS 3a	3.55	3.69	3.78	3.84	3.91	4.05
MARAETOTARA 725.00	XS 3	3.34	3.49	3.58	3.64	3.71	3.86
MARAETOTARA 885.97	at ditch	2.54	2.73	2.88	2.99	3.12	3.39
MARAETOTARA 968.00	XS 2 u/s	2.13	2.32	2.48	2.61	2.78	3.11
MARAETOTARA 978.00	XS 2 d/s	2.10	2.20	2.27	2.32	2.36	2.47
MARAETOTARA 990.00		2.10	2.20	2.27	2.32	2.37	2.47
MARAETOTARA 1100.00	XS 1	1.92	1.97	2.00	2.02	2.05	2.10
MARAETOTARA 1250.00		1.82	1.82	1.83	1.83	1.83	1.83
MARAETOTARA 1400.00	XS 0	1.82	1.82	1.82	1.82	1.82	1.82
RIGHT FLOODPLAIN -20.00	FPxs 9	6.55	6.55	6.55	6.55	6.55	6.58
RIGHT FLOODPLAIN 0.00	FPxs 8	6.45	6.45	6.45	6.45	6.45	6.58
RIGHT FLOODPLAIN 190.00	FPxs 7	5.48	5.48	5.48	5.48	5.48	5.53
RIGHT FLOODPLAIN 290.00	FPxs 6	5.03	5.03	5.03	5.03	5.03	5.07
RIGHT FLOODPLAIN 390.00	FPxs 5	4.57	4.57	4.67	4.85	4.93	5.00
RIGHT FLOODPLAIN 530.00	FPxs 4	3.79	3.79	3.82	4.22	4.50	4.61
BLUETT ROAD 0.00	BXS 1	3.19	3.19	3.25	3.30	3.36	3.39
BLUETT ROAD 150.00	BXS 2	3.09	3.19	3.25	3.30	3.36	3.39
BLUETT ROAD 255.00	BXS 3	3.09	3.15	3.25	3.30	3.36	3.39
BLUETT ROAD 260.00		3.09	3.15	3.25	3.30	3.36	3.39
DITCH 0.00		2.65	2.65	2.65	2.65	3.12	3.39
DITCH 5.00	DXS 1	2.65	2.65	2.65	2.65	3.12	3.39
DITCH 20.00	DXS 2	3.01	3.01	3.01	3.01	3.11	3.39
DITCH 25.00	DXS 3	2.54	2.73	2.88	2.99	3.12	3.39
DITCH 30.00	DXS 4	2.54	2.73	2.88	2.99	3.12	3.39
LINK 7 0.00		5.41	5.62	5.76	5.89	6.13	6.26
LINK 7 10.00		5.48	5.48	5.48	5.48	5.48	5.53
LINK 4 0.00		4.19	4.31	4.38	4.42	4.48	4.59
LINK 4 10.00		3.79	3.79	3.82	4.22	4.50	4.61
LINK 5 0.00		4.69	4.85	4.94	5.00	5.05	5.09
LINK 5 10.00		4.57	4.57	4.67	4.85	4.93	5.00
LINK 6 0.00		4.98	5.17	5.29	5.38	5.48	5.55
LINK 6 10.00		5.03	5.03	5.03	5.03	5.03	5.07
LINK 8 0.00		6.86	7.19	7.42	7.63	7.91	8.11
LINK 8 10.00		6.45	6.45	6.45	6.45	6.45	6.58
DRAIN&CULVERTS 0.00		2.89	3.20	3.27	3.31	3.36	3.40
DRAIN&CULVERTS 15.00		2.84	3.19	3.26	3.30	3.36	3.39
DRAIN&CULVERTS 18.00		2.85	3.19	3.26	3.30	3.36	3.39
DRAIN&CULVERTS 20.00		2.84	3.19	3.25	3.30	3.36	3.39
DRAIN&CULVERTS 22.00		2.84	3.19	3.25	3.30	3.36	3.39
DRAIN&CULVERTS 30.00		2.84	3.19	3.25	3.30	3.36	3.39
DRAIN&CULVERTS 130.00		2.10	2.20	2.27	2.32	2.37	2.47
LINK SPORTSFIELD 0.00		2.84	3.19	3.25	3.30	3.36	3.39
LINK SPORTSFIELD 10.00		3.09	3.19	3.25	3.30	3.36	3.39
LINK DITCH 0.00		3.09	3.19	3.25	3.30	3.36	3.39
LINK DITCH 10.00		2.64	2.64	2.64	2.64	3.12	3.39
LINK BLUETT 0.00		3.79	3.79	3.82	4.22	4.50	4.61
LINK BLUETT 10.00		3.19	3.19	3.25	3.30	3.36	3.39

Scenario 6, 10 year tide, blocked bridge, walnut trees cleared, stopbank @ XS4						
	Q2	Q5	Q10	Q20	Q50	Q100
flow (m3/s)						
Discharge	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -10.00	11.99	15.68	18.48	21.28	24.84	27.75
MARAETOTARA 95.00	11.97	15.65	18.45	21.24	24.80	27.70
MARAETOTARA 240.00	11.94	15.61	18.41	21.16	24.70	27.60
MARAETOTARA 340.00	11.91	15.58	18.33	21.10	24.61	27.56
MARAETOTARA 460.00	11.89	15.54	18.24	20.32	22.16	23.25
MARAETOTARA 598.50	11.81	15.48	18.17	20.05	22.18	26.65
MARAETOTARA 696.00	11.80	15.46	18.16	20.04	22.15	26.62
MARAETOTARA 805.48	11.77	15.39	18.11	20.00	22.08	26.52
MARAETOTARA 926.98	11.75	15.32	18.04	19.93	21.96	26.47
MARAETOTARA 973.00	11.75	15.32	18.03	19.92	21.95	26.46
MARAETOTARA 984.00	11.75	15.32	18.03	19.92	21.95	26.46
MARAETOTARA 1045.00	12.99	16.81	19.51	21.39	23.43	27.89
MARAETOTARA 1175.00	12.98	16.80	19.50	21.38	23.44	27.89
MARAETOTARA 1325.00	13.08	16.90	19.58	21.46	23.52	27.97
RIGHT FLOODPLAIN -10.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 95.00	0.00	0.00	0.00	0.00	0.00	0.01
RIGHT FLOODPLAIN 240.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 340.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 460.00	0.00	0.00	0.02	0.52	1.94	4.02
BLUETT ROAD 75.00	0.00	0.00	0.00	0.00	0.00	0.00
BLUETT ROAD 202.50	0.00	0.02	0.05	0.06	0.11	0.15
BLUETT ROAD 257.50	0.00	0.00	0.00	0.00	0.01	0.01
DITCH 2.50	0.00	0.00	0.00	0.00	0.02	0.09
DITCH 12.50	0.00	0.00	0.00	0.00	0.01	0.11
DITCH 22.50	0.00	0.00	0.00	0.00	0.01	0.11
DITCH 27.50	0.00	0.00	0.01	0.01	0.03	0.12
LINK 7 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 4 5.00	0.00	0.00	0.03	0.24	0.70	0.95
LINK 5 5.00	0.00	0.00	0.05	0.76	2.44	4.32
LINK 6 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 8 5.00	0.00	0.00	0.00	0.00	0.00	0.05
DRAIN&CULVERTS 7.50	1.39	2.00	2.40	2.70	3.20	3.50
DRAIN&CULVERTS 16.50	1.38	1.99	2.39	2.69	3.19	3.49
DRAIN&CULVERTS 19.00	1.38	1.99	2.39	2.69	3.19	3.49
DRAIN&CULVERTS 21.00	1.38	1.78	1.85	1.82	1.79	1.66
DRAIN&CULVERTS 26.00	1.37	1.75	1.81	1.78	1.75	1.63
DRAIN&CULVERTS 80.00	1.33	1.50	1.51	1.52	1.50	1.47
LINK SPORTSFIELD 5.00	0.00	0.15	0.22	0.26	0.28	0.34
LINK DITCH 5.00	0.00	0.00	0.00	0.00	0.02	0.09
LINK BLUETT 5.00	0.00	0.00	0.00	0.00	0.00	0.00

Scenario 7, 10 year tide, blocked bridge, walnut trees cleared, stopbank @ XS5							
		Q2	Q5	Q10	Q20	Q50	Q100
RL (m)	Cross-section						
Water Level		Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -20.00	XS 9	7.03	7.37	7.61	7.83	8.11	8.31
MARAETOTARA 0.00	XS 8	6.86	7.19	7.42	7.63	7.91	8.11
MARAETOTARA 190.00	XS 7	5.41	5.62	5.76	5.89	6.13	6.26
MARAETOTARA 290.00	XS 6	4.98	5.17	5.29	5.39	5.48	5.57
MARAETOTARA 390.00	XS 5	4.69	4.85	4.94	5.01	5.10	5.19
MARAETOTARA 530.00	XS 4	4.19	4.31	4.38	4.44	4.51	4.60
MARAETOTARA 667.00	XS 3a	3.55	3.69	3.78	3.86	3.95	4.06
MARAETOTARA 725.00	XS 3	3.34	3.49	3.58	3.66	3.76	3.88
MARAETOTARA 885.97	at ditch	2.54	2.73	2.88	3.02	3.20	3.41
MARAETOTARA 968.00	XS 2 u/s	2.13	2.32	2.49	2.65	2.88	3.14
MARAETOTARA 978.00	XS 2 d/s	2.10	2.20	2.27	2.33	2.40	2.47
MARAETOTARA 990.00		2.10	2.20	2.27	2.33	2.40	2.48
MARAETOTARA 1100.00	XS 1	1.92	1.97	2.00	2.03	2.07	2.11
MARAETOTARA 1250.00		1.82	1.82	1.83	1.83	1.83	1.83
MARAETOTARA 1400.00	XS 0	1.82	1.82	1.82	1.82	1.82	1.82
RIGHT FLOODPLAIN -20.00	FPxs 9	6.55	6.55	6.55	6.55	6.55	6.58
RIGHT FLOODPLAIN 0.00	FPxs 8	6.45	6.45	6.45	6.45	6.45	6.58
RIGHT FLOODPLAIN 190.00	FPxs 7	5.48	5.48	5.48	5.48	5.48	5.53
RIGHT FLOODPLAIN 290.00	FPxs 6	5.03	5.03	5.03	5.03	5.08	5.17
RIGHT FLOODPLAIN 390.00	FPxs 5	4.57	4.57	4.69	4.93	5.09	5.18
BLUETT ROAD 0.00	BXS 1	3.19	3.19	3.25	3.30	3.36	3.41
BLUETT ROAD 150.00	BXS 2	3.09	3.19	3.25	3.30	3.36	3.41
BLUETT ROAD 255.00	BXS 3	3.09	3.15	3.25	3.30	3.36	3.41
BLUETT ROAD 260.00		3.09	3.15	3.25	3.30	3.36	3.41
DITCH 0.00		2.65	2.65	2.65	2.65	3.21	3.41
DITCH 5.00	DXS 1	2.65	2.65	2.65	2.65	3.21	3.41
DITCH 20.00	DXS 2	3.01	3.01	3.01	3.02	3.19	3.41
DITCH 25.00	DXS 3	2.54	2.73	2.88	3.02	3.20	3.41
DITCH 30.00	DXS 4	2.54	2.73	2.88	3.02	3.20	3.41
LINK 7 0.00		5.41	5.62	5.76	5.89	6.13	6.26
LINK 7 10.00		5.48	5.48	5.48	5.48	5.48	5.53
LINK 5 0.00		4.69	4.85	4.94	5.01	5.10	5.19
LINK 5 10.00		4.57	4.57	4.69	4.93	5.09	5.18
LINK 6 0.00		4.98	5.17	5.29	5.39	5.48	5.57
LINK 6 10.00		5.03	5.03	5.03	5.03	5.08	5.17
LINK 8 0.00		6.86	7.19	7.42	7.63	7.91	8.11
LINK 8 10.00		6.45	6.45	6.45	6.45	6.45	6.58
DRAIN&CULVERTS 0.00		2.89	3.20	3.27	3.31	3.37	3.41
DRAIN&CULVERTS 15.00		2.84	3.19	3.26	3.30	3.36	3.41
DRAIN&CULVERTS 18.00		2.85	3.19	3.26	3.30	3.36	3.41
DRAIN&CULVERTS 20.00		2.84	3.19	3.26	3.30	3.36	3.41
DRAIN&CULVERTS 22.00		2.84	3.19	3.25	3.30	3.36	3.41
DRAIN&CULVERTS 30.00		2.84	3.19	3.25	3.30	3.36	3.40
DRAIN&CULVERTS 130.00		2.10	2.20	2.27	2.33	2.40	2.48
LINK SPORTSFIELD 0.00		2.84	3.19	3.26	3.30	3.36	3.41
LINK SPORTSFIELD 10.00		3.09	3.19	3.25	3.30	3.36	3.41
LINK DITCH 0.00		3.09	3.19	3.25	3.30	3.36	3.41
LINK DITCH 10.00		2.64	2.64	2.64	2.65	3.21	3.41
LINK BLUETT 0.00		4.57	4.57	4.69	4.93	5.09	5.18
LINK BLUETT 10.00		3.19	3.19	3.25	3.30	3.36	3.41

Scenario 7, 10 year tide, blocked bridge, walnut trees cleared, stopbank @ XS5						
	Q2	Q5	Q10	Q20	Q50	Q100
flow (m3/s)						
Discharge	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -10.00	11.99	15.68	18.48	21.28	24.84	27.76
MARAETOTARA 95.00	11.97	15.65	18.45	21.24	24.80	27.70
MARAETOTARA 240.00	11.94	15.61	18.41	21.16	24.70	27.59
MARAETOTARA 340.00	11.91	15.58	18.33	21.10	24.59	27.54
MARAETOTARA 460.00	11.89	15.54	18.26	20.66	23.61	27.30
MARAETOTARA 598.50	11.81	15.48	18.22	20.61	23.56	27.23
MARAETOTARA 696.00	11.80	15.46	18.20	20.60	23.54	27.19
MARAETOTARA 805.48	11.77	15.39	18.15	20.54	23.48	27.09
MARAETOTARA 926.98	11.75	15.32	18.08	20.46	23.37	26.86
MARAETOTARA 973.00	11.75	15.32	18.07	20.45	23.37	26.86
MARAETOTARA 984.00	11.75	15.32	18.07	20.45	23.37	26.86
MARAETOTARA 1045.00	12.99	16.81	19.55	21.90	24.82	28.28
MARAETOTARA 1175.00	12.98	16.80	19.54	21.89	24.83	28.28
MARAETOTARA 1325.00	13.08	16.90	19.62	21.98	24.90	28.36
RIGHT FLOODPLAIN -10.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 95.00	0.00	0.00	0.00	0.00	0.00	0.01
RIGHT FLOODPLAIN 240.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 340.00	0.00	0.00	0.00	0.00	0.00	0.01
BLUETT ROAD 75.00	0.00	0.00	0.00	0.00	0.00	0.01
BLUETT ROAD 202.50	0.00	0.02	0.05	0.06	0.11	0.17
BLUETT ROAD 257.50	0.00	0.00	0.00	0.00	0.01	0.01
DITCH 2.50	0.00	0.00	0.00	0.00	0.03	0.14
DITCH 12.50	0.00	0.00	0.00	0.00	0.03	0.15
DITCH 22.50	0.00	0.00	0.00	0.00	0.03	0.16
DITCH 27.50	0.00	0.00	0.01	0.01	0.04	0.17
LINK 7 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 5 5.00	0.00	0.00	0.02	0.41	1.44	1.83
LINK 6 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 8 5.00	0.00	0.00	0.00	0.00	0.00	0.05
DRAIN&CULVERTS 7.50	1.39	2.00	2.40	2.70	3.20	3.50
DRAIN&CULVERTS 16.50	1.38	1.99	2.39	2.69	3.19	3.49
DRAIN&CULVERTS 19.00	1.38	1.99	2.39	2.69	3.19	3.49
DRAIN&CULVERTS 21.00	1.38	1.78	1.85	1.82	1.79	1.64
DRAIN&CULVERTS 26.00	1.37	1.75	1.81	1.78	1.75	1.61
DRAIN&CULVERTS 80.00	1.33	1.50	1.51	1.52	1.51	1.50
LINK SPORTSFIELD 5.00	0.00	0.15	0.22	0.26	0.28	0.34
LINK DITCH 5.00	0.00	0.00	0.00	0.00	0.03	0.14
LINK BLUETT 5.00	0.00	0.00	0.00	0.00	0.00	0.00

Scenario 8, 10 year tide, blocked bridge, walnut trees cleared, stopbank @ XS6							
		Q2	Q5	Q10	Q20	Q50	Q100
RL (m)	Cross-section						
Water Level		Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -20.00	XS 9	7.03	7.37	7.61	7.83	8.11	8.31
MARAETOTARA 0.00	XS 8	6.86	7.19	7.42	7.63	7.91	8.11
MARAETOTARA 190.00	XS 7	5.41	5.62	5.76	5.89	6.13	6.26
MARAETOTARA 290.00	XS 6	4.98	5.17	5.29	5.39	5.49	5.57
MARAETOTARA 390.00	XS 5	4.69	4.85	4.94	5.02	5.12	5.19
MARAETOTARA 530.00	XS 4	4.19	4.31	4.38	4.45	4.53	4.61
MARAETOTARA 667.00	XS 3a	3.55	3.69	3.78	3.87	3.97	4.07
MARAETOTARA 725.00	XS 3	3.34	3.49	3.58	3.67	3.78	3.89
MARAETOTARA 885.97	at ditch	2.54	2.73	2.88	3.04	3.24	3.42
MARAETOTARA 968.00	XS 2 u/s	2.13	2.32	2.49	2.67	2.93	3.15
MARAETOTARA 978.00	XS 2 d/s	2.10	2.20	2.27	2.34	2.41	2.48
MARAETOTARA 990.00		2.10	2.20	2.27	2.34	2.42	2.49
MARAETOTARA 1100.00	XS 1	1.92	1.97	2.00	2.03	2.08	2.11
MARAETOTARA 1250.00		1.82	1.82	1.83	1.83	1.83	1.83
MARAETOTARA 1400.00	XS 0	1.82	1.82	1.82	1.82	1.82	1.82
RIGHT FLOODPLAIN -20.00	FPxs 9	6.55	6.55	6.55	6.55	6.55	6.58
RIGHT FLOODPLAIN 0.00	FPxs 8	6.45	6.45	6.45	6.45	6.45	6.58
RIGHT FLOODPLAIN 190.00	FPxs 7	5.48	5.48	5.48	5.48	5.48	5.53
RIGHT FLOODPLAIN 290.00	FPxs 6	5.03	5.03	5.03	5.03	5.03	5.19
BLUETT ROAD 0.00	BXS 1	3.19	3.19	3.25	3.30	3.36	3.41
BLUETT ROAD 150.00	BXS 2	3.09	3.19	3.25	3.30	3.36	3.41
BLUETT ROAD 255.00	BXS 3	3.09	3.15	3.25	3.30	3.36	3.41
BLUETT ROAD 260.00		3.09	3.15	3.25	3.30	3.36	3.41
DITCH 0.00		2.65	2.65	2.65	2.71	3.24	3.41
DITCH 5.00	DXS 1	2.65	2.65	2.65	2.71	3.24	3.41
DITCH 20.00	DXS 2	3.01	3.01	3.01	3.04	3.24	3.42
DITCH 25.00	DXS 3	2.54	2.73	2.88	3.04	3.24	3.42
DITCH 30.00	DXS 4	2.54	2.73	2.88	3.04	3.24	3.42
LINK 7 0.00		5.41	5.62	5.76	5.89	6.13	6.26
LINK 7 10.00		5.48	5.48	5.48	5.48	5.48	5.53
LINK 6 0.00		4.98	5.17	5.29	5.39	5.49	5.57
LINK 6 10.00		5.02	5.02	5.02	5.02	5.02	5.19
LINK 8 0.00		6.86	7.19	7.42	7.63	7.91	8.11
LINK 8 10.00		6.45	6.45	6.45	6.45	6.45	6.58
DRAIN&CULVERTS 0.00		2.89	3.20	3.27	3.31	3.37	3.42
DRAIN&CULVERTS 15.00		2.84	3.19	3.26	3.30	3.36	3.41
DRAIN&CULVERTS 18.00		2.85	3.19	3.26	3.30	3.36	3.41
DRAIN&CULVERTS 20.00		2.84	3.19	3.26	3.30	3.36	3.41
DRAIN&CULVERTS 22.00		2.84	3.19	3.25	3.30	3.36	3.41
DRAIN&CULVERTS 30.00		2.84	3.19	3.25	3.30	3.36	3.41
DRAIN&CULVERTS 130.00		2.10	2.20	2.27	2.34	2.42	2.49
LINK SPORTSFIELD 0.00		2.84	3.19	3.26	3.30	3.36	3.41
LINK SPORTSFIELD 10.00		3.09	3.19	3.25	3.30	3.36	3.41
LINK DITCH 0.00		3.09	3.19	3.25	3.30	3.36	3.41
LINK DITCH 10.00		2.64	2.64	2.64	2.71	3.24	3.41
LINK BLUETT 0.00		5.02	5.02	5.02	5.02	5.02	5.19
LINK BLUETT 10.00		3.19	3.19	3.25	3.30	3.36	3.41

Scenario 8, 10 year tide, blocked bridge, walnut trees cleared, stopbank @ XS6						
	Q2	Q5	Q10	Q20	Q50	Q100
flow (m3/s)						
Discharge	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -10.00	11.99	15.68	18.48	21.28	24.84	27.76
MARAETOTARA 95.00	11.97	15.65	18.45	21.24	24.80	27.70
MARAETOTARA 240.00	11.94	15.61	18.41	21.16	24.69	27.59
MARAETOTARA 340.00	11.91	15.58	18.33	21.09	24.56	27.55
MARAETOTARA 460.00	11.89	15.54	18.28	21.05	24.50	27.53
MARAETOTARA 598.50	11.81	15.48	18.23	20.99	24.42	27.47
MARAETOTARA 696.00	11.80	15.46	18.22	20.97	24.39	27.44
MARAETOTARA 805.48	11.77	15.39	18.17	20.90	24.30	27.34
MARAETOTARA 926.98	11.75	15.32	18.09	20.80	24.12	27.05
MARAETOTARA 973.00	11.75	15.32	18.09	20.80	24.11	27.05
MARAETOTARA 984.00	11.75	15.32	18.09	20.80	24.11	27.05
MARAETOTARA 1045.00	12.99	16.81	19.56	22.24	25.54	28.46
MARAETOTARA 1175.00	12.98	16.80	19.55	22.23	25.54	28.47
MARAETOTARA 1325.00	13.08	16.90	19.63	22.31	25.64	28.56
RIGHT FLOODPLAIN -10.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 95.00	0.00	0.00	0.00	0.00	0.00	0.01
RIGHT FLOODPLAIN 240.00	0.00	0.00	0.00	0.00	0.00	0.00
BLUETT ROAD 75.00	0.00	0.00	0.00	0.00	0.00	0.01
BLUETT ROAD 202.50	0.00	0.02	0.05	0.06	0.12	0.18
BLUETT ROAD 257.50	0.00	0.00	0.00	0.00	0.01	0.01
DITCH 2.50	0.00	0.00	0.00	0.00	0.03	0.17
DITCH 12.50	0.00	0.00	0.00	0.00	0.04	0.18
DITCH 22.50	0.00	0.00	0.00	0.00	0.04	0.18
DITCH 27.50	0.00	0.00	0.01	0.01	0.05	0.19
LINK 7 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 6 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 8 5.00	0.00	0.00	0.00	0.00	0.00	0.05
DRAIN&CULVERTS 7.50	1.39	2.00	2.40	2.70	3.20	3.50
DRAIN&CULVERTS 16.50	1.38	1.99	2.39	2.69	3.19	3.49
DRAIN&CULVERTS 19.00	1.38	1.99	2.39	2.69	3.19	3.49
DRAIN&CULVERTS 21.00	1.38	1.78	1.85	1.82	1.79	1.58
DRAIN&CULVERTS 26.00	1.37	1.75	1.81	1.78	1.75	1.56
DRAIN&CULVERTS 80.00	1.33	1.50	1.51	1.52	1.52	1.51
LINK SPORTSFIELD 5.00	0.00	0.15	0.22	0.26	0.28	0.32
LINK DITCH 5.00	0.00	0.00	0.00	0.00	0.03	0.16
LINK BLUETT 5.00	0.00	0.00	0.00	0.00	0.00	0.00

Scenario 9, 10 year tide, blocked bridge, walnut trees cleared, stopbank @ XS7							
		Q2	Q5	Q10	Q20	Q50	Q100
RL (m)	Cross-section						
Water Level		Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -20.00	XS 9	7.03	7.37	7.61	7.83	8.11	8.31
MARAETOTARA 0.00	XS 8	6.86	7.19	7.42	7.63	7.91	8.11
MARAETOTARA 190.00	XS 7	5.41	5.62	5.76	5.89	6.13	6.26
MARAETOTARA 290.00	XS 6	4.98	5.17	5.29	5.39	5.49	5.57
MARAETOTARA 390.00	XS 5	4.69	4.85	4.94	5.02	5.12	5.19
MARAETOTARA 530.00	XS 4	4.19	4.31	4.38	4.45	4.53	4.61
MARAETOTARA 667.00	XS 3a	3.55	3.69	3.78	3.87	3.97	4.07
MARAETOTARA 725.00	XS 3	3.34	3.49	3.58	3.67	3.78	3.89
MARAETOTARA 885.97	at ditch	2.54	2.73	2.88	3.04	3.24	3.42
MARAETOTARA 968.00	XS 2 u/s	2.13	2.32	2.49	2.67	2.93	3.15
MARAETOTARA 978.00	XS 2 d/s	2.10	2.20	2.27	2.34	2.41	2.48
MARAETOTARA 990.00		2.10	2.20	2.27	2.34	2.42	2.49
MARAETOTARA 1100.00	XS 1	1.92	1.97	2.00	2.03	2.08	2.11
MARAETOTARA 1250.00		1.82	1.82	1.83	1.83	1.83	1.83
MARAETOTARA 1400.00	XS 0	1.82	1.82	1.82	1.82	1.82	1.82
RIGHT FLOODPLAIN -20.00	FPxs 9	6.55	6.55	6.55	6.55	6.55	6.58
RIGHT FLOODPLAIN 0.00	FPxs 8	6.45	6.45	6.45	6.45	6.45	6.58
RIGHT FLOODPLAIN 190.00	FPxs 7	5.48	5.48	5.48	5.48	5.48	5.60
BLUETT ROAD 0.00	BXS 1	3.19	3.19	3.25	3.30	3.36	3.41
BLUETT ROAD 150.00	BXS 2	3.09	3.19	3.25	3.30	3.36	3.41
BLUETT ROAD 255.00	BXS 3	3.09	3.15	3.25	3.30	3.36	3.41
BLUETT ROAD 260.00		3.09	3.15	3.25	3.30	3.36	3.41
DITCH 0.00		2.65	2.65	2.65	2.71	3.24	3.41
DITCH 5.00	DXS 1	2.65	2.65	2.65	2.71	3.24	3.41
DITCH 20.00	DXS 2	3.01	3.01	3.01	3.04	3.24	3.42
DITCH 25.00	DXS 3	2.54	2.73	2.88	3.04	3.24	3.42
DITCH 30.00	DXS 4	2.54	2.73	2.88	3.04	3.24	3.42
LINK 7 0.00		5.41	5.62	5.76	5.89	6.13	6.26
LINK 7 10.00		5.48	5.48	5.48	5.48	5.48	5.60
LINK 8 0.00		6.86	7.19	7.42	7.63	7.91	8.11
LINK 8 10.00		6.45	6.45	6.45	6.45	6.45	6.58
DRAIN&CULVERTS 0.00		2.89	3.20	3.27	3.31	3.37	3.42
DRAIN&CULVERTS 15.00		2.84	3.19	3.26	3.30	3.36	3.41
DRAIN&CULVERTS 18.00		2.85	3.19	3.26	3.30	3.36	3.41
DRAIN&CULVERTS 20.00		2.84	3.19	3.26	3.30	3.36	3.41
DRAIN&CULVERTS 22.00		2.84	3.19	3.25	3.30	3.36	3.41
DRAIN&CULVERTS 30.00		2.84	3.19	3.25	3.30	3.36	3.41
DRAIN&CULVERTS 130.00		2.10	2.20	2.27	2.34	2.42	2.49
LINK SPORTSFIELD 0.00		2.84	3.19	3.26	3.30	3.36	3.41
LINK SPORTSFIELD 10.00		3.09	3.19	3.25	3.30	3.36	3.41
LINK DITCH 0.00		3.09	3.19	3.25	3.30	3.36	3.41
LINK DITCH 10.00		2.64	2.64	2.64	2.71	3.24	3.41
LINK BLUETT 0.00		5.48	5.48	5.48	5.48	5.48	5.60
LINK BLUETT 10.00		3.19	3.19	3.25	3.30	3.36	3.41

Scenario 9, 10 year tide, blocked bridge, walnut trees cleared, stopbank @ XS7						
	Q2	Q5	Q10	Q20	Q50	Q100
flow (m3/s)						
Discharge	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -10.00	11.99	15.68	18.48	21.28	24.84	27.76
MARAETOTARA 95.00	11.97	15.65	18.45	21.24	24.80	27.70
MARAETOTARA 240.00	11.94	15.61	18.41	21.16	24.69	27.59
MARAETOTARA 340.00	11.91	15.58	18.33	21.09	24.56	27.56
MARAETOTARA 460.00	11.89	15.54	18.28	21.05	24.50	27.53
MARAETOTARA 598.50	11.81	15.48	18.23	20.99	24.42	27.47
MARAETOTARA 696.00	11.80	15.46	18.22	20.97	24.39	27.44
MARAETOTARA 805.48	11.77	15.39	18.17	20.90	24.30	27.34
MARAETOTARA 926.98	11.75	15.32	18.09	20.80	24.12	27.05
MARAETOTARA 973.00	11.75	15.32	18.09	20.80	24.11	27.05
MARAETOTARA 984.00	11.75	15.32	18.09	20.80	24.11	27.05
MARAETOTARA 1045.00	12.99	16.81	19.56	22.24	25.54	28.46
MARAETOTARA 1175.00	12.98	16.80	19.55	22.23	25.54	28.47
MARAETOTARA 1325.00	13.08	16.90	19.63	22.31	25.64	28.56
RIGHT FLOODPLAIN -10.00	0.00	0.00	0.00	0.00	0.00	0.00
RIGHT FLOODPLAIN 95.00	0.00	0.00	0.00	0.00	0.00	0.01
BLUETT ROAD 75.00	0.00	0.00	0.00	0.00	0.00	0.01
BLUETT ROAD 202.50	0.00	0.02	0.05	0.06	0.12	0.18
BLUETT ROAD 257.50	0.00	0.00	0.00	0.00	0.01	0.01
DITCH 2.50	0.00	0.00	0.00	0.00	0.03	0.17
DITCH 12.50	0.00	0.00	0.00	0.00	0.04	0.18
DITCH 22.50	0.00	0.00	0.00	0.00	0.04	0.18
DITCH 27.50	0.00	0.00	0.01	0.01	0.05	0.19
LINK 7 5.00	0.00	0.00	0.00	0.00	0.00	0.00
LINK 8 5.00	0.00	0.00	0.00	0.00	0.00	0.05
DRAIN&CULVERTS 7.50	1.39	2.00	2.40	2.70	3.20	3.50
DRAIN&CULVERTS 16.50	1.38	1.99	2.39	2.69	3.19	3.49
DRAIN&CULVERTS 19.00	1.38	1.99	2.39	2.69	3.19	3.49
DRAIN&CULVERTS 21.00	1.38	1.78	1.85	1.82	1.79	1.58
DRAIN&CULVERTS 26.00	1.37	1.75	1.81	1.78	1.75	1.56
DRAIN&CULVERTS 80.00	1.33	1.50	1.51	1.52	1.52	1.51
LINK SPORTSFIELD 5.00	0.00	0.15	0.22	0.26	0.28	0.32
LINK DITCH 5.00	0.00	0.00	0.00	0.00	0.03	0.16
LINK BLUETT 5.00	0.00	0.00	0.00	0.00	0.00	0.00

Scenario 10, 10 year tide, blocked bridge, walnut trees cleared, overflow at Med Centre, no stopbank							
		Q2	Q5	Q10	Q20	Q50	Q100
RL (m)	Cross-section						
Water Level		Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -20.00	XS 9	7.03	7.37	7.61	7.83	8.11	8.31
MARAETOTARA 0.00	XS 8	6.86	7.19	7.42	7.63	7.91	8.11
MARAETOTARA 190.00	XS 7	5.41	5.62	5.76	5.89	6.13	6.26
MARAETOTARA 290.00	XS 6	4.98	5.17	5.29	5.38	5.48	5.55
MARAETOTARA 390.00	XS 5	4.69	4.85	4.94	5.00	5.05	5.09
MARAETOTARA 530.00	XS 4	4.19	4.31	4.38	4.42	4.45	4.47
MARAETOTARA 667.00	XS 3a	3.55	3.69	3.78	3.84	3.87	3.90
MARAETOTARA 725.00	XS 3	3.34	3.48	3.58	3.63	3.67	3.71
MARAETOTARA 885.97	at ditch	2.53	2.72	2.86	2.96	3.03	3.22
MARAETOTARA 960.00		2.19	2.38	2.54	2.66	2.75	3.00
MARAETOTARA 968.00	XS 2 u/s	2.13	2.32	2.48	2.60	2.69	2.95
MARAETOTARA 978.00	XS 2 d/s	2.10	2.20	2.27	2.31	2.34	2.42
MARAETOTARA 990.00		2.10	2.20	2.27	2.32	2.35	2.43
MARAETOTARA 1100.00	XS 1	1.92	1.97	2.00	2.02	2.04	2.07
MARAETOTARA 1250.00		1.82	1.82	1.83	1.83	1.83	1.83
MARAETOTARA 1400.00	XS 0	1.82	1.82	1.82	1.82	1.82	1.82
RIGHT FLOODPLAIN -20.00	FPxs 9	6.55	6.55	6.55	6.55	6.55	6.58
RIGHT FLOODPLAIN 0.00	FPxs 8	6.45	6.45	6.45	6.45	6.45	6.58
RIGHT FLOODPLAIN 190.00	FPxs 7	5.48	5.48	5.48	5.48	5.48	5.53
RIGHT FLOODPLAIN 290.00	FPxs 6	5.03	5.03	5.03	5.03	5.03	5.07
RIGHT FLOODPLAIN 390.00	FPxs 5	4.57	4.57	4.67	4.84	4.92	4.97
RIGHT FLOODPLAIN 530.00	FPxs 4	3.79	3.79	3.81	3.96	4.12	4.25
RIGHT FLOODPLAIN 667.00	FPxs 3a	3.37	3.37	3.38	3.70	3.85	3.96
RIGHT FLOODPLAIN 724.00		3.19	3.19	3.25	3.57	3.67	3.77
RIGHT FLOODPLAIN 725.00	FPxs 3	3.19	3.19	3.25	3.56	3.66	3.77
BLUETT ROAD 0.00	BXS 1	3.19	3.19	3.25	3.56	3.66	3.77
BLUETT ROAD 150.00	BXS 2	3.09	3.19	3.25	3.31	3.49	3.63
BLUETT ROAD 255.00	BXS 3	3.09	3.15	3.25	3.31	3.49	3.63
BLUETT ROAD 260.00		3.09	3.15	3.25	3.31	3.49	3.63
DITCH 0.00		2.65	2.65	2.65	2.65	3.43	3.55
DITCH 5.00	DXS 1	2.65	2.65	2.65	2.65	3.43	3.55
DITCH 20.00	DXS 2	3.01	3.01	3.01	3.01	3.39	3.54
DITCH 25.00	DXS 3	2.53	2.72	2.86	2.96	3.03	3.22
DITCH 30.00	DXS 4	2.53	2.72	2.86	2.96	3.03	3.22
LINK 7 0.00		5.41	5.62	5.76	5.89	6.13	6.26
LINK 7 10.00		5.48	5.48	5.48	5.48	5.48	5.53
LINK 4 0.00		4.19	4.31	4.38	4.42	4.45	4.47
LINK 4 10.00		3.79	3.79	3.81	3.96	4.12	4.25
LINK 5 0.00		4.69	4.85	4.94	5.00	5.05	5.09
LINK 5 10.00		4.57	4.57	4.67	4.84	4.92	4.97
LINK 6 0.00		4.98	5.17	5.29	5.38	5.48	5.55
LINK 6 10.00		5.03	5.03	5.03	5.03	5.03	5.07
LINK 8 0.00		6.86	7.19	7.42	7.63	7.91	8.11
LINK 8 10.00		6.45	6.45	6.45	6.45	6.45	6.58
LINK 3A 0.00		3.55	3.69	3.78	3.84	3.87	3.90
LINK 3A 10.00		3.37	3.37	3.38	3.70	3.85	3.96
LINK 3 0.00		3.19	3.19	3.25	3.57	3.67	3.77
LINK 3 10.00		3.34	3.48	3.58	3.63	3.67	3.71
DRAIN&CULVERTS 0.00		2.89	3.20	3.27	3.31	3.48	3.63
DRAIN&CULVERTS 15.00		2.85	3.19	3.26	3.31	3.48	3.63
DRAIN&CULVERTS 18.00		2.85	3.19	3.26	3.31	3.48	3.63
DRAIN&CULVERTS 20.00		2.84	3.19	3.25	3.31	3.48	3.63
DRAIN&CULVERTS 22.00		2.84	3.19	3.25	3.31	3.48	3.63
DRAIN&CULVERTS 30.00		2.84	3.19	3.25	3.30	3.48	3.63
DRAIN&CULVERTS 130.00		2.10	2.20	2.27	2.32	2.35	2.43
LINK SPORTSFIELD 0.00		2.84	3.19	3.25	3.31	3.48	3.63
LINK SPORTSFIELD 10.00		3.09	3.19	3.25	3.31	3.49	3.63
LINK DITCH 0.00		3.09	3.19	3.25	3.31	3.49	3.63
LINK DITCH 10.00		2.64	2.64	2.64	2.64	3.43	3.55
LINK OVERFLOW 0.00		2.84	3.19	3.25	3.31	3.48	3.63
LINK OVERFLOW 10.00		2.19	2.38	2.54	2.66	2.75	3.00

Scenario 10, 10 year tide, blocked bridge, walnut trees cleared, overflow at Med Centre, no stopbank								
	Q2	Q5	Q10	Q20	Q50	Q100		
flow (m3/s)								
Discharge	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum		
MARAETOTARA -10.00	11.99	15.68	18.48	21.28	24.84	27.75		
MARAETOTARA 95.00	11.97	15.65	18.45	21.24	24.80	27.70		
MARAETOTARA 240.00	11.94	15.61	18.41	21.16	24.70	27.60		
MARAETOTARA 340.00	11.91	15.58	18.33	21.10	24.61	27.56		
MARAETOTARA 460.00	11.89	15.54	18.24	20.32	22.16	23.39		
MARAETOTARA 598.50	11.81	15.48	18.15	19.90	21.10	21.73		
MARAETOTARA 696.00	11.80	15.46	18.13	19.89	21.09	21.72		
MARAETOTARA 805.48	11.77	15.39	18.09	19.85	21.06	21.68		
MARAETOTARA 922.98	11.75	15.33	18.02	19.79	21.02	23.61		
MARAETOTARA 964.00	11.75	15.33	18.02	19.79	21.02	24.26		
MARAETOTARA 973.00	11.75	15.33	18.02	19.79	21.02	24.26		
MARAETOTARA 984.00	11.75	15.33	18.02	19.79	21.02	24.26		
MARAETOTARA 1045.00	13.00	16.82	19.50	21.25	22.52	25.88		
MARAETOTARA 1175.00	12.98	16.81	19.48	21.24	22.52	25.89		
MARAETOTARA 1325.00	13.08	16.90	19.57	21.33	22.62	25.96		
RIGHT FLOODPLAIN -10.00	0.00	0.00	0.00	0.00	0.00	0.00		
RIGHT FLOODPLAIN 95.00	0.00	0.00	0.00	0.00	0.00	0.01		
RIGHT FLOODPLAIN 240.00	0.00	0.00	0.00	0.00	0.00	0.00		
RIGHT FLOODPLAIN 340.00	0.00	0.00	0.00	0.00	0.00	0.00		
RIGHT FLOODPLAIN 460.00	0.00	0.00	0.02	0.54	2.06	3.97		
RIGHT FLOODPLAIN 598.50	0.00	0.00	0.00	0.61	2.68	5.18		
RIGHT FLOODPLAIN 695.50	0.00	0.00	0.00	0.45	2.49	5.04		
RIGHT FLOODPLAIN 724.50	0.00	0.00	0.00	0.44	2.46	4.96		
BLUETT ROAD 75.00	0.00	0.00	0.00	0.42	2.36	4.75		
BLUETT ROAD 202.50	0.00	0.02	0.05	0.06	0.23	0.43		
BLUETT ROAD 257.50	0.00	0.00	0.00	0.00	0.01	0.02		
DITCH 2.50	0.00	0.00	0.00	0.00	0.89	2.77		
DITCH 12.50	0.00	0.00	0.00	0.00	0.90	2.77		
DITCH 22.50	0.00	0.00	0.00	0.00	0.89	2.77		
DITCH 27.50	0.00	0.00	0.01	0.01	0.90	2.78		
LINK 7 5.00	0.00	0.00	0.00	0.00	0.00	0.00		
LINK 4 5.00	0.00	0.00	0.05	0.40	1.05	1.66		
LINK 5 5.00	0.00	0.00	0.05	0.76	2.43	4.16		
LINK 6 5.00	0.00	0.00	0.00	0.00	0.00	0.00		
LINK 8 5.00	0.00	0.00	0.00	0.00	0.00	0.05		
LINK 3A 5.00	0.00	0.00	0.00	0.00	0.00	0.00		
LINK 3 5.00	0.00	0.00	0.00	0.00	0.00	0.00		
DRAIN&CULVERTS 7.50	1.39	2.00	2.40	2.70	3.20	3.49		
DRAIN&CULVERTS 16.50	1.38	1.99	2.39	2.69	3.19	3.48		
DRAIN&CULVERTS 19.00	1.38	1.99	2.39	2.69	3.19	3.48		
DRAIN&CULVERTS 21.00	1.38	1.78	1.85	1.82	1.79	1.79		
DRAIN&CULVERTS 26.00	1.37	1.75	1.81	1.78	1.75	1.80		
DRAIN&CULVERTS 80.00	1.33	1.50	1.51	1.58	1.71	1.82		
LINK SPORTSFIELD 5.00	0.00	0.15	0.22	0.26	0.28	0.00		
LINK DITCH 5.00	0.00	0.00	0.00	0.00	0.89	2.77		
LINK OVERFLOW 5.00	0.00	0.00	0.00	0.00	0.10	0.67		

Scenario 11, 10 year tide, blocked bridge, walnut trees cleared, overflow at Med Centre, stopbank at XS7								
		Q2	Q5	Q10	Q20	Q50	Q100	
RL (m)	Cross-section							
Water Level		Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	
MARAETOTARA -20.00	XS 9	7.03	7.37	7.61	7.83	8.11	8.31	
MARAETOTARA 0.00	XS 8	6.86	7.19	7.42	7.63	7.91	8.11	
MARAETOTARA 190.00	XS 7	5.41	5.62	5.76	5.89	6.13	6.26	
MARAETOTARA 290.00	XS 6	4.98	5.17	5.29	5.39	5.49	5.57	
MARAETOTARA 390.00	XS 5	4.69	4.85	4.94	5.02	5.12	5.19	
MARAETOTARA 530.00	XS 4	4.19	4.31	4.38	4.45	4.53	4.61	
MARAETOTARA 667.00	XS 3a	3.55	3.69	3.78	3.87	3.97	4.07	
MARAETOTARA 725.00	XS 3	3.34	3.48	3.58	3.67	3.78	3.89	
MARAETOTARA 885.97	at ditch	2.53	2.72	2.87	3.02	3.22	3.41	
MARAETOTARA 960.00		2.19	2.38	2.55	2.73	2.98	3.20	
MARAETOTARA 968.00	XS 2 u/s	2.13	2.32	2.49	2.67	2.93	3.16	
MARAETOTARA 978.00	XS 2 d/s	2.10	2.20	2.27	2.34	2.41	2.48	
MARAETOTARA 990.00		2.10	2.20	2.27	2.34	2.42	2.49	
MARAETOTARA 1100.00	XS 1	1.92	1.97	2.00	2.03	2.08	2.11	
MARAETOTARA 1250.00		1.82	1.82	1.83	1.83	1.83	1.83	
MARAETOTARA 1400.00	XS 0	1.82	1.82	1.82	1.82	1.82	1.82	
RIGHT FLOODPLAIN -20.00	FPxs 9	6.55	6.55	6.55	6.55	6.55	6.58	
RIGHT FLOODPLAIN 0.00	FPxs 8	6.45	6.45	6.45	6.45	6.45	6.58	
RIGHT FLOODPLAIN 190.00	FPxs 7	5.48	5.48	5.48	5.48	5.48	5.60	
BLUETT ROAD 0.00	BXS 1	3.19	3.19	3.25	3.30	3.36	3.41	
BLUETT ROAD 150.00	BXS 2	3.09	3.19	3.25	3.30	3.36	3.41	
BLUETT ROAD 255.00	BXS 3	3.09	3.15	3.25	3.30	3.36	3.41	
BLUETT ROAD 260.00		3.09	3.15	3.25	3.30	3.36	3.41	
DITCH 0.00		2.65	2.65	2.65	2.65	3.22	3.40	
DITCH 5.00	DXS 1	2.65	2.65	2.65	2.65	3.22	3.40	
DITCH 20.00	DXS 2	3.01	3.01	3.01	3.02	3.21	3.41	
DITCH 25.00	DXS 3	2.53	2.72	2.87	3.02	3.22	3.41	
DITCH 30.00	DXS 4	2.53	2.72	2.87	3.02	3.22	3.41	
LINK 7 0.00		5.41	5.62	5.76	5.89	6.13	6.26	
LINK 7 10.00		5.48	5.48	5.48	5.48	5.48	5.60	
LINK 8 0.00		6.86	7.19	7.42	7.63	7.91	8.11	
LINK 8 10.00		6.45	6.45	6.45	6.45	6.45	6.58	
DRAIN&CULVERTS 0.00		2.89	3.20	3.27	3.31	3.37	3.41	
DRAIN&CULVERTS 15.00		2.85	3.19	3.26	3.30	3.36	3.41	
DRAIN&CULVERTS 18.00		2.85	3.19	3.26	3.30	3.36	3.41	
DRAIN&CULVERTS 20.00		2.84	3.19	3.26	3.30	3.36	3.41	
DRAIN&CULVERTS 22.00		2.84	3.19	3.25	3.30	3.36	3.41	
DRAIN&CULVERTS 30.00		2.84	3.19	3.25	3.30	3.36	3.41	
DRAIN&CULVERTS 130.00		2.10	2.20	2.27	2.34	2.42	2.49	
LINK SPORTSFIELD 0.00		2.84	3.19	3.26	3.30	3.36	3.41	
LINK SPORTSFIELD 10.00		3.09	3.19	3.25	3.30	3.36	3.41	
LINK DITCH 0.00		3.09	3.19	3.25	3.30	3.36	3.41	
LINK DITCH 10.00		2.64	2.64	2.64	2.64	3.22	3.40	
LINK BLUETT 0.00		5.48	5.48	5.48	5.48	5.48	5.60	
LINK BLUETT 10.00		3.19	3.19	3.25	3.30	3.36	3.41	
LINK OVERFLOW 0.00		2.84	3.19	3.26	3.30	3.36	3.41	
LINK OVERFLOW 10.00		2.19	2.38	2.55	2.73	2.98	3.20	

Scenario 11, 10 year tide, blocked bridge, walnut trees cleared, overflow at Med Centre, stopbank at XS7								
	Q2	Q5	Q10	Q20	Q50	Q100		
flow (m3/s)								
Discharge	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum		
MARAETOTARA -10.00	11.99	15.68	18.48	21.28	24.84	27.76		
MARAETOTARA 95.00	11.97	15.65	18.45	21.24	24.80	27.70		
MARAETOTARA 240.00	11.94	15.61	18.41	21.16	24.69	27.59		
MARAETOTARA 340.00	11.91	15.58	18.33	21.09	24.56	27.56		
MARAETOTARA 460.00	11.89	15.54	18.28	21.05	24.50	27.53		
MARAETOTARA 598.50	11.81	15.48	18.23	20.99	24.42	27.47		
MARAETOTARA 696.00	11.80	15.46	18.22	20.97	24.39	27.44		
MARAETOTARA 805.48	11.77	15.39	18.17	20.90	24.30	27.33		
MARAETOTARA 922.98	11.75	15.33	18.10	20.81	24.13	27.09		
MARAETOTARA 964.00	11.75	15.33	18.09	20.80	24.12	27.09		
MARAETOTARA 973.00	11.75	15.33	18.09	20.80	24.12	27.09		
MARAETOTARA 984.00	11.75	15.33	18.09	20.80	24.12	27.09		
MARAETOTARA 1045.00	13.00	16.82	19.57	22.25	25.55	28.49		
MARAETOTARA 1175.00	12.98	16.81	19.55	22.23	25.55	28.50		
MARAETOTARA 1325.00	13.08	16.90	19.64	22.31	25.65	28.60		
RIGHT FLOODPLAIN -10.00	0.00	0.00	0.00	0.00	0.00	0.00		
RIGHT FLOODPLAIN 95.00	0.00	0.00	0.00	0.00	0.00	0.01		
BLUETT ROAD 75.00	0.00	0.00	0.00	0.00	0.00	0.01		
BLUETT ROAD 202.50	0.00	0.02	0.05	0.06	0.12	0.17		
BLUETT ROAD 257.50	0.00	0.00	0.00	0.00	0.01	0.01		
DITCH 2.50	0.00	0.00	0.00	0.00	0.03	0.16		
DITCH 12.50	0.00	0.00	0.00	0.00	0.04	0.17		
DITCH 22.50	0.00	0.00	0.00	0.00	0.04	0.18		
DITCH 27.50	0.00	0.00	0.01	0.01	0.05	0.19		
LINK 7 5.00	0.00	0.00	0.00	0.00	0.00	0.00		
LINK 8 5.00	0.00	0.00	0.00	0.00	0.00	0.05		
DRAIN&CULVERTS 7.50	1.39	2.00	2.40	2.70	3.20	3.50		
DRAIN&CULVERTS 16.50	1.38	1.99	2.39	2.69	3.19	3.49		
DRAIN&CULVERTS 19.00	1.38	1.99	2.39	2.69	3.19	3.49		
DRAIN&CULVERTS 21.00	1.38	1.78	1.85	1.82	1.79	1.58		
DRAIN&CULVERTS 26.00	1.37	1.75	1.81	1.78	1.75	1.55		
DRAIN&CULVERTS 80.00	1.33	1.50	1.51	1.52	1.52	1.50		
LINK SPORTSFIELD 5.00	0.00	0.15	0.22	0.26	0.29	0.32		
LINK DITCH 5.00	0.00	0.00	0.00	0.00	0.03	0.16		
LINK BLUETT 5.00	0.00	0.00	0.00	0.00	0.00	0.00		
LINK OVERFLOW 5.00	0.00	0.00	0.00	0.00	0.00	0.00		

Scenario 12, 10 year tide, blocked bridge, walnut trees cleared, culvert1 blocked, no stopbank							
		Q2	Q5	Q10	Q20	Q50	Q100
RL (m)	Cross-section						
Water Level		Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -20.00	XS 9	7.03	7.37	7.61	7.83	8.11	8.31
MARAETOTARA 0.00	XS 8	6.86	7.19	7.42	7.63	7.91	8.11
MARAETOTARA 190.00	XS 7	5.41	5.62	5.76	5.89	6.13	6.26
MARAETOTARA 290.00	XS 6	4.98	5.17	5.29	5.38	5.48	5.55
MARAETOTARA 390.00	XS 5	4.69	4.85	4.94	5.00	5.05	5.09
MARAETOTARA 530.00	XS 4	4.19	4.31	4.38	4.42	4.45	4.47
MARAETOTARA 667.00	XS 3a	3.55	3.69	3.78	3.84	3.87	3.90
MARAETOTARA 725.00	XS 3	3.34	3.48	3.58	3.63	3.67	3.72
MARAETOTARA 885.97	at ditch	2.53	2.72	2.87	2.98	3.10	3.28
MARAETOTARA 968.00	XS 2 u/s	2.09	2.28	2.44	2.58	2.75	2.97
MARAETOTARA 978.00	XS 2 d/s	2.07	2.17	2.24	2.29	2.33	2.41
MARAETOTARA 990.00		2.06	2.16	2.23	2.28	2.33	2.41
MARAETOTARA 1100.00	XS 1	1.91	1.95	1.98	2.01	2.03	2.06
MARAETOTARA 1250.00		1.82	1.82	1.83	1.83	1.83	1.83
MARAETOTARA 1400.00	XS 0	1.82	1.82	1.82	1.82	1.82	1.82
RIGHT FLOODPLAIN -20.00	FPxs 9	6.55	6.55	6.55	6.55	6.55	6.58
RIGHT FLOODPLAIN 0.00	FPxs 8	6.45	6.45	6.45	6.45	6.45	6.58
RIGHT FLOODPLAIN 190.00	FPxs 7	5.48	5.48	5.48	5.48	5.48	5.53
RIGHT FLOODPLAIN 290.00	FPxs 6	5.03	5.03	5.03	5.03	5.03	5.07
RIGHT FLOODPLAIN 390.00	FPxs 5	4.57	4.57	4.67	4.84	4.92	4.97
RIGHT FLOODPLAIN 530.00	FPxs 4	3.79	3.79	3.81	3.96	4.12	4.25
RIGHT FLOODPLAIN 667.00	FPxs 3a	3.38	3.41	3.43	3.70	3.85	3.97
RIGHT FLOODPLAIN 724.00		3.38	3.42	3.45	3.58	3.69	3.81
RIGHT FLOODPLAIN 725.00	FPxs 3	3.38	3.42	3.45	3.58	3.69	3.80
BLUETT ROAD 0.00	BXS 1	3.38	3.42	3.45	3.58	3.69	3.80
BLUETT ROAD 150.00	BXS 2	3.38	3.43	3.46	3.49	3.60	3.72
BLUETT ROAD 255.00	BXS 3	3.38	3.43	3.46	3.49	3.60	3.72
BLUETT ROAD 260.00		3.38	3.43	3.46	3.49	3.60	3.72
DITCH 0.00		3.15	3.26	3.31	3.39	3.51	3.64
DITCH 5.00	DXS 1	3.15	3.26	3.31	3.39	3.50	3.64
DITCH 20.00	DXS 2	3.15	3.26	3.31	3.36	3.49	3.62
DITCH 25.00	DXS 3	2.53	2.72	2.87	2.98	3.10	3.28
DITCH 30.00	DXS 4	2.53	2.72	2.87	2.98	3.10	3.28
LINK 7 0.00		5.41	5.62	5.76	5.89	6.13	6.26
LINK 7 10.00		5.48	5.48	5.48	5.48	5.48	5.53
LINK 4 0.00		4.19	4.31	4.38	4.42	4.45	4.47
LINK 4 10.00		3.79	3.79	3.81	3.96	4.12	4.25
LINK 5 0.00		4.69	4.85	4.94	5.00	5.05	5.09
LINK 5 10.00		4.57	4.57	4.67	4.84	4.92	4.97
LINK 6 0.00		4.98	5.17	5.29	5.38	5.48	5.55
LINK 6 10.00		5.03	5.03	5.03	5.03	5.03	5.07
LINK 8 0.00		6.86	7.19	7.42	7.63	7.91	8.11
LINK 8 10.00		6.45	6.45	6.45	6.45	6.45	6.58
LINK 3A 0.00		3.55	3.69	3.78	3.84	3.87	3.90
LINK 3A 10.00		3.38	3.41	3.43	3.70	3.85	3.97
LINK 3 0.00		3.38	3.42	3.45	3.58	3.69	3.81
LINK 3 10.00		3.34	3.48	3.58	3.63	3.67	3.72
DRAIN&CULVERTS 0.00		3.38	3.43	3.46	3.49	3.60	3.73
DRAIN&CULVERTS 15.00		3.38	3.43	3.46	3.49	3.60	3.73
DRAIN&CULVERTS 18.00		3.38	3.43	3.46	3.49	3.60	3.73
DRAIN&CULVERTS 20.00		3.38	3.43	3.46	3.49	3.60	3.73
DRAIN&CULVERTS 22.00		3.38	3.43	3.46	3.49	3.60	3.73
DRAIN&CULVERTS 30.00		3.38	3.43	3.46	3.49	3.60	3.73
DRAIN&CULVERTS 130.00		2.06	2.16	2.23	2.28	2.33	2.41
LINK SPORTSFIELD 0.00		3.38	3.43	3.46	3.49	3.60	3.73
LINK SPORTSFIELD 10.00		3.38	3.43	3.46	3.49	3.60	3.72
LINK DITCH 0.00		3.38	3.43	3.46	3.49	3.60	3.72
LINK DITCH 10.00		3.15	3.26	3.31	3.39	3.51	3.64

Scenario 12, 10 year tide, blocked bridge, walnut trees cleared, culvert1 blocked, no stopbank							
	Q2	Q5	Q10	Q20	Q50	Q100	
flow (m3/s)							
Discharge	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	
MARAETOTARA -10.00	11.99	15.68	18.48	21.28	24.84	27.75	
MARAETOTARA 95.00	11.97	15.65	18.45	21.24	24.80	27.70	
MARAETOTARA 240.00	11.94	15.61	18.41	21.16	24.70	27.60	
MARAETOTARA 340.00	11.91	15.58	18.33	21.10	24.61	27.56	
MARAETOTARA 460.00	11.89	15.54	18.24	20.32	22.16	23.39	
MARAETOTARA 598.50	11.81	15.48	18.15	19.90	21.10	21.72	
MARAETOTARA 696.00	11.80	15.46	18.13	19.89	21.09	21.71	
MARAETOTARA 805.48	11.77	15.39	18.09	19.85	21.05	21.64	
MARAETOTARA 926.98	11.75	15.33	18.06	20.01	22.03	25.12	
MARAETOTARA 973.00	11.75	15.32	18.06	20.00	22.02	25.11	
MARAETOTARA 984.00	11.75	15.32	18.06	20.00	22.02	25.11	
MARAETOTARA 1045.00	11.75	15.32	18.06	20.00	22.02	25.12	
MARAETOTARA 1175.00	11.77	15.31	18.07	20.02	22.02	25.13	
MARAETOTARA 1325.00	11.87	15.41	18.17	20.09	22.10	25.20	
RIGHT FLOODPLAIN -10.00	0.00	0.00	0.00	0.00	0.00	0.00	
RIGHT FLOODPLAIN 95.00	0.00	0.00	0.00	0.00	0.00	0.01	
RIGHT FLOODPLAIN 240.00	0.00	0.00	0.00	0.00	0.00	0.00	
RIGHT FLOODPLAIN 340.00	0.00	0.00	0.00	0.00	0.00	0.00	
RIGHT FLOODPLAIN 460.00	0.00	0.00	0.02	0.54	2.06	3.97	
RIGHT FLOODPLAIN 598.50	0.00	0.00	0.00	0.61	2.67	5.19	
RIGHT FLOODPLAIN 695.50	0.00	0.00	0.00	0.45	2.46	5.03	
RIGHT FLOODPLAIN 724.50	0.00	0.00	0.00	0.43	2.42	4.94	
BLUETT ROAD 75.00	0.00	0.00	0.00	0.39	2.30	4.69	
BLUETT ROAD 202.50	0.10	0.17	0.21	0.25	0.31	0.51	
BLUETT ROAD 257.50	0.00	0.01	0.01	0.01	0.01	0.02	
DITCH 2.50	0.09	0.37	0.59	0.92	2.37	4.53	
DITCH 12.50	0.18	0.37	0.59	0.92	2.37	4.53	
DITCH 22.50	0.19	0.37	0.59	0.92	2.37	4.53	
DITCH 27.50	0.19	0.37	0.59	0.92	2.37	4.53	
LINK 7 5.00	0.00	0.00	0.00	0.00	0.00	0.00	
LINK 4 5.00	0.00	0.00	0.05	0.40	1.05	1.66	
LINK 5 5.00	0.00	0.00	0.05	0.76	2.43	4.16	
LINK 6 5.00	0.00	0.00	0.00	0.00	0.00	0.00	
LINK 8 5.00	0.00	0.00	0.00	0.00	0.00	0.05	
LINK 3A 5.00	0.00	0.00	0.00	0.00	0.00	0.00	
LINK 3 5.00	0.00	0.00	0.00	0.00	0.00	0.00	
DRAIN&CULVERTS 7.50	1.40	2.00	2.40	2.69	3.19	3.49	
DRAIN&CULVERTS 16.50	1.39	1.99	2.39	2.69	3.19	3.48	
DRAIN&CULVERTS 19.00	1.39	1.99	2.39	2.69	3.18	3.48	
DRAIN&CULVERTS 21.00	0.51	0.61	0.67	0.72	0.77	0.80	
DRAIN&CULVERTS 26.00	0.48	0.56	0.62	0.67	0.71	0.74	
DRAIN&CULVERTS 80.00	0.01	0.01	0.01	0.01	0.01	0.01	
LINK SPORTSFIELD 5.00	0.26	0.41	0.63	0.64	0.92	1.75	
LINK DITCH 5.00	0.09	0.37	0.59	0.92	2.37	4.52	

Scenario 13, 10 year tide, blocked bridge, walnut trees cleared, culvert1 blocked, stopbank at XS7							
		Q2	Q5	Q10	Q20	Q50	Q100
RL (m)	Cross-section						
Water Level		Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -20.00	XS 9	7.03	7.37	7.61	7.83	8.11	8.31
MARAETOTARA 0.00	XS 8	6.86	7.19	7.42	7.63	7.91	8.11
MARAETOTARA 190.00	XS 7	5.41	5.62	5.76	5.89	6.13	6.26
MARAETOTARA 290.00	XS 6	4.98	5.17	5.29	5.39	5.49	5.57
MARAETOTARA 390.00	XS 5	4.69	4.85	4.94	5.02	5.12	5.19
MARAETOTARA 530.00	XS 4	4.19	4.31	4.38	4.45	4.53	4.61
MARAETOTARA 667.00	XS 3a	3.55	3.69	3.78	3.87	3.97	4.07
MARAETOTARA 725.00	XS 3	3.34	3.48	3.58	3.67	3.78	3.89
MARAETOTARA 885.97	at ditch	2.53	2.72	2.87	3.03	3.24	3.44
MARAETOTARA 968.00	XS 2 u/s	2.09	2.28	2.45	2.64	2.92	3.16
MARAETOTARA 978.00	XS 2 d/s	2.07	2.17	2.24	2.31	2.39	2.46
MARAETOTARA 990.00		2.06	2.16	2.24	2.31	2.39	2.47
MARAETOTARA 1100.00	XS 1	1.91	1.95	1.98	2.02	2.06	2.10
MARAETOTARA 1250.00		1.82	1.82	1.83	1.83	1.83	1.83
MARAETOTARA 1400.00	XS 0	1.82	1.82	1.82	1.82	1.82	1.82
RIGHT FLOODPLAIN -20.00	FPxs 9	6.55	6.55	6.55	6.55	6.55	6.58
RIGHT FLOODPLAIN 0.00	FPxs 8	6.45	6.45	6.45	6.45	6.45	6.58
RIGHT FLOODPLAIN 190.00	FPxs 7	5.48	5.48	5.48	5.48	5.48	5.60
BLUETT ROAD 0.00	BXS 1	3.38	3.43	3.46	3.48	3.52	3.55
BLUETT ROAD 150.00	BXS 2	3.38	3.43	3.46	3.48	3.53	3.55
BLUETT ROAD 255.00	BXS 3	3.38	3.43	3.46	3.48	3.53	3.55
BLUETT ROAD 260.00		3.38	3.43	3.46	3.48	3.53	3.55
DITCH 0.00		3.16	3.26	3.31	3.43	3.52	3.54
DITCH 5.00	DXS 1	3.16	3.26	3.31	3.43	3.52	3.54
DITCH 20.00	DXS 2	3.15	3.26	3.31	3.38	3.48	3.49
DITCH 25.00	DXS 3	2.53	2.72	2.87	3.03	3.24	3.44
DITCH 30.00	DXS 4	2.53	2.72	2.87	3.03	3.24	3.44
LINK 7 0.00		5.41	5.62	5.76	5.89	6.13	6.26
LINK 7 10.00		5.48	5.48	5.48	5.48	5.48	5.60
LINK 8 0.00		6.86	7.19	7.42	7.63	7.91	8.11
LINK 8 10.00		6.45	6.45	6.45	6.45	6.45	6.58
DRAIN&CULVERTS 0.00		3.38	3.43	3.46	3.48	3.53	3.55
DRAIN&CULVERTS 15.00		3.38	3.43	3.46	3.48	3.53	3.55
DRAIN&CULVERTS 18.00		3.38	3.43	3.46	3.48	3.53	3.55
DRAIN&CULVERTS 20.00		3.38	3.43	3.46	3.48	3.53	3.55
DRAIN&CULVERTS 22.00		3.38	3.43	3.46	3.48	3.53	3.55
DRAIN&CULVERTS 30.00		3.38	3.43	3.46	3.48	3.53	3.55
DRAIN&CULVERTS 130.00		2.06	2.16	2.24	2.31	2.39	2.47
LINK SPORTSFIELD 0.00		3.38	3.43	3.46	3.48	3.53	3.55
LINK SPORTSFIELD 10.00		3.38	3.43	3.46	3.48	3.53	3.55
LINK DITCH 0.00		3.38	3.43	3.46	3.48	3.53	3.55
LINK DITCH 10.00		3.16	3.26	3.31	3.43	3.52	3.54
LINK BLUETT 0.00		5.48	5.48	5.48	5.48	5.48	5.60
LINK BLUETT 10.00		3.38	3.43	3.46	3.48	3.52	3.55

Scenario 13, 10 year tide, blocked bridge, walnut trees cleared, culvert1 blocked, stopbank at XS7							
	Q2	Q5	Q10	Q20	Q50	Q100	
flow (m3/s)							
Discharge	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	
MARAETOTARA -10.00	11.99	15.68	18.48	21.28	24.84	27.76	
MARAETOTARA 95.00	11.97	15.65	18.45	21.24	24.80	27.70	
MARAETOTARA 240.00	11.94	15.61	18.41	21.16	24.69	27.59	
MARAETOTARA 340.00	11.91	15.58	18.33	21.09	24.56	27.56	
MARAETOTARA 460.00	11.89	15.54	18.28	21.05	24.50	27.53	
MARAETOTARA 598.50	11.81	15.48	18.23	20.99	24.42	27.47	
MARAETOTARA 696.00	11.80	15.46	18.22	20.97	24.39	27.43	
MARAETOTARA 805.48	11.77	15.39	18.17	20.90	24.27	27.29	
MARAETOTARA 926.98	11.75	15.33	18.13	20.92	24.38	27.55	
MARAETOTARA 973.00	11.75	15.32	18.12	20.89	24.37	27.54	
MARAETOTARA 984.00	11.75	15.32	18.12	20.89	24.37	27.54	
MARAETOTARA 1045.00	11.75	15.32	18.13	20.89	24.37	27.55	
MARAETOTARA 1175.00	11.77	15.31	18.14	20.89	24.38	27.55	
MARAETOTARA 1325.00	11.87	15.41	18.24	20.97	24.48	27.63	
RIGHT FLOODPLAIN -10.00	0.00	0.00	0.00	0.00	0.00	0.00	
RIGHT FLOODPLAIN 95.00	0.00	0.00	0.00	0.00	0.00	0.01	
BLUETT ROAD 75.00	0.00	0.00	0.00	0.00	0.03	0.08	
BLUETT ROAD 202.50	0.10	0.17	0.21	0.24	0.29	0.32	
BLUETT ROAD 257.50	0.00	0.01	0.01	0.01	0.01	0.01	
DITCH 2.50	0.10	0.38	0.60	0.78	1.60	1.76	
DITCH 12.50	0.17	0.38	0.60	0.91	1.75	1.97	
DITCH 22.50	0.18	0.38	0.60	0.84	1.71	1.86	
DITCH 27.50	0.18	0.38	0.60	0.84	1.71	1.86	
LINK 7 5.00	0.00	0.00	0.00	0.00	0.00	0.00	
LINK 8 5.00	0.00	0.00	0.00	0.00	0.00	0.05	
DRAIN&CULVERTS 7.50	1.40	2.00	2.40	2.69	3.19	3.49	
DRAIN&CULVERTS 16.50	1.39	1.99	2.39	2.69	3.19	3.49	
DRAIN&CULVERTS 19.00	1.39	1.99	2.39	2.69	3.18	3.48	
DRAIN&CULVERTS 21.00	0.51	0.61	0.67	0.72	0.77	0.80	
DRAIN&CULVERTS 26.00	0.48	0.56	0.62	0.67	0.71	0.74	
DRAIN&CULVERTS 80.00	0.01	0.01	0.01	0.01	0.01	0.01	
LINK SPORTSFIELD 5.00	0.26	0.40	0.62	0.86	1.51	1.49	
LINK DITCH 5.00	0.10	0.38	0.60	0.78	1.57	1.72	
LINK BLUETT 5.00	0.00	0.00	0.00	0.00	0.00	0.00	

Scenario 14, 10 year tide, blocked bridge, walnut trees cleared, 1.5m diameter at culvert1, no stopbank							
		Q2	Q5	Q10	Q20	Q50	Q100
RL (m)	Cross-section						
Water Level		Maximum	Maximum	Maximum	Maximum	Maximum	Maximum
MARAETOTARA -20.00	XS 9	7.03	7.37	7.61	7.83	8.11	8.31
MARAETOTARA 0.00	XS 8	6.86	7.19	7.42	7.63	7.91	8.11
MARAETOTARA 190.00	XS 7	5.41	5.62	5.76	5.89	6.13	6.26
MARAETOTARA 290.00	XS 6	4.98	5.17	5.29	5.38	5.48	5.55
MARAETOTARA 390.00	XS 5	4.69	4.85	4.94	5.00	5.05	5.09
MARAETOTARA 530.00	XS 4	4.19	4.31	4.38	4.42	4.45	4.47
MARAETOTARA 667.00	XS 3a	3.55	3.69	3.78	3.84	3.88	3.90
MARAETOTARA 725.00	XS 3	3.34	3.49	3.58	3.64	3.68	3.71
MARAETOTARA 885.97	at ditch	2.54	2.74	2.89	2.99	3.09	3.14
MARAETOTARA 968.00	XS 2 u/s	2.13	2.33	2.50	2.63	2.78	2.85
MARAETOTARA 978.00	XS 2 d/s	2.10	2.21	2.29	2.34	2.40	2.44
MARAETOTARA 990.00		2.09	2.21	2.29	2.34	2.41	2.45
MARAETOTARA 1100.00	XS 1	1.92	1.97	2.01	2.03	2.07	2.09
MARAETOTARA 1250.00		1.82	1.82	1.83	1.83	1.83	1.83
MARAETOTARA 1400.00	XS 0	1.82	1.82	1.82	1.82	1.82	1.82
RIGHT FLOODPLAIN -20.00	FPxs 9	6.55	6.55	6.55	6.55	6.55	6.58
RIGHT FLOODPLAIN 0.00	FPxs 8	6.45	6.45	6.45	6.45	6.45	6.58
RIGHT FLOODPLAIN 190.00	FPxs 7	5.48	5.48	5.48	5.48	5.48	5.53
RIGHT FLOODPLAIN 290.00	FPxs 6	5.03	5.03	5.03	5.03	5.03	5.07
RIGHT FLOODPLAIN 390.00	FPxs 5	4.57	4.57	4.67	4.84	4.92	4.97
RIGHT FLOODPLAIN 530.00	FPxs 4	3.79	3.79	3.81	3.96	4.12	4.25
RIGHT FLOODPLAIN 667.00	FPxs 3a	3.37	3.37	3.38	3.70	3.84	3.95
RIGHT FLOODPLAIN 724.00		3.19	3.19	3.22	3.57	3.66	3.73
RIGHT FLOODPLAIN 725.00	FPxs 3	3.19	3.19	3.22	3.55	3.64	3.71
BLUETT ROAD 0.00	BXS 1	3.19	3.19	3.22	3.55	3.64	3.71
BLUETT ROAD 150.00	BXS 2	3.09	3.09	3.10	3.15	3.20	3.41
BLUETT ROAD 255.00	BXS 3	3.09	3.09	3.09	3.11	3.19	3.41
BLUETT ROAD 260.00		3.09	3.09	3.09	3.11	3.19	3.41
DITCH 0.00		2.65	2.65	2.65	2.65	2.95	3.40
DITCH 5.00	DXS 1	2.65	2.65	2.65	2.65	2.95	3.40
DITCH 20.00	DXS 2	3.01	3.01	3.01	3.01	3.07	3.24
DITCH 25.00	DXS 3	2.54	2.74	2.89	2.99	3.09	3.14
DITCH 30.00	DXS 4	2.54	2.74	2.89	2.99	3.09	3.14
LINK 7 0.00		5.41	5.62	5.76	5.89	6.13	6.26
LINK 7 10.00		5.48	5.48	5.48	5.48	5.48	5.53
LINK 4 0.00		4.19	4.31	4.38	4.42	4.45	4.47
LINK 4 10.00		3.79	3.79	3.81	3.96	4.12	4.25
LINK 5 0.00		4.69	4.85	4.94	5.00	5.05	5.09
LINK 5 10.00		4.57	4.57	4.67	4.84	4.92	4.97
LINK 6 0.00		4.98	5.17	5.29	5.38	5.48	5.55
LINK 6 10.00		5.03	5.03	5.03	5.03	5.03	5.07
LINK 8 0.00		6.86	7.19	7.42	7.63	7.91	8.11
LINK 8 10.00		6.45	6.45	6.45	6.45	6.45	6.58
LINK 3A 0.00		3.55	3.69	3.78	3.84	3.88	3.90
LINK 3A 10.00		3.37	3.37	3.38	3.70	3.84	3.95
LINK 3 0.00		3.19	3.19	3.22	3.57	3.66	3.73
LINK 3 10.00		3.34	3.49	3.58	3.64	3.68	3.71
DRAIN&CULVERTS 0.00		2.60	2.75	2.85	2.92	3.11	3.40
DRAIN&CULVERTS 15.00		2.36	2.51	2.61	2.68	3.07	3.40
DRAIN&CULVERTS 18.00		2.32	2.48	2.58	2.66	3.07	3.40
DRAIN&CULVERTS 20.00		2.29	2.45	2.56	2.64	3.07	3.40
DRAIN&CULVERTS 22.00		2.26	2.42	2.53	2.62	3.05	3.40
DRAIN&CULVERTS 30.00		2.16	2.34	2.47	2.56	3.02	3.39
DRAIN&CULVERTS 130.00		2.09	2.21	2.29	2.34	2.41	2.45
LINK SPORTSFIELD 0.00		2.29	2.45	2.56	2.64	3.07	3.40
LINK SPORTSFIELD 10.00		3.09	3.09	3.10	3.15	3.20	3.41
LINK DITCH 0.00		3.09	3.09	3.10	3.15	3.20	3.41
LINK DITCH 10.00		2.64	2.64	2.64	2.64	2.95	3.40

Scenario 14, 10 year tide, blocked bridge, walnut trees cleared, 1.5m diameter at culvert1, no stopbank								
	Q2	Q5	Q10	Q20	Q50	Q100		
flow (m3/s)								
Discharge	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum		
MARAETOTARA -10.00	11.99	15.68	18.48	21.28	24.84	27.75		
MARAETOTARA 95.00	11.97	15.65	18.45	21.24	24.80	27.70		
MARAETOTARA 240.00	11.94	15.61	18.41	21.16	24.70	27.60		
MARAETOTARA 340.00	11.91	15.58	18.33	21.10	24.61	27.56		
MARAETOTARA 460.00	11.89	15.54	18.24	20.32	22.16	23.39		
MARAETOTARA 598.50	11.81	15.48	18.15	19.89	21.09	21.70		
MARAETOTARA 696.00	11.80	15.46	18.13	19.88	21.08	21.70		
MARAETOTARA 805.48	11.77	15.39	18.09	19.84	21.03	21.67		
MARAETOTARA 926.98	11.76	15.34	18.04	19.80	20.90	21.62		
MARAETOTARA 973.00	11.76	15.34	18.04	19.81	20.89	21.61		
MARAETOTARA 984.00	11.76	15.34	18.04	19.81	20.88	21.61		
MARAETOTARA 1045.00	12.93	17.08	20.17	22.25	25.08	26.83		
MARAETOTARA 1175.00	12.92	17.06	20.15	22.24	25.09	26.84		
MARAETOTARA 1325.00	12.98	17.02	20.08	22.17	25.17	26.91		
RIGHT FLOODPLAIN -10.00	0.00	0.00	0.00	0.00	0.00	0.00		
RIGHT FLOODPLAIN 95.00	0.00	0.00	0.00	0.00	0.00	0.01		
RIGHT FLOODPLAIN 240.00	0.00	0.00	0.00	0.00	0.00	0.00		
RIGHT FLOODPLAIN 340.00	0.00	0.00	0.00	0.00	0.00	0.00		
RIGHT FLOODPLAIN 460.00	0.00	0.00	0.02	0.54	2.06	3.97		
RIGHT FLOODPLAIN 598.50	0.00	0.00	0.00	0.61	2.69	5.22		
RIGHT FLOODPLAIN 695.50	0.00	0.00	0.00	0.45	2.58	5.12		
RIGHT FLOODPLAIN 724.50	0.00	0.00	0.00	0.44	2.57	5.10		
BLUETT ROAD 75.00	0.00	0.00	0.00	0.42	2.55	5.04		
BLUETT ROAD 202.50	0.00	0.00	0.00	0.00	0.02	0.17		
BLUETT ROAD 257.50	0.00	0.00	0.00	0.00	0.00	0.01		
DITCH 2.50	0.00	0.00	0.00	0.00	0.00	0.17		
DITCH 12.50	0.00	0.00	0.00	0.00	0.00	0.15		
DITCH 22.50	0.00	0.00	0.00	0.00	0.00	0.15		
DITCH 27.50	0.00	0.00	0.01	0.01	0.01	0.15		
LINK 7 5.00	0.00	0.00	0.00	0.00	0.00	0.00		
LINK 4 5.00	0.00	0.00	0.05	0.41	1.06	1.68		
LINK 5 5.00	0.00	0.00	0.05	0.76	2.43	4.16		
LINK 6 5.00	0.00	0.00	0.00	0.00	0.00	0.00		
LINK 8 5.00	0.00	0.00	0.00	0.00	0.00	0.05		
LINK 3A 5.00	0.00	0.00	0.00	0.00	0.00	0.00		
LINK 3 5.00	0.00	0.00	0.00	0.00	0.00	0.00		
DRAIN&CULVERTS 7.50	1.40	2.00	2.40	2.70	3.20	3.50		
DRAIN&CULVERTS 16.50	1.40	2.00	2.40	2.70	3.19	3.49		
DRAIN&CULVERTS 19.00	1.40	2.00	2.40	2.70	3.19	3.48		
DRAIN&CULVERTS 21.00	1.40	2.00	2.40	2.70	4.30	5.34		
DRAIN&CULVERTS 26.00	1.40	2.00	2.40	2.70	4.30	5.34		
DRAIN&CULVERTS 80.00	1.39	1.98	2.39	2.68	4.29	5.34		
LINK SPORTSFIELD 5.00	0.00	0.00	0.00	0.00	0.00	0.00		
LINK DITCH 5.00	0.00	0.00	0.00	0.00	0.00	0.18		

Scenario 15, 10 year tide, blocked bridge, walnut trees cleared, 1.5m diameter at culvert1, stopbank at XS7								
		Q2	Q5	Q10	Q20	Q50	Q100	
RL (m)	Cross-section							
Water Level		Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	
MARAETOTARA -20.00	XS 9	7.03	7.37	7.61	7.83	8.11	8.31	
MARAETOTARA 0.00	XS 8	6.86	7.19	7.42	7.63	7.91	8.11	
MARAETOTARA 190.00	XS 7	5.41	5.62	5.76	5.89	6.13	6.26	
MARAETOTARA 290.00	XS 6	4.98	5.17	5.29	5.39	5.49	5.57	
MARAETOTARA 390.00	XS 5	4.69	4.85	4.94	5.02	5.12	5.19	
MARAETOTARA 530.00	XS 4	4.19	4.31	4.38	4.45	4.53	4.61	
MARAETOTARA 667.00	XS 3a	3.55	3.69	3.78	3.87	3.98	4.08	
MARAETOTARA 725.00	XS 3	3.34	3.49	3.58	3.67	3.79	3.90	
MARAETOTARA 885.97	at ditch	2.54	2.74	2.89	3.05	3.26	3.45	
MARAETOTARA 968.00	XS 2 u/s	2.13	2.33	2.50	2.70	2.97	3.19	
MARAETOTARA 978.00	XS 2 d/s	2.10	2.21	2.29	2.36	2.44	2.51	
MARAETOTARA 990.00		2.09	2.21	2.29	2.36	2.45	2.52	
MARAETOTARA 1100.00	XS 1	1.92	1.97	2.01	2.05	2.09	2.13	
MARAETOTARA 1250.00		1.82	1.82	1.83	1.83	1.83	1.83	
MARAETOTARA 1400.00	XS 0	1.82	1.82	1.82	1.82	1.82	1.82	
RIGHT FLOODPLAIN -20.00	FPxs 9	6.55	6.55	6.55	6.55	6.55	6.58	
RIGHT FLOODPLAIN 0.00	FPxs 8	6.45	6.45	6.45	6.45	6.45	6.58	
RIGHT FLOODPLAIN 190.00	FPxs 7	5.48	5.48	5.48	5.48	5.48	5.60	
BLUETT ROAD 0.00	BXS 1	3.19	3.19	3.19	3.19	3.19	3.19	
BLUETT ROAD 150.00	BXS 2	3.09	3.09	3.09	3.09	3.09	3.14	
BLUETT ROAD 255.00	BXS 3	3.09	3.09	3.09	3.09	3.09	3.10	
BLUETT ROAD 260.00		3.09	3.09	3.09	3.09	3.09	3.10	
DITCH 0.00		2.65	2.65	2.65	2.77	3.26	3.42	
DITCH 5.00	DXS 1	2.65	2.65	2.65	2.77	3.26	3.42	
DITCH 20.00	DXS 2	3.01	3.01	3.01	3.04	3.26	3.44	
DITCH 25.00	DXS 3	2.54	2.74	2.89	3.05	3.26	3.45	
DITCH 30.00	DXS 4	2.54	2.74	2.89	3.05	3.26	3.45	
LINK 7 0.00		5.41	5.62	5.76	5.89	6.13	6.26	
LINK 7 10.00		5.48	5.48	5.48	5.48	5.48	5.60	
LINK 8 0.00		6.86	7.19	7.42	7.63	7.91	8.11	
LINK 8 10.00		6.45	6.45	6.45	6.45	6.45	6.58	
DRAIN&CULVERTS 0.00		2.60	2.75	2.85	2.92	3.03	3.12	
DRAIN&CULVERTS 15.00		2.36	2.51	2.61	2.68	2.82	2.94	
DRAIN&CULVERTS 18.00		2.32	2.48	2.58	2.67	2.81	2.93	
DRAIN&CULVERTS 20.00		2.29	2.45	2.56	2.65	2.79	2.92	
DRAIN&CULVERTS 22.00		2.26	2.42	2.53	2.62	2.77	2.90	
DRAIN&CULVERTS 30.00		2.16	2.34	2.47	2.57	2.73	2.87	
DRAIN&CULVERTS 130.00		2.09	2.21	2.29	2.36	2.45	2.52	
LINK SPORTSFIELD 0.00		2.29	2.45	2.56	2.65	2.79	2.92	
LINK SPORTSFIELD 10.00		3.09	3.09	3.09	3.09	3.09	3.14	
LINK DITCH 0.00		3.09	3.09	3.09	3.09	3.09	3.14	
LINK DITCH 10.00		2.64	2.64	2.64	2.77	3.26	3.42	
LINK BLUETT 0.00		5.48	5.48	5.48	5.48	5.48	5.60	
LINK BLUETT 10.00		3.19	3.19	3.19	3.19	3.19	3.19	

Scenario 15, 10 year tide, blocked bridge, walnut trees cleared, 1.5m diameter at culvert1, stopbank at XS7								
	Q2	Q5	Q10	Q20	Q50	Q100		
flow (m3/s)								
Discharge	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum		
MARAETOTARA -10.00	11.99	15.68	18.48	21.28	24.84	27.76		
MARAETOTARA 95.00	11.97	15.65	18.45	21.24	24.80	27.70		
MARAETOTARA 240.00	11.94	15.61	18.41	21.16	24.69	27.59		
MARAETOTARA 340.00	11.91	15.58	18.33	21.09	24.56	27.55		
MARAETOTARA 460.00	11.89	15.54	18.28	21.05	24.50	27.53		
MARAETOTARA 598.50	11.81	15.48	18.23	20.99	24.42	27.47		
MARAETOTARA 696.00	11.80	15.46	18.22	20.97	24.39	27.43		
MARAETOTARA 805.48	11.77	15.39	18.17	20.90	24.29	27.33		
MARAETOTARA 926.98	11.76	15.34	18.11	20.83	24.14	27.01		
MARAETOTARA 973.00	11.76	15.34	18.12	20.83	24.15	27.02		
MARAETOTARA 984.00	11.76	15.34	18.12	20.83	24.15	27.02		
MARAETOTARA 1045.00	12.93	17.08	20.23	23.18	26.87	30.18		
MARAETOTARA 1175.00	12.92	17.06	20.21	23.17	26.85	30.17		
MARAETOTARA 1325.00	12.98	17.02	20.14	23.10	26.81	30.19		
RIGHT FLOODPLAIN -10.00	0.00	0.00	0.00	0.00	0.00	0.00		
RIGHT FLOODPLAIN 95.00	0.00	0.00	0.00	0.00	0.00	0.01		
BLUETT ROAD 75.00	0.00	0.00	0.00	0.00	0.00	0.00		
BLUETT ROAD 202.50	0.00	0.00	0.00	0.00	0.00	0.00		
BLUETT ROAD 257.50	0.00	0.00	0.00	0.00	0.00	0.00		
DITCH 2.50	0.00	0.00	0.00	0.00	0.00	0.01		
DITCH 12.50	0.00	0.00	0.00	0.00	0.02	0.03		
DITCH 22.50	0.00	0.00	0.00	0.00	0.02	0.04		
DITCH 27.50	0.00	0.00	0.01	0.01	0.03	0.05		
LINK 7 5.00	0.00	0.00	0.00	0.00	0.00	0.00		
LINK 8 5.00	0.00	0.00	0.00	0.00	0.00	0.05		
DRAIN&CULVERTS 7.50	1.40	2.00	2.40	2.70	3.20	3.50		
DRAIN&CULVERTS 16.50	1.40	2.00	2.40	2.70	3.19	3.49		
DRAIN&CULVERTS 19.00	1.40	2.00	2.40	2.70	3.19	3.49		
DRAIN&CULVERTS 21.00	1.40	2.00	2.40	2.70	3.19	3.51		
DRAIN&CULVERTS 26.00	1.40	2.00	2.40	2.69	3.19	3.51		
DRAIN&CULVERTS 80.00	1.39	1.98	2.39	2.68	3.17	3.49		
LINK SPORTSFIELD 5.00	0.00	0.00	0.00	0.00	0.00	0.00		
LINK DITCH 5.00	0.00	0.00	0.00	0.00	0.00	0.00		
LINK BLUETT 5.00	0.00	0.00	0.00	0.00	0.00	0.00		

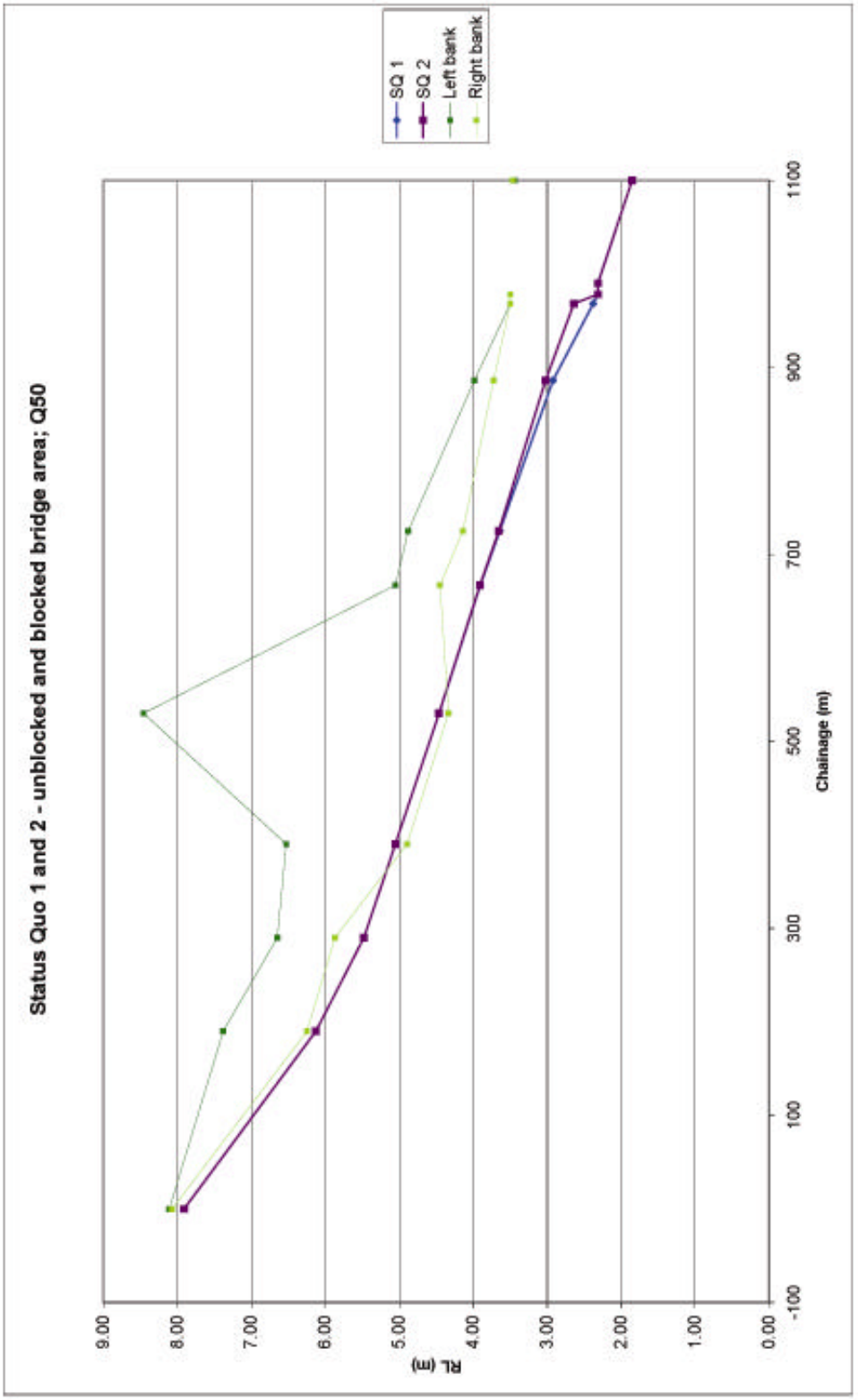
Scenario 16, 10 year tide, blocked bridge, walnut trees cleared, add. culvert under Bluett Rd, no stopbank								
		Q2	Q5	Q10	Q20	Q50	Q100	
RL (m)	Cross-section							
Water Level		Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	
MARAETOTARA -20.00	XS 9	7.03	7.37	7.61	7.83	8.11	8.31	
MARAETOTARA 0.00	XS 8	6.86	7.19	7.42	7.63	7.91	8.11	
MARAETOTARA 190.00	XS 7	5.41	5.62	5.76	5.89	6.13	6.26	
MARAETOTARA 290.00	XS 6	4.98	5.17	5.29	5.38	5.48	5.55	
MARAETOTARA 390.00	XS 5	4.69	4.85	4.94	5.00	5.05	5.09	
MARAETOTARA 530.00	XS 4	4.19	4.31	4.38	4.42	4.45	4.47	
MARAETOTARA 667.00	XS 3a	3.55	3.69	3.78	3.84	3.87	3.90	
MARAETOTARA 725.00	XS 3	3.34	3.48	3.58	3.63	3.67	3.71	
MARAETOTARA 885.97	at ditch	2.53	2.72	2.86	2.96	3.04	3.21	
MARAETOTARA 960.00		2.19	2.38	2.55	2.67	2.77	2.99	
MARAETOTARA 968.00	XS 2 u/s	2.13	2.32	2.49	2.61	2.71	2.94	
MARAETOTARA 978.00	XS 2 d/s	2.10	2.20	2.27	2.32	2.35	2.42	
MARAETOTARA 990.00		2.10	2.20	2.27	2.32	2.35	2.42	
MARAETOTARA 1100.00	XS 1	1.92	1.97	2.00	2.02	2.04	2.07	
MARAETOTARA 1250.00		1.82	1.82	1.83	1.83	1.83	1.83	
MARAETOTARA 1400.00	XS 0	1.82	1.82	1.82	1.82	1.82	1.82	
RIGHT FLOODPLAIN -20.00	FPxs 9	6.55	6.55	6.55	6.55	6.55	6.58	
RIGHT FLOODPLAIN 0.00	FPxs 8	6.45	6.45	6.45	6.45	6.45	6.58	
RIGHT FLOODPLAIN 190.00	FPxs 7	5.48	5.48	5.48	5.48	5.48	5.53	
RIGHT FLOODPLAIN 290.00	FPxs 6	5.03	5.03	5.03	5.03	5.03	5.07	
RIGHT FLOODPLAIN 390.00	FPxs 5	4.57	4.57	4.67	4.84	4.92	4.97	
RIGHT FLOODPLAIN 530.00	FPxs 4	3.79	3.79	3.81	3.96	4.12	4.25	
RIGHT FLOODPLAIN 667.00	FPxs 3a	3.37	3.37	3.38	3.70	3.84	3.96	
RIGHT FLOODPLAIN 724.00		3.19	3.19	3.25	3.57	3.67	3.77	
RIGHT FLOODPLAIN 725.00	FPxs 3	3.19	3.19	3.25	3.56	3.66	3.76	
BLUETT ROAD 0.00	BXS 1	3.19	3.19	3.25	3.56	3.66	3.76	
BLUETT ROAD 150.00	BXS 2	3.09	3.18	3.25	3.29	3.46	3.62	
BLUETT ROAD 255.00	BXS 3	3.09	3.14	3.24	3.29	3.46	3.62	
BLUETT ROAD 260.00		3.09	3.14	3.24	3.29	3.46	3.62	
DITCH 0.00		2.65	2.65	2.65	2.65	3.43	3.55	
DITCH 5.00	DXS 1	2.65	2.65	2.65	2.65	3.43	3.54	
DITCH 20.00	DXS 2	3.01	3.01	3.01	3.01	3.37	3.53	
DITCH 25.00	DXS 3	2.53	2.72	2.86	2.96	3.04	3.21	
DITCH 30.00	DXS 4	2.53	2.72	2.86	2.96	3.04	3.21	
LINK 7 0.00		5.41	5.62	5.76	5.89	6.13	6.26	
LINK 7 10.00		5.48	5.48	5.48	5.48	5.48	5.53	
LINK 4 0.00		4.19	4.31	4.38	4.42	4.45	4.47	
LINK 4 10.00		3.79	3.79	3.81	3.96	4.12	4.25	
LINK 5 0.00		4.69	4.85	4.94	5.00	5.05	5.09	
LINK 5 10.00		4.57	4.57	4.67	4.84	4.92	4.97	
LINK 6 0.00		4.98	5.17	5.29	5.38	5.48	5.55	
LINK 6 10.00		5.03	5.03	5.03	5.03	5.03	5.07	
LINK 8 0.00		6.86	7.19	7.42	7.63	7.91	8.11	
LINK 8 10.00		6.45	6.45	6.45	6.45	6.45	6.58	
LINK 3A 0.00		3.55	3.69	3.78	3.84	3.87	3.90	
LINK 3A 10.00		3.37	3.37	3.38	3.70	3.84	3.96	
LINK 3 0.00		3.19	3.19	3.25	3.57	3.67	3.77	
LINK 3 10.00		3.34	3.48	3.58	3.63	3.67	3.71	
DRAIN&CULVERTS 0.00		2.89	3.20	3.26	3.30	3.46	3.62	
DRAIN&CULVERTS 15.00		2.84	3.19	3.25	3.29	3.46	3.62	
DRAIN&CULVERTS 18.00		2.85	3.19	3.25	3.29	3.46	3.62	
DRAIN&CULVERTS 20.00		2.84	3.18	3.25	3.29	3.46	3.62	
DRAIN&CULVERTS 22.00		2.84	3.18	3.25	3.29	3.46	3.62	
DRAIN&CULVERTS 30.00		2.84	3.18	3.24	3.29	3.46	3.62	
DRAIN&CULVERTS 130.00		2.10	2.20	2.27	2.32	2.35	2.42	
LINK SPORTSFIELD 0.00		2.84	3.18	3.25	3.29	3.46	3.62	
LINK SPORTSFIELD 10.00		3.09	3.18	3.25	3.29	3.46	3.62	
LINK DITCH 0.00		3.09	3.18	3.25	3.29	3.46	3.62	
LINK DITCH 10.00		2.64	2.64	2.64	2.64	3.43	3.55	
ADD CULVERT 0.00		0.99	2.38	2.57	2.73	3.36	3.60	
ADD CULVERT 40.00		2.19	2.38	2.55	2.67	2.77	2.99	
LINK ADD CULVERT 0.00		2.84	3.18	3.25	3.29	3.46	3.62	
LINK ADD CULVERT 10.00		0.99	2.38	2.57	2.73	3.36	3.60	

Scenario 16, 10 year tide, blocked bridge, walnut trees cleared, add. culvert under Bluett Rd, no stopbank								
	Q2	Q5	Q10	Q20	Q50	Q100		
flow (m3/s)								
Discharge	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum		
MARAETOTARA -10.00	11.99	15.68	18.48	21.28	24.84	27.75		
MARAETOTARA 95.00	11.97	15.65	18.45	21.24	24.80	27.70		
MARAETOTARA 240.00	11.94	15.61	18.41	21.16	24.70	27.60		
MARAETOTARA 340.00	11.91	15.58	18.33	21.10	24.61	27.56		
MARAETOTARA 460.00	11.89	15.54	18.24	20.32	22.16	23.39		
MARAETOTARA 598.50	11.81	15.48	18.15	19.90	21.10	21.72		
MARAETOTARA 696.00	11.80	15.46	18.13	19.89	21.09	21.71		
MARAETOTARA 805.48	11.77	15.39	18.09	19.85	21.06	21.67		
MARAETOTARA 922.98	11.75	15.33	18.00	19.77	20.98	23.54		
MARAETOTARA 964.00	11.75	15.33	18.10	19.91	21.29	24.10		
MARAETOTARA 973.00	11.75	15.33	18.10	19.91	21.29	24.10		
MARAETOTARA 984.00	11.75	15.33	18.09	19.91	21.29	24.10		
MARAETOTARA 1045.00	12.99	16.82	19.57	21.37	22.80	25.72		
MARAETOTARA 1175.00	12.98	16.80	19.56	21.37	22.81	25.73		
MARAETOTARA 1325.00	13.08	16.90	19.65	21.47	22.90	25.81		
RIGHT FLOODPLAIN -10.00	0.00	0.00	0.00	0.00	0.00	0.00		
RIGHT FLOODPLAIN 95.00	0.00	0.00	0.00	0.00	0.00	0.01		
RIGHT FLOODPLAIN 240.00	0.00	0.00	0.00	0.00	0.00	0.00		
RIGHT FLOODPLAIN 340.00	0.00	0.00	0.00	0.00	0.00	0.00		
RIGHT FLOODPLAIN 460.00	0.00	0.00	0.02	0.54	2.06	3.97		
RIGHT FLOODPLAIN 598.50	0.00	0.00	0.00	0.61	2.68	5.18		
RIGHT FLOODPLAIN 695.50	0.00	0.00	0.00	0.45	2.50	5.05		
RIGHT FLOODPLAIN 724.50	0.00	0.00	0.00	0.44	2.47	4.98		
BLUETT ROAD 75.00	0.00	0.00	0.00	0.43	2.39	4.75		
BLUETT ROAD 202.50	0.00	0.01	0.04	0.06	0.21	0.40		
BLUETT ROAD 257.50	0.00	0.00	0.00	0.00	0.01	0.02		
DITCH 2.50	0.00	0.00	0.00	0.00	0.66	2.71		
DITCH 12.50	0.00	0.00	0.00	0.00	0.83	2.71		
DITCH 22.50	0.00	0.00	0.00	0.00	0.81	2.71		
DITCH 27.50	0.00	0.00	0.01	0.01	0.80	2.71		
LINK 7 5.00	0.00	0.00	0.00	0.00	0.00	0.00		
LINK 4 5.00	0.00	0.00	0.05	0.40	1.05	1.66		
LINK 5 5.00	0.00	0.00	0.05	0.76	2.43	4.16		
LINK 6 5.00	0.00	0.00	0.00	0.00	0.00	0.00		
LINK 8 5.00	0.00	0.00	0.00	0.00	0.00	0.05		
LINK 3A 5.00	0.00	0.00	0.00	0.00	0.00	0.00		
LINK 3 5.00	0.00	0.00	0.00	0.00	0.00	0.00		
DRAIN&CULVERTS 7.50	1.39	2.00	2.40	2.70	3.20	3.49		
DRAIN&CULVERTS 16.50	1.38	1.99	2.39	2.69	3.19	3.48		
DRAIN&CULVERTS 19.00	1.38	1.99	2.39	2.69	3.19	3.48		
DRAIN&CULVERTS 21.00	1.38	1.78	1.85	1.82	1.79	1.76		
DRAIN&CULVERTS 26.00	1.37	1.75	1.81	1.78	1.75	1.76		
DRAIN&CULVERTS 80.00	1.33	1.50	1.50	1.54	1.65	1.79		
LINK SPORTSFIELD 5.00	0.00	0.15	0.21	0.26	0.28	0.00		
LINK DITCH 5.00	0.00	0.00	0.00	0.00	0.62	2.71		
ADD CULVERT 20.00	0.00	0.03	0.11	0.19	0.60	0.73		
LINK ADD CULVERT 5.00	0.00	0.04	0.11	0.19	0.59	0.72		

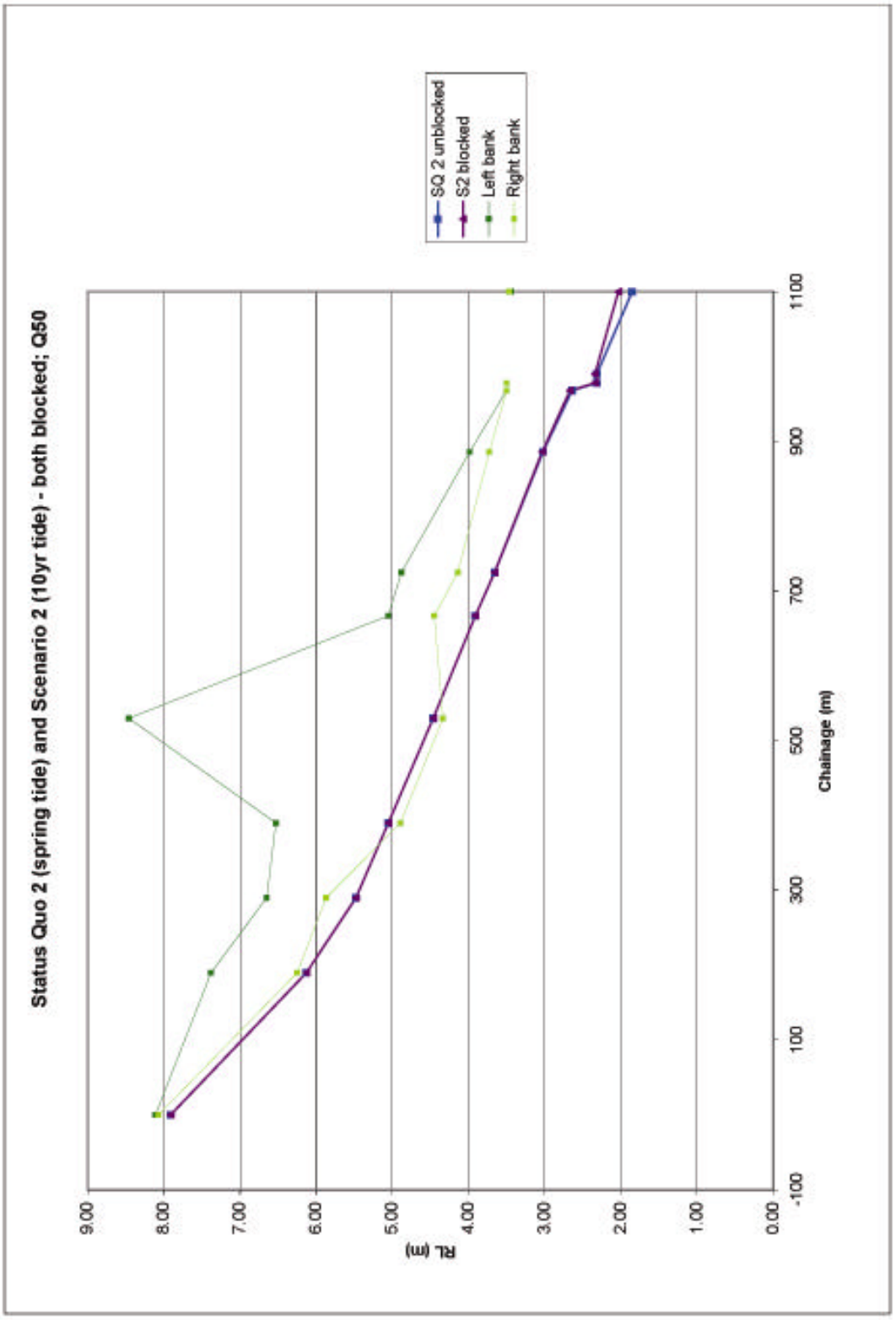
Scenario 17, 10 year tide, blocked bridge, walnut trees cleared, add. culvert under Bluett Rd, stopbank at XS7								
		Q2	Q5	Q10	Q20	Q50	Q100	
RL (m)	Cross-section							
Water Level		Maximum	Maximum	Maximum	Maximum	Maximum	Maximum	
MARAETOTARA -20.00	XS 9	7.03	7.37	7.61	7.83	8.11	8.31	
MARAETOTARA 0.00	XS 8	6.86	7.19	7.42	7.63	7.91	8.11	
MARAETOTARA 190.00	XS 7	5.41	5.62	5.76	5.89	6.13	6.26	
MARAETOTARA 290.00	XS 6	4.98	5.17	5.29	5.39	5.49	5.57	
MARAETOTARA 390.00	XS 5	4.69	4.85	4.94	5.02	5.12	5.19	
MARAETOTARA 530.00	XS 4	4.19	4.31	4.38	4.45	4.53	4.61	
MARAETOTARA 667.00	XS 3a	3.55	3.69	3.78	3.87	3.97	4.07	
MARAETOTARA 725.00	XS 3	3.34	3.48	3.58	3.67	3.78	3.89	
MARAETOTARA 885.97	at ditch	2.53	2.72	2.87	3.02	3.23	3.42	
MARAETOTARA 960.00		2.19	2.38	2.55	2.74	3.00	3.22	
MARAETOTARA 968.00	XS 2 u/s	2.13	2.32	2.49	2.68	2.95	3.17	
MARAETOTARA 978.00	XS 2 d/s	2.10	2.20	2.27	2.34	2.42	2.48	
MARAETOTARA 990.00		2.10	2.20	2.27	2.34	2.42	2.49	
MARAETOTARA 1100.00	XS 1	1.92	1.97	2.00	2.04	2.08	2.11	
MARAETOTARA 1250.00		1.82	1.82	1.83	1.83	1.83	1.83	
MARAETOTARA 1400.00	XS 0	1.82	1.82	1.82	1.82	1.82	1.82	
RIGHT FLOODPLAIN -20.00	FPxs 9	6.55	6.55	6.55	6.55	6.55	6.58	
RIGHT FLOODPLAIN 0.00	FPxs 8	6.45	6.45	6.45	6.45	6.45	6.58	
RIGHT FLOODPLAIN 190.00	FPxs 7	5.48	5.48	5.48	5.48	5.48	5.60	
BLUETT ROAD 0.00	BXS 1	3.19	3.19	3.25	3.29	3.34	3.39	
BLUETT ROAD 150.00	BXS 2	3.09	3.18	3.25	3.29	3.34	3.39	
BLUETT ROAD 255.00	BXS 3	3.09	3.14	3.24	3.28	3.34	3.39	
BLUETT ROAD 260.00		3.09	3.14	3.24	3.28	3.34	3.39	
DITCH 0.00		2.65	2.65	2.65	2.65	3.22	3.40	
DITCH 5.00	DXS 1	2.65	2.65	2.65	2.65	3.22	3.40	
DITCH 20.00	DXS 2	3.01	3.01	3.01	3.02	3.22	3.42	
DITCH 25.00	DXS 3	2.53	2.72	2.87	3.02	3.23	3.42	
DITCH 30.00	DXS 4	2.53	2.72	2.87	3.02	3.23	3.42	
LINK 7 0.00		5.41	5.62	5.76	5.89	6.13	6.26	
LINK 7 10.00		5.48	5.48	5.48	5.48	5.48	5.60	
LINK 8 0.00		6.86	7.19	7.42	7.63	7.91	8.11	
LINK 8 10.00		6.45	6.45	6.45	6.45	6.45	6.58	
DRAIN&CULVERTS 0.00		2.89	3.20	3.26	3.30	3.35	3.40	
DRAIN&CULVERTS 15.00		2.84	3.19	3.25	3.29	3.34	3.39	
DRAIN&CULVERTS 18.00		2.85	3.19	3.25	3.29	3.34	3.39	
DRAIN&CULVERTS 20.00		2.84	3.18	3.25	3.29	3.34	3.39	
DRAIN&CULVERTS 22.00		2.84	3.18	3.25	3.29	3.34	3.39	
DRAIN&CULVERTS 30.00		2.84	3.18	3.24	3.28	3.34	3.39	
DRAIN&CULVERTS 130.00		2.10	2.20	2.27	2.34	2.42	2.49	
LINK SPORTSFIELD 0.00		2.84	3.18	3.25	3.29	3.34	3.39	
LINK SPORTSFIELD 10.00		3.09	3.18	3.25	3.29	3.34	3.39	
LINK DITCH 0.00		3.09	3.18	3.25	3.29	3.34	3.39	
LINK DITCH 10.00		2.64	2.64	2.64	2.65	3.22	3.40	
LINK BLUETT 0.00		5.48	5.48	5.48	5.48	5.48	5.60	
LINK BLUETT 10.00		3.19	3.19	3.25	3.29	3.34	3.39	
ADD CULVERT 0.00		0.99	2.38	2.57	2.80	3.16	3.36	
ADD CULVERT 40.00		2.19	2.38	2.55	2.74	3.00	3.22	
LINK ADD CULVERT 0.00		2.84	3.18	3.25	3.29	3.34	3.39	
LINK ADD CULVERT 10.00		0.99	2.38	2.57	2.80	3.16	3.36	

Scenario 17, 10 year tide, blocked bridge, walnut trees cleared, add. culvert under Bluett Rd, stopbank at XS7								
	Q2	Q5	Q10	Q20	Q50	Q100		
flow (m3/s)								
Discharge	Maximum	Maximum	Maximum	Maximum	Maximum	Maximum		
MARAETOTARA -10.00	11.99	15.68	18.48	21.28	24.84	27.76		
MARAETOTARA 95.00	11.97	15.65	18.45	21.24	24.80	27.70		
MARAETOTARA 240.00	11.94	15.61	18.41	21.16	24.69	27.59		
MARAETOTARA 340.00	11.91	15.58	18.33	21.09	24.56	27.56		
MARAETOTARA 460.00	11.89	15.54	18.28	21.05	24.50	27.53		
MARAETOTARA 598.50	11.81	15.48	18.23	20.99	24.42	27.47		
MARAETOTARA 696.00	11.80	15.46	18.22	20.97	24.39	27.43		
MARAETOTARA 805.48	11.77	15.39	18.17	20.90	24.29	27.32		
MARAETOTARA 922.98	11.75	15.33	18.08	20.78	24.09	27.03		
MARAETOTARA 964.00	11.75	15.33	18.17	20.93	24.34	27.28		
MARAETOTARA 973.00	11.75	15.33	18.17	20.93	24.34	27.28		
MARAETOTARA 984.00	11.75	15.33	18.17	20.93	24.34	27.28		
MARAETOTARA 1045.00	12.99	16.82	19.64	22.37	25.75	28.68		
MARAETOTARA 1175.00	12.98	16.80	19.63	22.36	25.76	28.69		
MARAETOTARA 1325.00	13.08	16.90	19.72	22.45	25.86	28.78		
RIGHT FLOODPLAIN -10.00	0.00	0.00	0.00	0.00	0.00	0.00		
RIGHT FLOODPLAIN 95.00	0.00	0.00	0.00	0.00	0.00	0.01		
BLUETT ROAD 75.00	0.00	0.00	0.00	0.00	0.00	0.00		
BLUETT ROAD 202.50	0.00	0.01	0.04	0.06	0.09	0.15		
BLUETT ROAD 257.50	0.00	0.00	0.00	0.00	0.01	0.01		
DITCH 2.50	0.00	0.00	0.00	0.00	0.01	0.08		
DITCH 12.50	0.00	0.00	0.00	0.00	0.02	0.10		
DITCH 22.50	0.00	0.00	0.00	0.00	0.02	0.10		
DITCH 27.50	0.00	0.00	0.01	0.01	0.03	0.11		
LINK 7 5.00	0.00	0.00	0.00	0.00	0.00	0.00		
LINK 8 5.00	0.00	0.00	0.00	0.00	0.00	0.05		
DRAIN&CULVERTS 7.50	1.39	2.00	2.40	2.70	3.20	3.50		
DRAIN&CULVERTS 16.50	1.38	1.99	2.39	2.69	3.19	3.49		
DRAIN&CULVERTS 19.00	1.38	1.99	2.39	2.69	3.19	3.49		
DRAIN&CULVERTS 21.00	1.38	1.78	1.85	1.82	1.79	1.58		
DRAIN&CULVERTS 26.00	1.37	1.75	1.81	1.78	1.75	1.56		
DRAIN&CULVERTS 80.00	1.33	1.50	1.50	1.50	1.48	1.44		
LINK SPORTSFIELD 5.00	0.00	0.15	0.21	0.26	0.28	0.30		
LINK DITCH 5.00	0.00	0.00	0.00	0.00	0.00	0.08		
LINK BLUETT 5.00	0.00	0.00	0.00	0.00	0.00	0.00		
ADD CULVERT 20.00	0.00	0.03	0.12	0.18	0.31	0.34		
LINK ADD CULVERT 5.00	0.00	0.04	0.11	0.18	0.30	0.33		

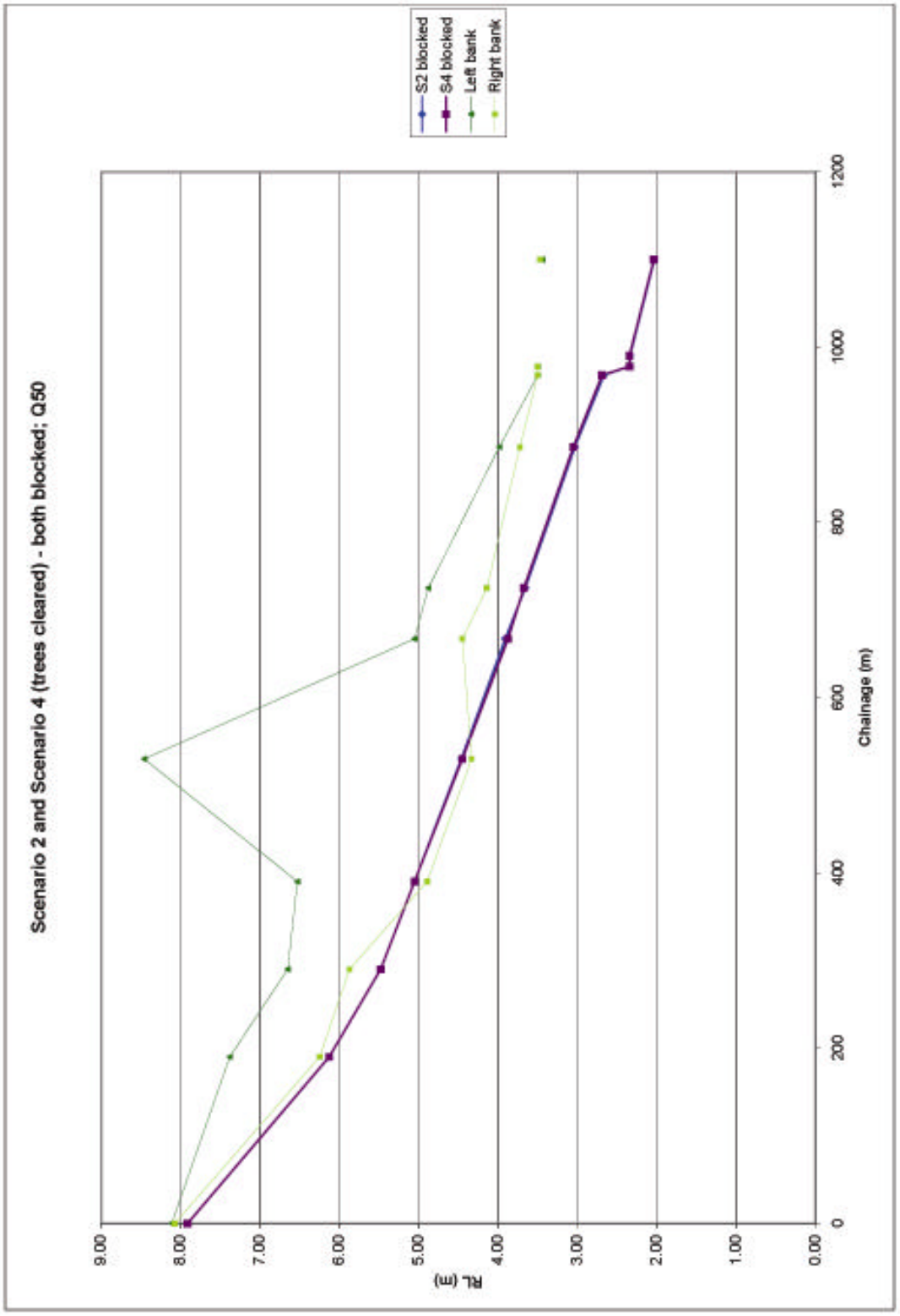
Appendix 2 – Comparison of Water Levels in Maraetotara Stream of Status Quo 1 and Status Quo 2 - Q50



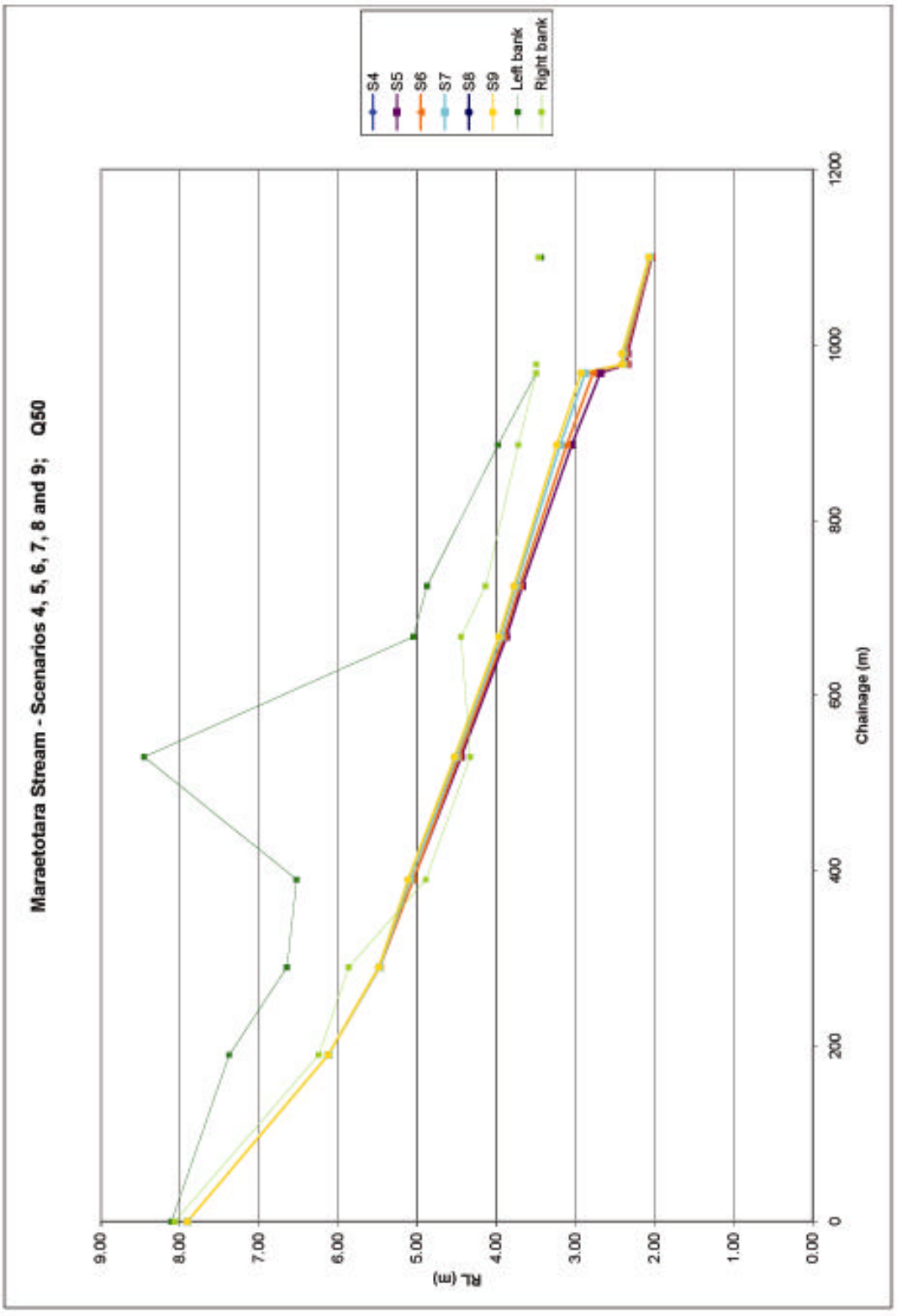
Appendix 3 – Comparison of Water Levels in Maraetotara Stream of Status Quo 2 and Scenario 2 – Q50



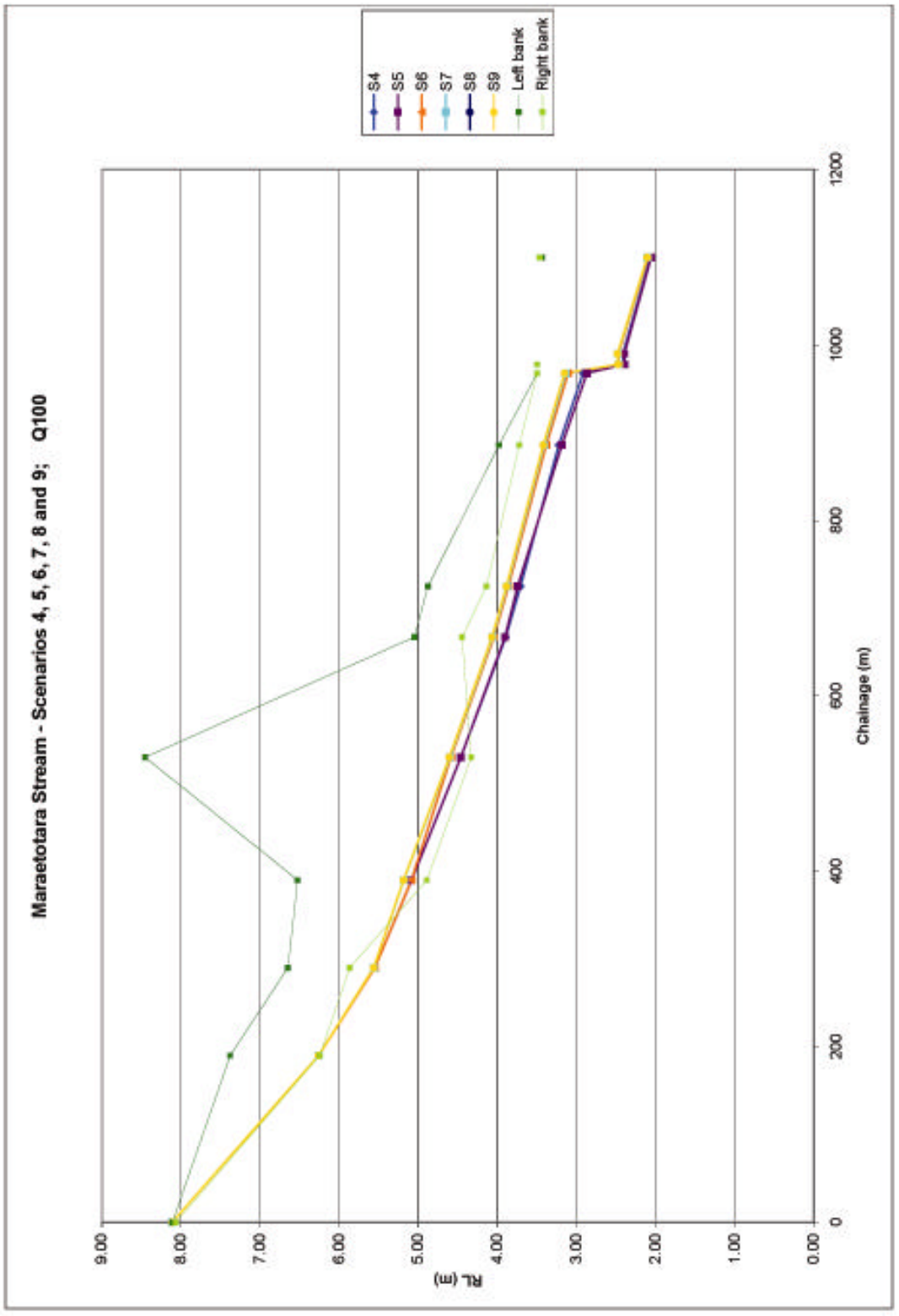
Appendix 4 – Comparison of Water Levels in Maraetotara Stream of Scenario 2 and Scenario 4 – Q50



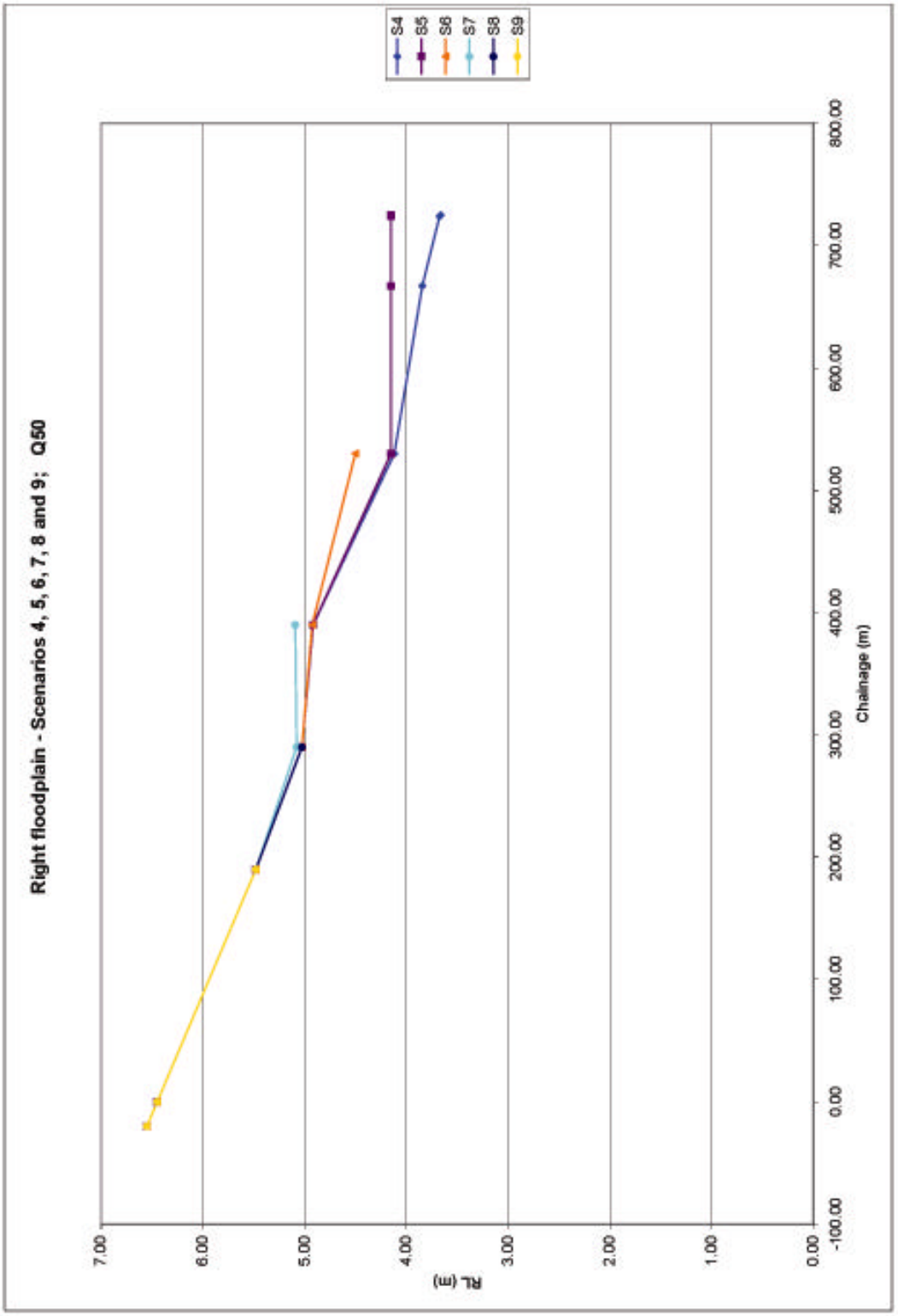
Appendix 5 – Comparison of Water Levels in Maraetotara Stream of Scenarios 4, 5, 6, 7, 8 and 9 – Q50



Appendix 5a – Comparison of Water Levels in Maraetotara Stream of Scenarios 4, 5, 6, 7, 8 and 9 – Q100



Appendix 6 – Comparison of Water Levels on the right floodplain of Scenarios 4, 5, 6, 7, 8 and 9 – Q50



Appendix 7 – Files Used