

**DETERMINATION OF FLOOD LEVELS AT
AKA AKA / OTAUA**

**HYDROLOGICAL
ASSESSMENT OF THE AREA**

Report Prepared for

FRANKLIN DISTRICT COUNCIL

By

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INTRODUCTION

Franklin District Council has commissioned this report to determine the 1%AEP flood levels on the low-lying land in the Aka-Aka / Otaua drainage area. This area is identified in the Council Hazards register as possibly subject to flooding. This means that any new occupiable floor space is required, under rule 7.3.4 of the District Plan, to be 500mm above the defined flood level.

There has been some contention as to the most appropriate methodology to set this flood level due to the proximity to the Waikato River and the existence of a local drainage scheme. This report has been prepared to provide a simple methodology based on subcatchments identified in an earlier assessment by the former Waikato Valley Authority of the local drainage scheme. The approach does not apply hydraulic modelling and it is assumed that each subcatchment is independent of others. Comments are made on the application of these estimates should there be overflows between subcatchments.

CATCHMENT SETTING

The Aka-Aka / Otaua area is a low-lying area adjacent to the Waikato River. It is also very close to the outlet of the Waikato River.

The area is protected from the Waikato River by operative flood protection works that have been subjected to floods of a magnitude of the design flood. The design flood is the 1% AEP event and the protection works provided the design standard protection.

Because the Aka-Aka / Otaua area is close to the mouth of the Waikato River and the time of travel of a flood peak, in local catchments, is far less from the area than the Waikato River there would be no coincidence of flood peaks

This means that

- The area is separated from the Waikato River and flood peaks in the river have no direct bearing on estimating flood levels in the Aka-Aka / Otaua area, and

- That flood levels in the area are directly related to runoff response in the local catchment

These local catchments are the subject of their own flood protection Scheme.

AKA-AKA / OTAUA DRAINAGE SCHEME

The Aka-Aka and Otaua low-lying land is protected by a drainage scheme. This scheme is designed to provide protection for agricultural land up to a 5% AEP event. Details of the scheme and its performance are reviewed in the *Aka-Aka / Otaua Drainage Study* Waikato Valley Authority, Technical Publication No 34, February 1986.

This study divides the area into small contributory hill and flat land subcatchments. These flows are then routed through a hydraulic model, which assesses the capacity of drains and various outlets to the Waikato River, under differing boundary conditions.

ESTIMATION OF THE 1% AEP FLOOD LEVEL

In this assessment the subcatchments are used as the basis for estimating flood levels. The approach is:

- It is assumed that the 5% AEP event is carried by the existing drainage scheme as it is designed.
- Given that the area is relatively flat and reliant on outfalls storage allowance for the 24 hour rainfall should be made. It is assumed that the 24 hour rainfall is distributed evenly over the subcatchment (i.e. the subcatchment is flat)
- Rainfall in excess of the 5% AEP event is available to runoff and that there is no initial losses or infiltration.
- The freeboard in a channel is not considered in the assessment, thus runoff greater than the 5% AEP event is assumed to overflow the drain, and therefore
- The rainfall excess for any contributing hill catchment is assumed to be uniformly distributed over the low lying land.

Rainfall is therefore the basis of this estimation and the 1% AEP 24 hour rainfall for the area is 185mm based on Council rainfall maps. The 5% AEP 24 hour rainfall is 143mm.

Therefore the estimated flood level is comprised of:

- A 24 hour rainfall storage allowance, plus
- The rainfall in excess of the 5%AEP design standard for the drainage scheme for both the low lying land and the contributing hill country catchments, plus
- 0.5m freeboard as required by Council, plus
- 0.015m as an allowance for increasing rainfall intensity resulting from climate change.

The assumptions that have been made are considered conservative as the drainage scheme is operative and not all the 24 hour rainfall on the catchment will be stored in the subcatchment. Further no channel freeboard has been considered so more runoff will remain in the channels prior to overtopping the stop banks. Also it is assumed there is no connection between subcatchments. Should there be a connection between subcatchments then there will be a balancing of water levels between the connected subcatchments.

RESULTS AND RECOMMENDATIONS

The lowland subcatchments are identified in the map that is contained in the map pocket at the back of this report.

The estimated water levels are given in appendix one. These tabulated results show the contributory catchment area and the rainfall excess, which along with freeboard allowances give the estimated water level.

The estimated water level for each subcatchment is expressed as the height a floor level should be above “average” ground level in the subcatchment. This is the recommended floor level for each subcatchment.

The height above ground level ranges from 0.742m to 1.136m. The higher floor levels result from areas where the contributory hill catchment area is proportionately greater than the lowland area through which the catchment drains.

The lowland subcatchments that have height requirements of 0.742m are those, which are not directly fed by hill catchments. Consequently, the flood level in those lowland subcatchments results from rainfall on the subcatchment.

Should connections exist between subcatchments then it is these lowland areas that are most likely to be receiving areas for additional runoff. Those subcatchments with the greatest heights above ground level are more likely to be source areas for runoff.

Given that there is an allowance of 0.515m for freeboard then it is recommended that Council consider adopting one standard level throughout the area. A height of 0.9m above ground level is suggested as an appropriate level.

While these estimates are based on rainfall excesses and adopt a conservative approach it is recommended that the 1% AEP event be routed through the local drainage scheme hydraulic model to further refine recommended building levels in the Aka-Aka / Otaua lowland area.

LIMITATIONS

This report has been prepared for the sole benefit of Franklin District Council. It is not to be relied upon or used out of context by any other person without reference to the author.

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APPENDIX ONE

CATCHMENT	LOWLAND AREA (ha)	HILL AREA (ha)	LOWLAND EXCESS (m)	HILL EXCESS (m)	FREEBOARD (m)	CLIMATE CHANGE (m)	HEIGHT ABOVE GROUND (m)
1	71	324	0.227	0.192	0.5	0.015	0.934
2	55	516	0.227	0.394	0.5	0.015	1.136
3	194		0.227		0.5	0.015	0.742
4A	214	5	0.227	0.001	0.5	0.015	0.743
4B	104	12	0.227	0.005	0.5	0.015	0.747
4C	110	752	0.227	0.287	0.5	0.015	1.029
4D	215	384	0.227	0.075	0.5	0.015	0.817
4E	466	197	0.227	0.018	0.5	0.015	0.760
5A	282	1812	0.227	0.270	0.5	0.015	1.012
5B	229		0.227		0.5	0.015	0.742
6A	266	64	0.227	0.010	0.5	0.015	0.752
6B	149		0.227		0.5	0.015	0.742
7A	139	32	0.227	0.010	0.5	0.015	0.752
7B	128	185	0.227	0.061	0.5	0.015	0.803
7C	186	119	0.227	0.027	0.5	0.015	0.769
7D	129		0.227		0.5	0.015	0.742
7E	204		0.227		0.5	0.015	0.742
7F	141		0.227		0.5	0.015	0.742
8A	101	277	0.227	0.115	0.5	0.015	0.857
8B	107	426	0.227	0.167	0.5	0.015	0.909
8C	208	182	0.227	0.037	0.5	0.015	0.779
8D	299		0.227		0.5	0.015	0.742
8E	184		0.227		0.5	0.015	0.742
8F	51		0.227		0.5	0.015	0.742
8G	23		0.227		0.5	0.015	0.742
8H	196		0.227		0.5	0.015	0.742
8I	62		0.227		0.5	0.015	0.742
8J	132		0.227		0.5	0.015	0.742
9A	189	375	0.227	0.083	0.5	0.015	0.825
9B	82	61	0.227	0.031	0.5	0.015	0.773
9C	136	58	0.227	0.018	0.5	0.015	0.760
9D	113		0.227		0.5	0.015	0.742
9E	88		0.227		0.5	0.015	0.742
10A	37	25	0.227	0.028	0.5	0.015	0.770
10B	111	36	0.227	0.014	0.5	0.015	0.756

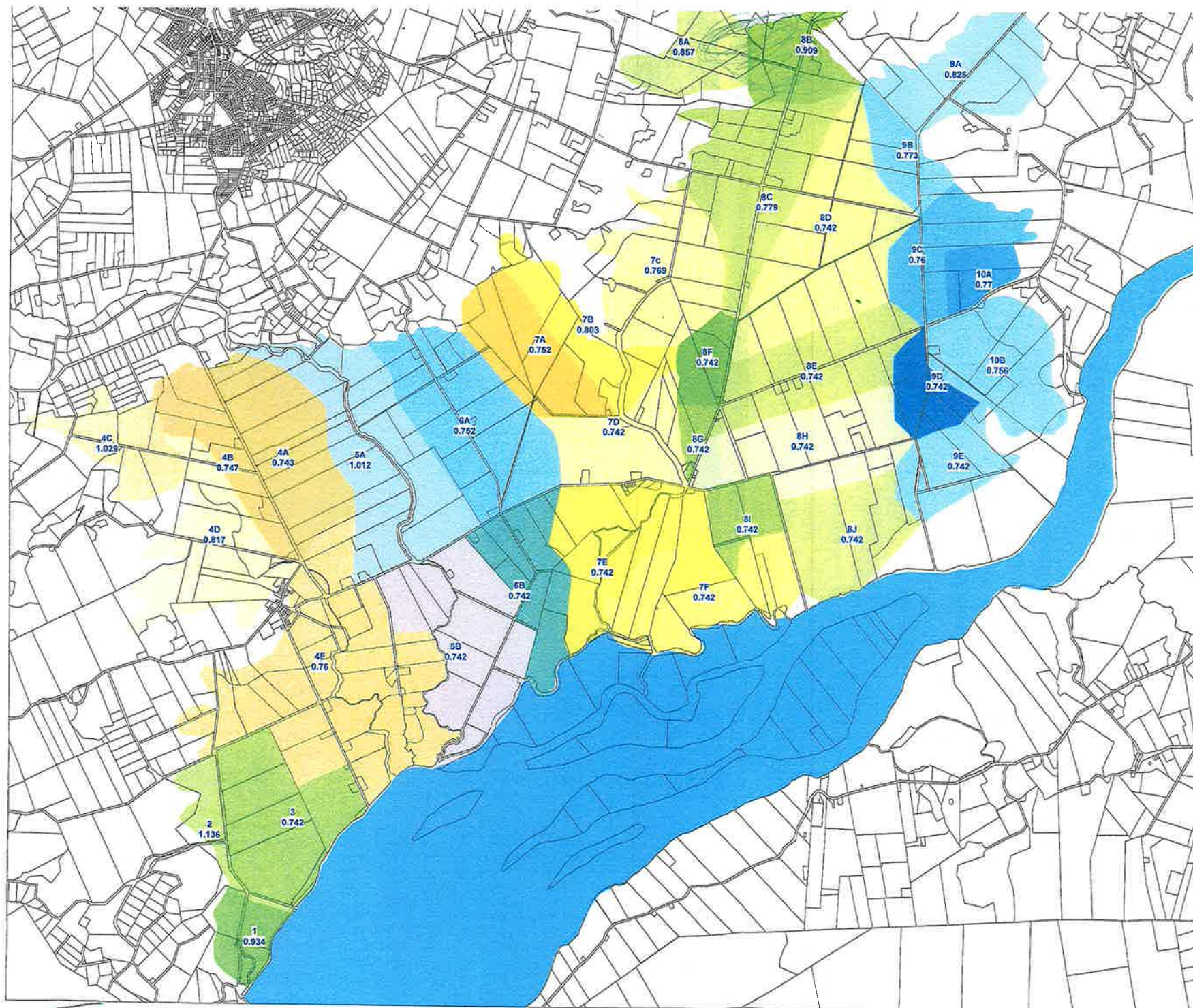
Aka Aka Otua Catchments and Floor Levels



LEGEND

Aka Aka Otua Catchments and Floor Levels

	1	0.934
	2	1.136
	3	0.742
	4A	0.743
	4B	0.747
	4C	1.029
	4D	0.817
	4E	0.76
	6B	0.742
	5A	1.012
	5B	0.742
	6A	0.752
	7A	0.752
	7B	0.803
	7E	0.742
	7F	0.742
	8E	0.742
	8H	0.742
	8D	0.742
	9A	0.825
	9B	0.773
	9C	0.76
	10A	0.77
	9D	0.742



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Flood Class Sourced From The Report:
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