

Waitohu Stream study

A history of the management of the Waitohu Stream

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1. Introduction

The Waitohu Stream, flowing from the Tararua Ranges to the Tasman Sea just north of Otaki, is a dynamic stream with a history of flooding and erosion problems (Figure 1). It has a catchment of 54km² and the steepest average slope of the Kapiti Coast rivers (WRC, 1994). Under the mandate of the Soil Conservation and Rivers Control Act 1941, erosion and flood mitigation work has been undertaken in the Waitohu Stream by the Flood Protection Group of the Wellington Regional Council (Greater Wellington) and its predecessor authorities (most notably, the Manawatu Catchment Board prior to 1989).

In 1948, the Manawatu Catchment Board proposed a River Control and Drainage Scheme for the Otaki area, which covered the Waitohu downstream of the Waitohu Valley Road Bridge. The principal proposals for the stream were as follows:

1. To put in a new mouth, shortening the outlet of the Waitohu.
2. To clean out the willows in the lower Waitohu from the mouth to 3 miles¹ and to dredge and straighten the river along this length.
3. To improve the Waikatu Drain and build a stopbank to the south side of it to prevent overflow of the Waitohu flood waters to the Rangiora.
4. To stabilise the banks of the Waitohu from 3½ miles to 5½ miles by planting willows and poplars on this length and making minor improvements in the stream.

A plan accompanied the proposal; this is reproduced in Figure 2. This management policy remains essentially unchanged today (ref WRC report 00.152, 8/3/2000, file N/6/30/5) (although today any mouth cuts are less severe than that originally proposed).

The Otaki Scheme was reviewed in 1978, and again in 1983. The 1978 review stated concluded that flooding from Waitohu across Tasman and Rangiora Roads has been reduced, that there was a need for further remedial works to prevent flooding in lower reaches of Waitohu and that improved drainage of areas adjacent to Waitohu Stream had been achieved.

In 1988 the Manawatu Catchment Board was disestablished, as part of nationwide local government re-organisation. It was replaced by an interim Central Districts Catchment Board and then in 1989 its functions in the Kapiti area were passed to the Wellington Regional Council.

During the 1990s, the Otaki Floodplain Management Plan was prepared, providing a blueprint for the management of the river and floodplain over upcoming decades. The Waitohu Stream physically links with the Otaki River, with overflows between the two systems occurring occasionally via the Mangapouri and Rangiora Streams. In recognition of this, the Otaki

¹ River chainages (in miles or in km) are as measured from the mouth. Because the Waitohu mouth moves, in practice these chainages are only indicative.

Floodplain Management Plan stated that *“for the purposes of this plan, the Otaki catchment includes the Waitohu and Mangapouri Streams where they interact with flood flows from the Otaki River. In the case of the Waitohu Stream, this covers the reach between the mouth and the State Highway 1 bridge.”* However that Plan does not explicitly nor in detail deal with the flood and erosion hazard in the Waitohu.

Several Waitohu flood events and resulting erosion, combined with general development pressure on the Kapiti Coast, since 1989 have now led Greater Wellington to initiate a Waitohu Stream Flood Hazard Assessment. The assessment commenced in 2002 and it aims to describe the hazard and to identify and document issues associated with the flood hazard or the management of the hazard.

To assist in the assessment, this current report has been prepared as a reference or archive document. Available information on historical flood events and on management of the stream relating to flood and erosion hazards has been collated and summarised. The document is principally drawn from a search of MCB, CDCB and WRC and Horowhenua County Council files, together with interviews with past and present MCB/WRC staff. Records relevant to the Mangapouri downstream of Covent Rd and to the Ngatotara, Greenwood Boulevard Stream have been included. While a large amount of information has been collated, the document should not be regarded as exhaustive – information will have been lost over time.

The summary of the file entries that follows paraphrases the records, more or less as they appear. Note that this does not imply that the information is correct nor that opinions expressed are valid. The entries are entered roughly in chronological order, although related entries from around the same time are grouped together. A summary of the main themes is also given.

Following that file entry section, listings of newspaper clippings, photographic records, reports and drawings are provided. The document ends with a summary of some of the recollections of George Gray, who was an overseer from 1952 until 1992.

Figure 1 Waitohu Stream Location

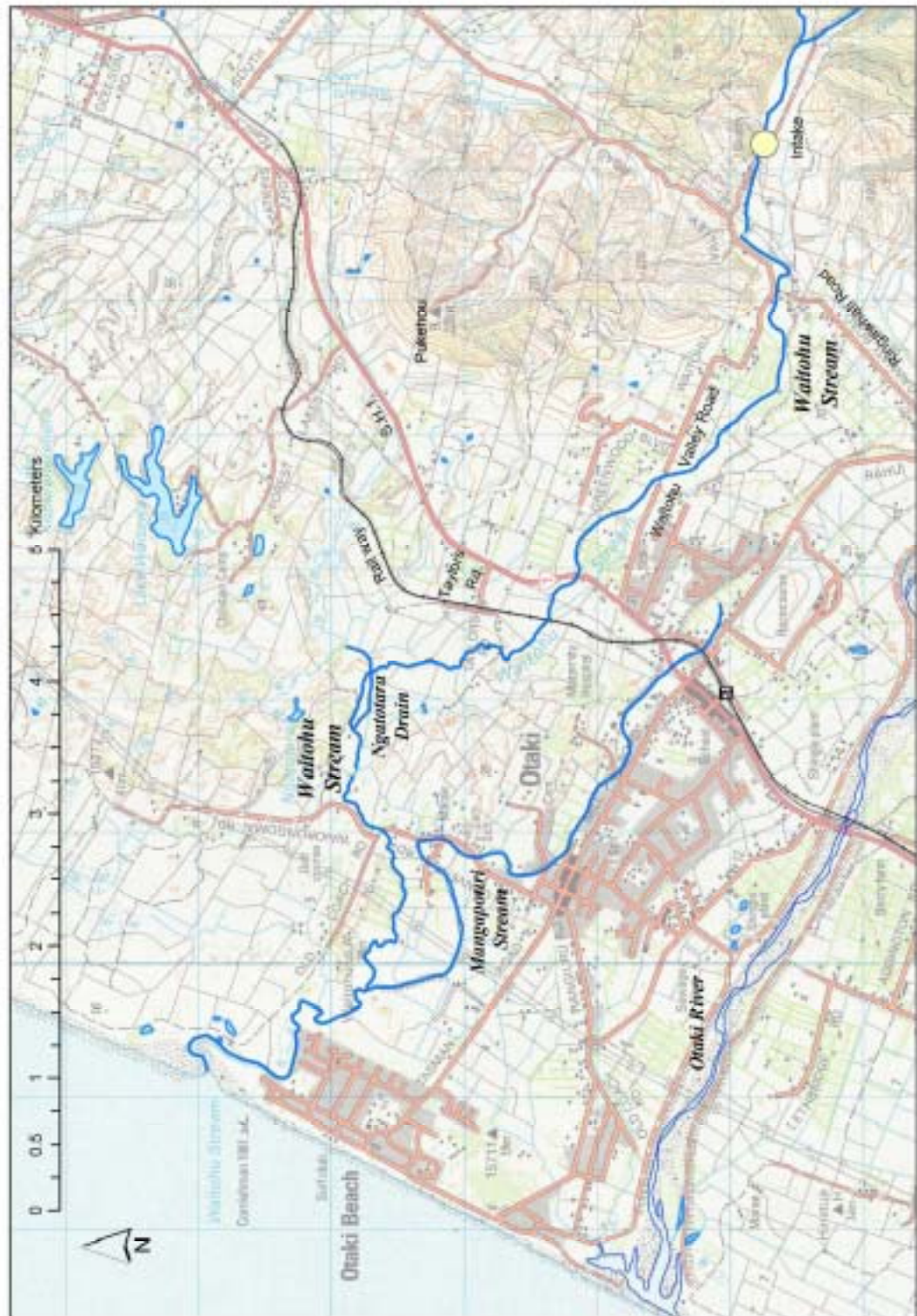
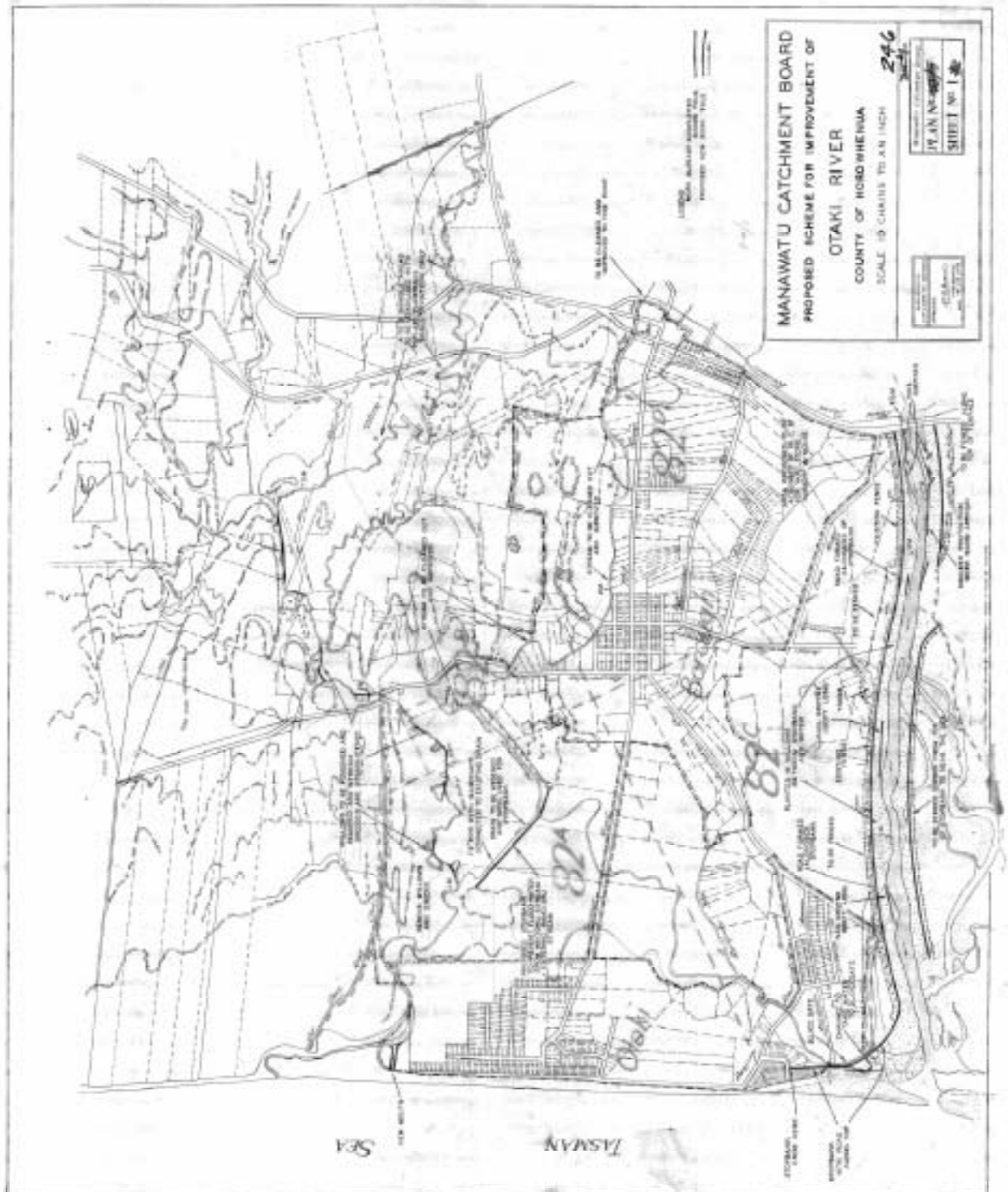


Figure 2 Proposed Scheme Works
1948



2. File Entries

Abbreviations used:

MCB	Manawatu Catchment Board and Regional Water Board
WRC	Wellington Regional Council
GW	Greater Wellington (brand name of Wellington Regional Council)
SCRRC	Soil Conservation and Rivers Control Council
PWD	Public Works Department
MWD	Ministry of Works and Development
KCDC	Kapiti Coast District Council
HCC	Horowhenua County Council
OBC	Otaki Borough Council

File Listings

The following files contain information of relevance to the Waitohu.

GRWC files:			
File No.	Vol No.	Covering Years	Subject/Title Heading
N/6/30/5	1-7		Waitohu Stream and Tributaries
X/9/6/5			
MCB files (now held by GWRC):			
File No.	Vol No.	Covering Years	Subject/Title Heading
10/1	1		
10/1	2		Horowhenua South
2/10/1	1		Otaki River
2/10/1	2		
49/12	4		Otaki Borough District Scheme
10/3/2			Ngatotara Farms
10/3/2	1	1963-1966	

10/6			Waitohu
10/3		1968-1970	
10/3		1970-1975	Otaki Major Scheme
10/3	1	1973-1978	Otaki Major Scheme
10/3	2	-1987	
10/3	3	1987-1989	Otaki Major Scheme
12/1			Kapiti Borough – General
10/5	2		Otaki River – Survey and Shingle

Also possibly of use (referred to in Otaki Archive) is the file 23/28/E – Flood Reports. This is not held by Greater Wellington, but is presumably held by Horizons Regional Council

Summary of themes

Several general themes or topics emerge from the file records. A short discussion on each follows, based largely on the file records but supplemented with information from MCB/GW-WRC staff George Gray (Rivers Overseer 1952-1992) and Garry Baker (Area Engineer 1993-).

Scheme

The Otaki Scheme was created in 1948, and the Waitohu was included in it at that time. There was some opposition to the Waitohu being included and to the resulting classification, with appeals not being resolved until 1951. Major scheme reviews were undertaken in 1978 and 1983, but did not result in any significant changes to the Waitohu Stream management.

Stream Mouth

The position of the mouth is a recurring subject in the files. The mouth migrates up and down the beach, according to recent winds/storms and river flows. As the mouth migrates, the length of the lower stream changes. With a longer mouth, perhaps with sand building up at the mouth and blocking the flow, higher upstream water levels can result. Migration of the mouth to the north can also increase the erosion risk to the sand dunes to the north. The position of the MCB and GW to date has been to occasionally cut a more direct path to the sea to reduce these concerns, but neither has considered it cost-effective to create a fixed mouth.

The 1948 sketch map of the area by Adkins shows the mouth at the time heading towards the north, but the map also shows an “old mouth” that runs through what is now Moana St (Figures 3A-3C). This was the position of the mouth cut proposed in the original 1948 scheme.

Figure 3C



Floods (specific)

Many floods have occurred over the period of file records, although none appear to be large or extreme. Flood damage to stream banks has primarily been confined to the reach from Taylors (i.e. between the railway and the Ngatotara siphon) to the water supply intake. Significant floods occurred in 1955, 1990, 1996, 1998 and 2000. File records show that other floods occurred in 1972, 1976, 1980, 1982, 1985, 1986 and 1991. (As the Waitohu flow recorder was not installed until 1994, no flow estimates are available prior to this.) There is some correlation observed between Otaki River floods and Waitohu floods (Gray, pers.comm.) and Otaki floods were recorded in most of these years. Note that in the Otaki, the 1955 flood is considered the largest since 1920 (WRC, 1994b)

Flood Risk (general)

Various broad scale maps of the flood hazard in the Waitohu and Mangapouri areas were produced by the MCB. Updated flood hazard maps were created by the WRC during the 1990s, and are reproduced in the 1998 Otaki Floodplain Management Plan.

Development

Development within the catchment has been limited. Some developments that have generated discussion are in the Otaki Beach and Greenwood Boulevard areas.

Mangapouri

Sometime prior to the Otaki Scheme, the Mangapouri Stream was diverted from its previous path into the Rangiu Stream (which flows into the Otaki River), to its current path through what was the Waikato (also referred to as the Waikatu) Stream (or a drain just to the west). The diversion would have been made by the Public Works Department. (Note that the sketch plan in Adkins (1948) shows the Mangapouri in its original path i.e. flowing into the Rangiu). A section of the Mangapouri alongside Convent Rd was culverted in the past.

Greenwood Boulevard

A subdivision developed during the 1980s and 1990s. An unnamed tributary runs through it and into the Ngatotara. Drainage difficulties and local flooding have been an issue at various times. In response to this, WRC carried out a hydrological investigation in 1995/6, on behalf of KCDC.

Ngatotara

The major tributary to the north of the Waitohu Stream, it drains various lakes and the slopes of Pukehou. The outlet of the stream to the Waitohu was moved 500m downstream at some stage in the past, so as allow floodwaters from the Ngatotara to discharge more readily into the Waitohu. A siphon was installed to allow this extension of the Ngatotara. The extension is also known as the Waikato Cut.

Drainage problems from the Pukehou branch have occurred in the past. As the peat land was drained, it subsided and so culverts under the railway line became ineffective and required upgrading. The problems were never

completely resolved at the time, but more recently the land in question has been used as wetland and so drainage is not a concern at the present.

Erosion

Bank erosion has been a continuing problem, and freshes and floods have invariably caused some erosion damage. MCB and GW have faced pressure from landowners to repair such damage.

Accretion

The converse of erosion is accretion, and in some sections of the stream this has occurred. Where the change is considered permanent, a formal change to the land titles can be granted. This has occurred in the lower reaches of the Stream in the past.

Works

MCB and WRC/GW have undertaken numerous works on the Waitohu Stream, generally to repair erosion or to improve bank protection. WRC attempted during the late 1990s to obtain a 25 year global resource consent for its maintenance activities on the stream. This was abandoned after failing to obtain agreement from all landowners, and the council now operates with a three year consent.

The Waitohu Stream was diverted from its course some time during the early 1900s downstream of Taylors Rd, over approximately 1800m. (The sketch plan in Adkins shows that the diversion was in place c1948)).

Bridges

There are eight bridges over the Waitohu River downstream of the Water Supply Intake. Most have suffered some damage to abutments and approaches during a flood. The impact of the bridges on flood levels has also been significant. Gravel deposition near the railway bridge exacerbates concerns there.

Drains

Drainage - mostly of the land to the north of the stream i.e. Ngatotara - has been part of Scheme works, in the past, although it was not explicitly included in 1948 report. The MCB did some drainage maintenance work up to the State Highway and also up to the lakes. Today however, very little drain maintenance work is undertaken by GW.

Date	Paraphrased File Information. (Does not imply that the information is correct or that GW agrees with it.)	Source (MCB file number to 1 November 1989, WRC/GW file number after)
16/4/48	Board No.2 Works Committee meeting: Desire of the settlers that the Board clears the Waitohu Stream of willows and other obstructions, and that the classification to secure necessary finance be part of Otaki Scheme.	2/10/1 No. 1
20/4/48	Board not in favour of proposed Rahui Drainage District, as drains into Mangapouri and then Waitohu – better to be part of Otaki Scheme	2/10/1 No. 1
8/6/48	Committee meeting. Board received correspondence re Waitohu Stream erosion from Horowhenua CC. Chief Engineer to reply	2/10/1 No. 1
27/10/48	SCRCC reply to Board letter of 12/10/48 (that letter not found on file): Comments on proposed works Otaki Scheme, including Waitohu Stream. "Waitohu Work: It is difficult to assess the value of items 11 and 12, particularly if there is much work involved. These items would appear to be rather low. In general the estimates are considered satisfactory."	2/10/1 No. 1
8/6/49 16/4/51	Judgement on appeals against classification Discussion by valuer/assessor of Otaki Scheme Classification - inclusion of Waitohu land in the Scheme	2/10/1 No. 2
8/5/51	Discussion by solicitor of result of appeals heard 11-18 April	
12/10/49	OBC to Board – asking when work on Waitohu will commence	2/10/1 No. 1
17/10/49	Board reply: Awaiting approval to raise loans for Otaki Scheme before commencing. Hope to have Waitohu work underway within 6 months.	
February 1963- April 1966	Various correspondence re improvements to Ngatotara Drain & drainage of lakes. Summary file notes and 8/6/64 and 10/8/64. Works proposed as part of original Otaki Scheme 1950, but never carried out because landowners objected. Properties changed hands and works carried out, but provision of stock water supply and fencing became a sticking point. Settled April 1966.	10/3/2 Vol 1
6/9/67	Chief Engineer's report to Board committee: Approval given to Knox to improve outlet by constructing a cut at his expense. To be regarded as temporary until Board can carry out permanent cut.	10/3 10/6 vol 1
8/9/67	Chief Engineer's report to Board committee. Cut put through in early August 1967, fresh soon after established good new course. Cost \$450 paid by Knox, but recommends that this receive subsidy. Propose that a permanent mouth be stabilised with 1500cu. yards rock at total cost of \$4,125. If works are successful, further 10 chains on left bank could be protected by landowners.	

Undated 1967?	Minutes of Board Meeting: In response to letter from Wootton/Hammond/Winterburn, complaining that Stream adversely affecting their properties, recommended that they be advised that a mouth cut has since been put through (Knox given permission to do so), and that Board considering a permanent mouth diversion.	10/3
29/2/68	Offer by Knox in response to Board letter 20/12/67 (not located on file) to contribute to stabilisation works (re his subdivision near mouth of Waitohu) (see subdivision plan Dec 1979 on file 10/6 vol 1?)	10/3
21/3/68	MCB letter to SCRCC: request for opinion on Knox proposal	
9/4/68	SCRCC opinion: Earlier letter 16/11/67 (not located on file) had declined to subsidise such works, but nothing to stop Board from carrying out works without subsidy. Whether Board should repair any subsequent flood damage would depend on standard of works and on assets protected. Noted that coastal erosion could be a concern. "The territorial local authority would be well advised to consider the stability of the area very carefully before agreeing to the subdivision".	
19/6/68	Committee paper from Chief Engineer (also filed 10/6 v1): "At the present time the mouth has gone considerably north of its previous position". Recommendation: <ul style="list-style-type: none"> • No subdivision between the extension of Marine Parade and the sea • Prior to subdivision, the owner to carry out protection work and to stabilise mouth. "The work on the Waitohu itself will not need to be very strong as there has been no erosion on this stream in this vicinity for a considerable period of time". • A reserve extending 5 ch. south of the Waitohu should be created • The classification of the subdivided area be changed from Class D to Class C (doubles annual rate). 	
2/9/68	Letter from HJ Wootton to Board: With Mr Knox, last year he had stream direction moved from its southerly direction. However heavy seas for last month and also stream mouth now being further north have led to stream outlet not working effectively and water backing up behind, flooding his land.	10/3
17/9/68	Board reply: Chief Engineer directed to construct a cut at mouth as soon as possible	
15/1/69	Letter from NZ Railways: On 6/12/68 flood level to within 12" of rail level, a result of waterway reduced due to gravel build-up on upstream side of rail bridge.	10/3
30/1/69	Reply from Board: Confirm gravel build-up over past few years. No records of previous bed levels in locality.	
14/2/69	NZR Railways reply: Provided Plan 30862 showing known ground levels under rail bridge. Southern abutment replaced and bridge shortened in 1962 when scouring threatened to undermine the bridge. Periodic use of bulldozer needed in past few years to maintain adequate waterway.	

c28/05/69	Letter from Knox: Requests permission to undertake mouth works. Previously has "stabilised the east bank at a cost of about \$1000". Proposes 8ch of rock protection out towards sea.	10/3
3/6/69	Knox given verbal permission to do works, but Board not accepting responsibility for future maintenance nor damage. (Hand-written note by Board staff member on above letter).	
17/6/69	Letter from Board: Before Board can approve, Knox must agree to have land reclassify the land as Class D. (As future land owners would look to Board for maintenance).	
c2/7/69	Agreed to by Knox	
21/10/69	Letter from Board to NZ Railways: No solution seen to problem outlined in NZ Railways letter 15/1/69. Thought timber milling in upper catchment a contributing cause. Fewer large floods in last 4 years, resulting in build up near state highway and rail bridges.	10/3
3/11/69	Improvement works carried out some years earlier to improve channel efficiency between Waitohu Valley Rd and the sea, but channel continues to aggrade. Suggest extract gravel for use in Otaki ballast crushing plant. Letter from NZR to Board: In near future, will take fill from streambed for track formation widening, rather than for ballast.	
c6/11/69	Letter from Knox Completed stabilisation works survived heavy seas and floods over last 3-4 months. Cost approximately \$1700. Water level lowered by about 2'	10/3
1968-69	Various letters between Odmins, Board, OBC, SCRCC, and NZ Forest Service: OBC has option under 1948 agreement to purchase 1646 acres from Odmins at \$1/acre of recently milled upper catchment. Odmins also offers OBC a further 1500 acres at same price. NZ Forest Service considers acquiring this land as a protection forest. (File records end before matter concluded).	10/6 vol1
13/8/70	Letter from Morison Taylor & Co solicitors acting for Knox. In recent years two subdivisions been carried out and sections sold for beach sites. Application for 3 rd subdivision, sections backing onto Stream and with frontage to Moana St. Awaiting Board decision that stream banks sufficiently stabilised to enable subdivision to be completed without risk of erosion. Understand that Knox has carried out work on south bank under guidance of Board engineer – tipping of rotten rock. "Mr Knox informs us that this has had the desired effect and that your engineer is satisfied that erosion will not now occur except in exceptional circumstances." Request that Board sanction.	10/3 1970-75
31/8/70	Letter to same effect from surveyors, 20/8/70. Plan 1749 of subdivision. Note on that letter refers to report 17/5/68.	
15/9/70	Board Reply. Board submitted report to OBC in 1968. (see 19/6/68). Work carried out by Knox appears satisfactory. Board at the time (1968) believed that a few years should elapse so the work should be allowed to consolidate and to study the effect of the work after flooding.	

	Board resolved that as protection work completed according to Board requirements, it has no objection to subdivision.	
12/10/70	Letter to Sim. Suggest he write to Board requesting advice/assistance re stabilisation of mouth and sand dunes.	10/3 1970-75
25/11/70	Further letter to Sim. In near future the stream will be opened to sea, which should halt erosion of foredunes. Board policy to periodically open stream rather than permanently fix the mouth.	
14/10/70	Solicitor's letter, re Knox subdivision. Note Board letter of 5/10/70 not objecting to proposal. Assume that work recommended in 1968 report has been carried out to Board's satisfaction and that Waitohu Stream has stabilised sufficiently.	10/3 1970-75
22/10/70	Holmes letter to Board	10/3 1970-75
5/11/70	Erosion above Ringawhati Bridge worsening. He has lost 10-15ft of land over past 3 months, threatening his well (6ft from river edge) and pump. Requests action Board minutes – Work now being attended to.	
27/11/70	Winiata letter to Board: Request advice re drainage of land. Railway culvert too high	10/1 vol1
16/12/70	Board reply. Suggest if sufficient other landowners interested, Board will investigate and prepare a scheme.	
27/7/72	Letter from NZR to Board: NZR requests permission to remove 1200 cubic yards of metal from within 3ch either side of bridge. Will lower bed by up to 2'.	10/6 vol1
3/8/72	Agreed to by Board	
14/12/72	Knox to Board Objects to Mangapouri discharging into Waitohu. Believes his work at mouth in constructing rock walls was successful until OBC road improvements caused extra mud into stream, leading to stream over-running north bank.	10/3 1970-75
21/12/72	Letter from Walker Flood damage repaired at Ringawhati Rd by Cottle, requests subsidy. Correspondence Cottle-Walker 21/7 and 26/7/72 indicates that cost initially shared between Walker and Thorpe. Walker invoiced for \$40, Thorpe for slightly more.	10/3 1970-75
24/1/73	Ian Macallan & Co. Heavy flood last winter damaged the water supply pipeline at the two crossings. Propose to relay the lower crossing under the stream to replace the suspended pipeline (truss timber support washed away). The crossing to remain in same position, but bed unstable there and pipe was washed out due to scour. Propose to protect pipeline with concrete weir on railway irons driven to base rock.	10/3 1970-75
28/2/73	Board reply – proposal acceptable	
9/3/73	Wootton appointed manager of subdivision. Mouth stable, but Wishes to confirm that the Board will maintain mouth (letter from solicitor 22/3/73 stating that OBC approved subject to Board can assure that stream can and will be maintained	10/3 1970-75

17/5/73	Board does not oppose subdivision as per letter of 22/3/73, but would advise against further subdivision	
4/5/73	Wootton Letter – reply to Board letter 11/4/73. Concern over stream mouth	10/3 1970-75
9/8/73	Wootton Letter. Board recently straightened mouth, but “to no avail”. Believes need rotten rock needs to be heaped up to hold the alignment – requests Board liase with Knox. Concern over flooding of his land.	
15/8/73	Board reply – Board policy to excavate new mouth when movement of mouth starts to affect drainage outlets of land upstream. “Previous work with rock both by the Board and by Mr Knox has been without success as is now apparent”. The latest board work opened up the original channel between the lines of rock	
24/8/73	Wootton Letter. Believes rotten rock walls will control the stream, “for we (i.e. Knox) proved this when we established the wall on the south side	
21/9/73	Wootton Letter. Stream not flowing on a “reasonable course”, and is flooding his land and undermining Sims fences.	
28/6/73	Judgement re Wootton petition for division of block Pukehou 4C4C. Opposed by Winterburn. Judgement in favour.	10/3 1970-75
10/12/73	Dept of Lands and Survey letter: Accretion discovered when block was surveyed following above judgement.	
2/4/74	Maori Land Court letter: In light of accretion, Court intention to amend the Partition Order made 28/6/73	
10/5/74	Board does not object to 464m ² on south side of property, but opposes 9056m ² near mouth as it is tidal estuary land and a flood could return river there.	
29/5/74	Wootton claiming accretion Pukehou 4C4C 1 and 2.	
8/7/74	Correspondence re Wootton. To be heard in Maori Land Court. Note added to say that applicant later withdrew, and will try instead to partition further back. Accretion claimed now admitted not to be accretion.	
15/10/74- 17/12/74	Further correspondence— subdivision to redefine Winterburn/Wootton boundary Partition plan agreed to by Board	
19/9/74	OBC to Board, asking for comment on revised Knox subdivision (replaces earlier subdivision proposal 17/5/73)	10/3 1970-75
14/10/74	Board resolves to advise OBC that it does not recommend any this or further subdivision in the area	
June-Sept 75	Various further correspondence re Knox subdivision, and provision of reserve off end of Te Moana St. Board in favour of a reserve but not of further subdivision. Plan of subdivision and reserve on file (provided 13/6/75)	
5/11/74 to	Letters from Wootton to Board re stream mouth. 5/11/74 - Wants rotten rock wall raised by 3-4 ft and carried to high water mark. 18/11/74 - Water backs up as far as township. 12/3/75 - Water level drops by as much as 3' if free access. Water overflows onto farm land as far upstream as Catholic Farm area. Wants cut to be made between the two lines of rotten rock. 5/5/75 – stream remains at high level and is flooding as far back as Green’s property. 9/6/75 - water level 4' above normal.	10/3 1970-75

25/6/75 1/7/75	Board reply: Stream mouth inspected, little or no aggravation, drainage unaffected Wootton to Board: Disagrees, believes stream water level to be 3-4' higher than normal	
13/11/74	MWD concern over state of rivers in vicinity of highway bridges, with respect to long term stability and sour problems. Request information regarding state of rivers, likely changes or control measures.	10/3 1970-75
23/11/73	Board reply. Waitohu – no new works anticipated, amount of metal increasing. Low flows confined to narrow channels.	
2/7/74	MWD reply. Waitohu Stream piles reinforced concrete to nominal length of 15ft.	
11/12/74	Application for works - RB Monk, Waitohu Stud, Freemans Rd: Cross-blading existing channel, to improve meanders and eroded banks over 10ch. Estimated cost \$375 (Board to provide 2:1 subsidy).(Done as Board work, i.e. "non-Scheme")	10/6 vol1
20/1/75	Monk letter: River causes damage to his property (Freemans Rd), requests occasional maintenance. Asks why Board only maintains to bridge.	10/6 vol1
27/1/75	Board reply: Area above the highway (hand written note suggests upstream of Ringawhati Bridge) not in Scheme area (owners at time did not want to contribute), so no works can be done.	
22/9/75	Sims letter to Board Requesting cut in mouth. He has for third time lost several chain of fence, stream cutting into his land which has "been consolidating nicely for the last 10 years..."	10/3 1970-75
17/9/75	Cowie requesting mouth cut. Stream 3-4' above normal. Also letter from Wootton, same request.	
4/12/75	Board reply: Inspected, no action considered necessary. 4/11/75 Report to committee. Inspected 29 October. Season has been wet, heavy seas are common in the area, debris carried upstream by tide.	
10/2/76	Wootton to Board: Believes stream course is causing normal water level to be 4' higher and has flooded 4 acres. Fenceline put up by Sims also removed by stream Board Reply. Inspected, no need to cut the mouth	10/3 Vol 1
4/5/76	Wootton replied 6/5/76, still concerned. Further letter from Wootton 7/10/76. Believes two sand bars at mouth holding water back to approx. 5' above normal. Logs flow over farm and destroyed 1 chain of fence.	
6/5/76 and 7/10/76	Board reply: Log debris and sand bars caused by heavy seas 12/9/76 (repeat of 12/7/74). Most of sand bar since eroded away and water not 5' above normal. No need to cut mouth. Will only do in emergency.	
1/11/76 24/11/76	Wootton reply: Still believes water level 4' above normal. Last time mouth cut by Mr Peters, cost was approx. \$100.	
20/12/76	December 1976 storm caused flooding of tomato and other crops. Not clear if this relates to Waitohu	Referred to in Otaki archive as being on 10/3/v1, but not there now
12/1/77	Letter NZR to Board: Concern over frequency of overland flow at rail bridge and threat to rail traffic. Plan of bed levels 1926 (when bridge built) and 1968.	10/6 vol1
3/3/77 11/3/77 14/3/78	Letter from Ahern: Four months ago the Waitohu Stream flooded property on Convent Rd, around the house and through garage. Also flooding 4 years earlier. Born over 70 years ago and he had not seen flooding until now.	10/6 vol1

17/4/78	Board reply: Original scheme allowed some ponding on dairying land. Land use now changing to market gardening. Further letter from Ahern requesting remedial works. Stream overtopped banks 4 times in last 5 years. Board reply: Ahern's comments to be noted in report which will probably recommend erecting low bank.	
15/5/78	Application to build stopbank for 350m, average height 0.5m, to stop flooding through market gardens at Bennetts Rd. Estimated cost \$1200. Approved.	
c15/3/77	Atkins Letter to Board: Drainage problems from Lake Waitawa over last year. Believes outlet draining to Waitohu Stream needs clearing.	10/1 vol1
18/5/77	Board reply: Other complaints received, so Board investigated. No problem with weed, extensive works required to improve drainage. Wet season in 1976 contributor to high lake levels. Atkins would need support of other landowners to lower lake.	
5/7/78	Letter to NZR from Board: Completed Scheme Review 1948-1978 Preliminary study of Waitohu indicates that channel barely adequate for annual flood. Impractical to provide more than 10 year level of protection.	10/6 vol1
17/7/78	Letter from Wootton: Stream now 4' higher than normal, due to mouth blockage. Mouth several hundred yards north of outlet prepared by Mr Knox – i.e. outflanked the guide banks Knox built. Stream has taken Sims fenceline. Logs floating upstream and damaging Wootton fenceline. Reply from Chief Engineer (and file note 5/9/78): Small flows typical of streams on the coast. Tidal and sea effects dominate and migration of mouth normal. Some raise in level possible but doubts that stream could be 1.2m higher as claimed.	10/6 vol1
18/9/78	Guidebanks constructed by Knox: Rotten rock, considered experimental. Left bank partially destroyed in 1969 (shown in plan) and overwhelmed in 1972. Sea storms of 1977/76 would have completely destroyed them. Further expenditure considered pointless due to frequency of high seas. Expect Board to cut mouth early in next year.	
11/10/78 and 1/2/79	Letters from Wootton: Stream eating into sand dunes to the north. Latter letter complains that mouth further blocked and flooding considerable part of his farmland. Board reply: Mouth to be cut as soon as suitable plant obtained.	10/6 vol1
7/2/79 4/4/79	Wootton to Board: Although mouth cut a few weeks back, mouth opening has not developed and his land is still being flooded.	
1/2/80	Application for works: Board to reconstruct 100m of right stopbank, remove gravel from stream and fill eroded bank. Cost \$1800. HCC contributor Location not recorded	10/3 vol2
10/7/80 29/8/80	Housiaux letter to Board: Owns land below golf course. High water floods land he wishes to garden. Wishes to shape bank on northern? side. Board reply. Land not suited to market gardening, as would require stopbank protection, upstream works and rock revetment bank protection	10/1 vol1
19/12/80	Letter to Horowhenua CC: Outstanding account re January 1980 emergency works. Waitohu Stream had broken out on left bank, floodwaters travelled towards SH1, entering house properties on Waitohu Valley Rd, including a garage to depth of 1-1.2m. Some years ago the stream cut through the right abutment of the bridge and works were done to improve the alignment.	10/1 vol1

15/6/81	Letter to HCC, enclosing letter from HCC to Board 26/11/68. That letter outlined proposed replacement of truss bridge on Waitohu Valley Rd. Estimated Q_{50} 4100cusecs, observed flood velocities of 10 ft/s. Also intend to move boulder deposits upstream of bridge to the right bank to limit scour and to aim stream at centre of new bridge.	
17/2/81	Accretion claim on end of Hewson Cres/Dodds Cres (3 properties) (Part of Knox subdivision?)	10/6 vol1
17/3/81	Board does not object. Land formed some time prior to 1948, has been stable since and no river control works constructed.	
1/7, 22/7, 27/7, 19/6, 27/8/81	Correspondence re Winiata drainage difficulties, highway culvert and railway culvert levels.	10/3 vol2
16/6/82	NZR Believe present culvert installed c 1880, adequate for railway purposes, but no objection to extra culvert if landowner was to get approval and fund it. Comment that d/s area would need drainage improvements if culvert was to be effective.	
20/8/81	NZR to Board: Request comments on stopbank proposals at rail bridge, and on implications of 100 year capacity waterway.	10/6 vol1
21/6/82	Further NZR letter: Estimate $Q_{100} = 125m^3/s$. Proposed works – replacement bridge to pass $100m^3/s$. Excess flow to be via existing and extra culverts around Taylors Rd. Plans showing culvert location and inverts, river bed longsection and current bridge cross-section.	
6/9/82	Board reply: Agree with Q_{100} estimate. While raising bridge soffit will increase waterway area, excess gravel will need to be removed occasionally. Discuss culvert options. Board intends to conduct overland flow to Ngatotara lake/drainage system.	
26/1/83	Application for works: Board to carry out channel works to improve alignment and reduce bank erosion - Waitohu Valley Rd – at bridge (letter to Horowhenua CC 25/1/83). Estimated cost \$500.	10/1 vol1
14/2/83	Application for works: Willow Park Developments. Board to carry out stream realignment over approximately 600m. Estimated cost \$2400.	10/1 vol1
16/3/83	Bennetts Rd residents to Board. Flooding late Dec 1982. Pasture flooding and crop loss. Two houses surrounded with floodwaters, “following a breach of Waitohu stopbank”. Concerned that earthworks on north bank to west of Old Coach Rd-Convent Rd bridge are directing flow to the south bank and threaten existing houses/ market gardens/farmlets.	10/6 vol1
29/3/83	Board reply: Will investigate to see if any illegal stopbank.	
30/6/83	HCC letter to Board: Plans for replacement of Ringawhata Rd bridge. Bridge will have slightly less waterway area than existing	10/1 vol1
15/7/83	Board Reply. Agree with HCC proposal, provided the road on left is not built higher as wish to retain the overflow. Thirteen years ago an approach was built on left bank, which stopbanks the left berm, entrenches the stream and degrades the bed at bridge and at John’s property. Protection works at John’s has been undercut.	
27/10/83	Letter to MWD re Otaki Scheme Review: Estimate of works 1983-88, includes Winiata floodway \$6000 and Ngatotara Stream Improvement \$8000 in 1984/85, Ngatotara Siphon \$14,000 in 1985/86. Also non-specific river works.	10/3 vol2

11/9/84	Letter from Simpson West & Co to Board: Re old watercourse into Waitohu between Manuao Rd and Waitohu Valley Rd (near bridge). Client wish to obtain title and maybe build over top	10/1 vol1
28/9/84	Board Reply: Drain probably was for stock water supply, but intake had been eroded by Waitohu prior to 1948. Drained filled in by 1966. Recommend drain be constructed.	
3/12/84	Application for works: Board to carry out cross-blading to improve alignment – I.W. Tew. Estimated cost \$264.	10/1 vol1
3/12/84	Application for works: Board to carry out cross-blading to improve alignment and protect pumping installation – Palamountain. Approx. length 100m. Estimated cost \$1452.	10/1 vol1
30/10/84	Letter from Taylor to Board: Ngatotara culvert under Waitohu now too small, as additional drains enter into it. Request Board enlarge and lower the culvert, and extend drain clearing upstream.	10/6 vol1
8/11/84	Board reply: Propose remedial works as part of Otaki Scheme Review, but is awaiting NWASCA approval.	
3/1/85	Letter from Pegler: Concern over gravel build up near rail bridge, and that it could cause flooding over state highway	10/6 vol1
1/2/85	Otaki Borough Council letter: Proposed bridge to service Mansell subdivision and water supply plant. Observed flood level shown, plus cross-section.	10/6 vol1
1/7/85	Bridge design acceptable, but require road level on east side of bridge is lowered, so as to not impede floodwaters.	
19/2/85	NWASCA letter advising that it declines to approve 5 year works programme for Otaki Scheme	10/3 vol2
27/2/85	Request to take “small amount” gravel from above state highway	10/6 vol1
13/3/85	Board refuses permission from that area – as stream has been stable in that area since a major flood in early 1970s. Suggest that better to extract from above rail bridge.	
12/3/85	Letter from Board, in response to request for information re area between Waitohu River and Waitohu Valley Rd, from state highway upstream. Comment regarding floodability, stream bed behaviour and debris/floodwaters spreading across land during early 1970s flood.	10/6 vol1
17/7/85	McMurray-Hill letter to Board: Waitohu stream mouth re-routed earlier in year. Works “negated by nature within 4 weeks”.	10/6 vol1
24/10/85 and 25/10/85	Board letters re proposed subdivision and proposed access bridge, Palamountain. Requirements for bridge dimensions. .	10/6 vol1
Jan-Feb 1986	Correspondence between McMurray-Hill –Board Development of sand dunes at end of Moana St and along streambank over past few years.	10/6 vol1
20/2/86	Letter to Horowhenua County Council: Proposed works – rock protection along 100m section of bank, immediately upstream of Ringawhati bridge, to repair flood damage and risk to Waitohu Valley Rd. 600m ³ rock proposed, total estimated cost of works \$13,000. Subsequent note 27/2/86 indicates HCC will use concrete rubble instead.	10/6 vol1 and 10/1 Vol2
6/7/86	Franklin Letter to Board: Stream flowed through 3-4m section of stopbank on Ryder property onto his property (Bennetts Rd) during Dec 1985 flood. Part of his bank being undercut due to slumping – threatens stopbank.	10/6 vol1

28/7/86 8/9/86	Simcox letter to Board: Drain from his property via Sims, under Old Coach Rd, then via Wootton to Waitohu. Water backing up from further down in drain. Requests, on behalf of the other landowners, for Old Coach Rd culvert to be lowered and drain to be cleared.	10/6 vol1
30/7/87	Board reply that it needs to do survey to decide how to deal with problem. Board offer to take over drain maintenance, but too costly to upgrade the stream crossings/culverts etc.	
3/11/86	Approx 10 year flood in Waitohu Stream on 4 October 1986.	10/3 vol2
18/11/86	Knotts Berry Farm Letter to Board: River bank erosion adjacent to its land in Waitohu Valley Rd	10/6 vol1
22/4/87	Board Reply: Works had been done – diversion channel cut south of eroded section	
29/1/87	Winiata letter to Board: Winiata Floodway. 12" siphon not effective in heavy rain. Reply as already included above 31/3/87. Drawings attached; includes drain bed levels relative to culvert	10/3 vol2
19/3/87 4/5/87	Duncan letter: Flood mid-86 caused erosion of river bank Hewson Cres Board Reply to OBC: Recent protection works completed. Board was unaware of Norfolk Park subdivision, concerned that only narrow reserve strip allowed. Stream banks subject to tidal wave lap plus stream flow erosion. Duncan dwelling only 4m from bank edge at time of inspection. Request that in future a 15m strip be allowed.	10/6 vol1
23/3/87	Plunkett letter to Board: Re ex-Pritchard block – (Upstream of SH1) River realignment done previously (after letter from Plunkett Oct 86???) At time discussed possible planting and use of concrete rubble at SE corner of his land. Now river has broken out again.	10/6 vol1
31/3/87	Letter from Board to Winiata: 300mm siphon culvert runs through railway box culvert. Consider installing second siphon would best improve drainage of Winiata land. Calculations to be done.	10/3 copy on 10/6 vol1
19/5/87 29/6/87	Railfreight letter to Board: Washout of rail embankment at Taylors Rd crossing in October 1986. Second washout in two years. Intend to upgrade culvert under Taylors Rd. Also wish to either remove gravel from under rail bridge or enlarge a further culvert (midway bridge and Taylors Rd). Prefer second option. Stream attacks southern abutment of bridge. Board reply: First option (remove gravel from bridge waterway) better. Costly to install large culvert and overflow path downstream inadequate which would put house at risk.	10/6 vol1
21/5/87 10/6/87	Hunt Letter to Board: "During the past 10 years I have observed the fruitless attempts to divert the course of the Waitohu Stream at its mouth. Board reply: Periodic work at mouth done to reduce erosion of sandhill at stream's northern position and to improve drainage. Mouth naturally tends to migrate north. And need to do this work as required, repeated on 2-3 year cycle. Permanent solution not justified.	10/6 vol1
16/7/87 29/7/87	Application to place culvert Mangapouri, opposite Tainui Pa off Convent Rd Board approves, provided at least 1200mm	10/6 vol1
27/8/87	File note – propose to enlarge and lower the Ngatotara siphon. Existing no longer effective due to peat shrinkage as land drained. 1350mm culvert proposed. Work to be done Feb/March 1988. (Additional note to say that old culvert removed 28/4/88).	10/6 vol1
14/3/88	Letter to OBC: Report tabled 16/2/88 to Works Committee on flooding potential of Mangapouri Stream	10/6 vol1

1/2/89	Further letter to OBC. Includes floodable area map	
9/12/88	Board to OBC: Copy of analysis of Otaki/Waikanae flood risk prepared for Horowhenua United Council.	49/12 Vol 4
31/1/89	Winiata to Board – Requests assistance with drainage improvements/flooding protection to his land at base of Pukehou Hill. Quote received for \$4000-\$4500, including floodgates	10/3 vol 3 1987-1989
10/2/89	Board reply. Will fund 50% up to maximum of contribution of \$2500. Understand proposal is to construct low stopbank alongside main channel across his land, preventing Pukehou catchment runoff flooding his land due to inadequate railway culvert. Includes small culvert/flapgate under the bank to release internal water. Board accepts no responsibility for future maintenance or repairs to the bank. Note added to state that Boards share will be charged to Otaki Scheme as an improvement.	
23/8/89	Draft Otaki Borough District Scheme prepared by Gabites Porter & Partners for Board consideration. (Scheme Review No. 2). Extracts – flood risk – flood maps, ordinances, minimum floor levels, discussion of flood risk, management responsibilities.	49/12 Vol 4
22/11/89	Estimate – willow removal Taylors to Wootton (NIMT to beach)– 6km, est cost \$6390 incl GST	N/6/30/5 vol 1
18/1/90	Flood damage 17/1/90 Askew channel realignment – flood damage –stream has jumped out of channel and across pasture. Block off, plant willows, crossblade. Actual cost \$1573 + gst Crossblading and realignment over 3km, rail to Askew. Est \$12110 + GST Construct tree groynes to direct flow away from stopbank. Actual cost \$2188.08 + gst	N/6/30/5 vol 1
25/1/90	Letter from Johns. Waitohu Valley Rd. Flood afternoon of 17/1/90 caused floodwaters to enter his house. Never occurred before, despite having lived in house since 1950 and larger floods have occurred. Believes caused by two problems: inadequate waterworks bridge so water flows down road. Water level backed up to 2 nd to top wire on new fence upstream of bridge. Also caused by fencing on overflow path trapping debris and diverting flow down road rather than overflow path – that path took floodwaters behind his property to discharge downstream. Peak flood level 17 Jan ½ metre below Ringawhati bridge. He holds flood levels from previous floods.	N/6/30/5 vol 1
22/2/90	Simpson letter. Flood January was out Waitohu bridge, damage either side. Damage to his property downstream of bridge.	N/6/30/5 vol 1
6/3/90	RC reply – work to begin about 1 March.	
27/3/90	Askew letter and photo. Stream has taken course through his property during recent floods, appears to be natural course in floods. Recent work by RC seems to encourage course that results in flooding due to sharp changes in direction. River threatens Standish property (within 2m) Altering of course north of Ringawhati bridge has worsened situation. Stream now runs in straight line for 1km. Requests that river be allowed to take natural course during floods.	N/6/30/5 vol 1
29/3/90	KCDC proposal re remedial work to water supply bridge, following significant scouring of river bed and banks 9-13 March flood.	N/6/30/5 vol 1
27/4/90	Plunkett letter. 150mm of water of property recently, via overflow from creek that crosses the Waitohu Estate, held up by inadequate culverts under new road. Cost to him \$1050. (Greenwood Blvd??) Also fencing repairs needed following 2 recent Waitohu floods, despite fences being	N/6/30/5 vol 1

	<p>10m from river bank. Older willows washed out. Previously Geo. Gray installed 50m groyne of concrete slabs. River bed risen 1m since he brought property 3 years ago. WRC reply re overflow from Greenwood Blvd: suggest form a depression and stopbank on his property to divert flood waters to Waitohu</p> <p>KCDC reply – Developer of Waitohu Estate undertaken to widen cut-off drain at end of road to take secondary flow.</p> <p>Plunkett reply c21/8/90. RE Waitohu Stream. Need attention paid to SE bank abutting SH1 bridge.</p>	
26/2/90	Press clipping.. Waitohu Valley Stream bridge – est repair cost \$39,600. Northern wall and rock/concrete protection collapsed. Abutment and pier not damaged.	N/6/30/5 vol 1
12/6/90	<p>R Johns. Since works upstream in Waitohu Valley Rd area, loose gravel has moved downstream, and river bed level risen, causing flooding.</p> <p>RC reply 21/8/90. Permit granted for limited extraction from within his property.</p>	N/6/30/5 vol 1
4/7/90	Estimate – willow removal over 3km, Golf course to Wootton. Est \$6561.50.	N/6/30/5 vol 1
8/8/90	Wootton letter, Mouth moved north, water being held back and 4-5ft higher. Request stream mouth returned to its normal course.	N/6/30/5 vol 1
21/8/90	WRC to KCDC request permission to extract up to 40000m ³ over area identified on aerial photograph (not on file). KCDC reply 28/8/90, no notified consent needed.	N/6/30/5 vol 1
28/8/90	WRC letters to Simpson and Plunkett, informing landowners that they can undertake limited gravel extraction along river.	N/6/30/5 vol 1
28/8/90	KCDC request for comment – subdivisions Gaskell/Sims Wairongomai Rd and Palamountain, Waitohu Valley Rd. WRC reply 21/11/90 – some flood risk.	N/6/30/5 vol 1
4/7/90	Estimate – willow removal over 4km, Golf course to Rail bridge Est \$6094.	N/6/30/5 vol 1
13/9/90	Winstones – agree to take delivery of 5000m ³ of <10” material delivered to yard. Note to say CCM not in favour.	N/6/30/5 vol 1
12/9/90	Report to committee Interim Management Policy for West Coast Stream Mouths. Resolve to continue interim policy of cutting mouths when possible to protect properties threatened by flooding. ...A rise of 0.5m will generally be sufficient to initiate this action.	N/6/30/5 vol 1
1/11/90	KCDC – request advice/comment re subdivision application adjacent Waitohu and Mangapouri	N/6/30/5 vol 1
22/3/90	KCDC – drawings of remedial works to Waitohu waterworks bridge for comment	N/6/30/5 vol 1
1/11/90	Jull letter – noticed planting downstream of Waitohu Valley Rd bridge. Suggests coordinate his and WRC planting. Planted trees along western side of stream. First attempt removed by Oct 86 flood.	N/6/30/5 vol 1
2/11/90	<p>WOW – concerned about erosion on south side of stream alongside their and adjacent property. Esplanade reserve being gradually eroded. Suggest encourage stream back into old course, use groynes and concrete rubble. Phoned to say more land loss 25/11/90</p> <p>Further letter 20/3/91. Waterworks bridge caused river to change course, eliminating a loop, resulting in attack on bank on their property and Neighbour Haines. 21 Jan flood caused erosion; river moved 3m into their property.</p>	N/6/30/5 vol 1
1/6/90	Letter to KCDC, summarising site meeting Ringawhata/Waterworks bridges. Bank erosion and bed degradation in vicinity of both bridges noted, resulting into changed river alignment. River no longer has access to flood relief channels resulting in higher flood levels. Askew willing to accept realignment through his property to relieve problems.	N/6/30/5 vol 1
22/2/91	Calculations re Convent Rd. March 90, water weired across road. Diagram shows water level relative to floor level,..1976 flow estimated at 50-60m ³ /s.	N/6/30/5 vol 1

18/3/91	KCDC re Greenwood Blvd. Map of 1986 flood extent.	N/6/30/5 vol 1
5/6/91	Estates Te Ao and Kaihau, Waitohu Valley Rd. 20-45m planting strip to be taken out of grazing, to be planted in willows followed by natives e.g. kahikatea after two years.	N/6/30/5 vol 1
21/6/91	WRC letter – planting well advanced.	
31/3/95	WRC letter – 63 natives and 75 willows planted during 1991/92. To date, 31 natives survived, willows have matured. Willow loss attributed to stream bank erosion and pest/stock grazing.	
13/6/91	KCDC to Walch (WOW). Refute that waterworks bridge caused river alignment change – bridge on same alignment as original streambed. Bed has been lowered along entire river bed, at least 1m at waterworks bridge, similar drops evident at downstream bridges. Shaping new channel recently been undertaken groynes will be built to direct floodwaters south of Ringawhata bridge over next few months.	N/6/30/5 vol 1
June 91	Aerial photos of mouth	N/6/30/5 vol 1
7/8/91	Invoice to KCDC for works – channel realignment, willow planting, concrete rubble groynes, tree removal, fencing, between Ringawhata and waterworks bridges. Cost \$1890.	N/6/30/5 vol 1
7/8/91	KCDC letter. Photos of flooding on Taylors property 6/8/91. First time that the stream has broken through the channel training embankment. Stream broke through to old Waitohu Stream bed.	N/6/30/5 vol 1
16/8/91	WRC reply. Breach repaired when water levels dropped. Excess gravel removed between railway and Taylors Rd at same time.	
30/8/91	Quote for \$4663.02 by WRC to do works at Waitohu waterworks Bridge: build 2 weirs, rock protection to south abutment, secure damaged gabions at south abutment. Plan 901/24. (See 13/1/92 below)	N/6/30/5 vol 1
Undated reports	<p>Summary of works carried out 1990/91, including:</p> <p>August 1990 Willow removal – working upstream from Laureson Willow planting – Plunkett</p> <p>September 1990 Willow removal – completed 4km to rail bridge River alignment and gravel extraction - Askew, Johns, Palomountain River alignment and gravel extraction - Below rail bridge, Johns Gravel extraction – Askew (1547m3)</p> <p>October 1990 Tree removal, river alignment and mouth cut – mouth area River alignment and gravel extraction – Askew Willow planting and tree groynes – Simpson</p> <p>November 1990 Water intake cleared – Palomountain</p> <p>December 1990 River alignment, improve floodway: below rail bridge</p> <p>February 1991 Tree groynes – Taylor</p>	N/6/30/5 vol 1

	<p>March 1991 Remove shingle – below rail bridge Improve bridge waterway: Johns (ambiguous as to location)</p> <p>April 1991 Cross-blading – Valley Rd (Simpsons)</p> <p>May 1991 Cross-blading to improve alignment – Valley Rd bridge Berm clearing, fencing, willow planting, tree groynes – above rail bridge</p> <p>June 1991 Berm clearing – from Valley Rd bridge Berm clearing and willow planting - above Ringawhati bridge Summary of works carried out 1991/92, including</p> <p>July 1991 Willow planting - Ringawhati and Wootton Native tree planting Fencing, channel realignment (80m), tree groynes and concrete blocks - Ringawhati</p> <p>August 1991 Willow and native tree planting – Valley Rd Stopbank repair and gravel removal – below rail bridge to Taylors Rd</p> <p>Rock groynes (2) – Golf Club</p>	
19/9/91	KCDC request flood advice re proposed conversion of building to dwelling Wairongomai Rd. WRC reply – 4/11/90 – no real prob, min floor 450mm above rd,	N/6/30/5 vol 1
20/9/91	WRC letter re waterworks bridge and works. Waterway inadequate. Material placed by KCDC added rock on top of gabion – likely to wash away.. 2 nd weir placed to prevent bed degradation, 3 rd may be needed.	N/6/30/5 vol 2
13/12/91	Duffil Watts Tse reply 13/12/91. Agree that stream channel reshaping u/s of Valley rd bridge needed, please undertake, 50/50 cost share WRC/KCDC	
21/4/92	WRC letter – works completed, and invoice KCDC \$2448.75	
Oct 91	KCDC letters rebuilding permit appln Convent Rd, and building enquiry SH1.	N/6/30/5 vol 2
19/11/91	Invoice from WRC to Railnet for \$2662.50 gravel removal around rail bridge 1-7/10/91	N/6/30/5 vol 2
13/1/92	<p>WRC summary of works for KCDC.</p> <p>Waterworks bridge actual cost \$3445 (quote \$4663)</p> <p>Ringawhati bridge (abutment repairs) actual 2006 (Est \$2000)</p> <p>In-channel works between bridges – repair weir, add weir, realign channel – actual \$3145 (est \$2000)</p>	N/6/30/5 vol 2
7/5/92	WRC letter to Longley - Erosion to access track, left bank Waitohu upstream of waterworks bridge. Localised erosion resulted in loss of 3m of bank along with some of access track. Believe erosion due to outfall from water treatment plant, aggravated by quarry operator filling the stream channel.	N/6/30/5 vol 2
13/5/92	Further WRC letter. Extraction approved.	

1/7/92	Winiata letter – quote for \$29750 to thrust new culvert under railway received. Asks for assistance.	N/6/30/5 vol 2
30/7/92	WRC letter – decline to assist Railnet fax – culvert proposed not acceptable (too thin)	
11/8/92	5/10/92 Letter from Winiata - Revised quote for smaller culvert \$18000. Propose that KCDC and WRC contribute \$4500 between them. WRC letter 14/10/92 decline to assist 22/12/92 WRC letter to Ombudsman confirms WRC stance. Notes that 12” siphon not effective any more – due to continued subsidence due to its presence. Winiata proposed to put culvert at stream level (i.e. lower), and WRC of opinion that further subsidence would result.	
14/7/92	Willard letter. Complains about river works at sharp bend south of Waitohu Valley Rd bridge. Water now flows underground to SH1, where it rises and floods his property if there is a fresh in the river, also damage to SH1 from water under the seal. WRC response. Disagree – believe that blocked/broken drain under SH1 more likely the cause.	N/6/30/5 vol 2
20/10/92	WRC Proposal for concrete block weir to establish control for river monitoring station, above water supply intake.	N/6/30/5 vol 2
19/7/93	WRC Rivers propose to cut Waitohu mouth 22/23 July. DoC visit, does not believe needed. WRC Consents advice needs consent.	N/6/30/5 vol 2
c3/8/93	Newspaper article 3/8/93. Erosion on Phillips farm after floods, but no floods Jan-June of this year. Stream course substantially altered in 1880s. WRC did erosion protection works 29/30 June, Taylor property.	N/6/30/5 vol 2
31/8/93	Duffill Watts & Tse, prelim report on stability of Waitohu Valley Rd, Ringawhati and waterworks bridges. WRC comments 1/10/93	N/6/30/5 vol 2
29/11/93	(Refers to memo 23/11/93 flood damage report). Flood damage 20-21 Nov. Total assessed repair cost \$9400. Also propose place riprap short section between Rail bridge and Taylor’s bridge – est cost \$11400.	N/6/30/5 vol 2
1/12/93	Further memo. Works approved – maintenance run of \$10,440 + \$540 contingency. (which ones) Trees fell into river and some stopbanks undermined.	
13/12/93	WRC summary of damage and proposed works. Actual hours worked by machinery for works carried out – January 1994 (Filed on vol 3 with 23/11/94 consent application)	
16/12/93	Fish and Game letter re WRC proposed remedial works. Works involve 400-500m of stream. Believe long-term management plan and/or consents needed.	
17/1/94	WRC letter to F&G. Also propose positioning 4 large rocks of approx. 5 tonne in the channel, as an experiment in response to F&G suggestion that pools will develop for fish.	
6/12/93	WRC to carry out erosion mitigation work, on behalf of NZR. 50 x 3m of riprap at a batter of 1.5H:1V. Protect north embankment, upstream of bridge for 50m.	N/6/30/5 vol 2

13/12/93	WRC summary of damage and proposed works. Actual hours worked by machinery for works carried out – January 1994..	N/6/30/5 vol 2,3
25/1/94	KCDC request comment on subdivision applications Taylors Rd. Long term plan is to construct road through property to link with either Forest Lakes Rd or Wairongomai Rd to provide alternative to SH1 for local traffic.	N/6/30/5 vol 2
18/5/94	Martin letter to WRC re river mouth. This year the movement of mouth to south has been extreme, damaging dunes. Water backs up over farmlands at rear of residential properties. Believes that cut needs to be made.	N/6/30/5 vol 2
31/5/94	Reply. WRC inspections. No action warranted, but will continue to monitor.	
14/6/94	WRC memo. Recommend that additional trigger for cutting mouth be adopted – that “When the meander migrates with 50m north or 1050m south of a centre line determined by the training wall adjacent to Field Way or erosion seriously threatens buildings.” Not the position of the mouth that concerns local residents but the extent of the meander and its pattern of movement into the sand dunes.	
16/6/94	Recommend that mouth be cut again now, estimated cost \$4800. Approved.	
27/7/94	WRC Memo. Mouth cut and realignment commenced 0800hrs 15/6, expect to complete 1730hrs 17/6. Rapid southward advance of erosion at stream – now only 300m from private dwellings. On 27/5, mouth was 500-550m north of present position i.e. 800-850m from dwellings. Heavy rain and strong westerlies 11/12 June aggravated mouth. Mouth moved approx. 150m between 10 and 13 June.	
29/9/94	Sims letter. Stream still eroding his property on northern side. Has done for long time, affecting 12-15 acres. Request that stream be returned to its correct position WRC reply. Agree that outlet should be 30-40m south of present position, removing it from within his property, but do not consider necessary to recut the outlet.	
23/11/94	Consent application to take water midway SH1 and Ringawhati Rd– refers to WRC river works 15 Dec 1993 in this reach (see memo dated 13/12/93)	
20/12/94	Proposed works – Ringawhati Bridge to Rail bridge, estimated cost \$5000.	N/6/30/5 vol 3
24/5/95	Plunkett letter, request that WRC consider the problem corner on his property boundary. Previous repairs have created damage in two locations downstream.	N/6/30/5 vol 3
26/4/95	Letter from Parsons, re flooding prev Saturday night Greenwood Boulevard. WRC reply 2/5/95 – Existing stream channel inadequate to carry flood flows – MCB recommended that a secondary flow path be created, this has since been filled in by a landowner. Flood 22 April 1995. Secondary flow path has been reinstated	N/6/30/5 vol 3
9/5/95	WRC memo – request discretion to realign mouths in June/July. Mouth now at approx. 1km north of Konini St.	N/6/30/5 vol 3
8/5/95	Re consent application to place about 54m of rock riprap on west bank immediately upstream of Waitohu Valley Rd bridge. Propose rock 60-2000kg, with mean of 400kg. 3.25m high at 1.5H:1V. Stream threatens left bank. There have been 3 or 4 failures to bridge abutments/approaches since 1989. Granted 26/5/95	N/6/30/5 vol 3
1/6/95	Wakapua Farms letter – Flood 22/4/95 eroded south bank where races crosses stream. Request repairs. WRC response – Repairs will cost \$1000, offer to fund half.	N/6/30/5 vol 3
5/6/95	Plunkett letter. Land about to be inundated for 3 rd time in 6 weeks. Erosion problems, major build up gravel	N/6/30/5 vol 3

2/8/95	Plunkett letter. Two weeks since last "5 year flood – the 4 th this year". Further erosion, gravel deposition, willows removed.	
13/6/95	WRC memo – no Waitohu planting proposed as erosion has removed berms.	N/6/30/5 vol 3
23/6/95	WRC letter re Waitohu Country Estate flooding issues. Floods 22 April and 22 June 1995.	N/6/30/5 vol 3
22/6/95	Wootton letter, request willow clearing downstream of Old Coach Rd. WRC reply 30/6/95 – to be done within next two weeks	N/6/30/5 vol 3
5/2/96	Wootton – floods prior to Christmas eroded one of the banks – suggest repair with rock/rotten rock.	
7/2/96	WRC reply – willow clearing and erosion to be attended to later this month	
25/9/95	WRC fax to Transit NZ and NZ Rail. - river channel against left bank gabion baskets under abutments of both bridges. Recommend that channel be realigned and excess gravel moved into bank edges. Estimated cost \$300 at each bridge.	N/6/30/5 vol 3
2/11/95	Duffill Watts & Tse – Stream undermining right abutment of Ringawhati Bridge and rock protection either side. Interim solution to realign stream and rearrange existing concrete block protection. KCDC share \$200.	N/6/30/5 vol 3
18/12/95	Letter with video of flooding 22 June 1995 at end of Greenwood Boulevard. (where is video now?)	N/6/30/5 vol 3
10/1/96	Cadmuir Holdings – erosion, request crossblading to bring channel to centre of stream.	N/6/30/5 vol 3
19/1/96	WRC report on Hydrological Investigation of Greenwood Boulevard stream. (Response to concerns raised during the year by residents).	N/6/30/5 vol 3
1/2/96	Consent granted for two years to WRC to undertake stream maintenance in reach 100m upstream of Waterworks Bridge and 100m downstream of Old Coach Rd	N/6/30/5 vol 3
16/2/96	KCDC – 10 year flood last week undermined left abutment of Ringawhati Rd bridge by approx. 1.5m, and moved blocks protecting downstream wingwall and approach road. WRC to undertake remedial works (fill scour hole, place rock riprap), at estimated cost of \$10,000. (Earlier KCDC letter outlined additional repairs needed at Waterworks Bridge and along Valley Rd.) Note that work superseded by later flood.	N/6/30/5 vol 3
27/2/96	Bank erosion during 19 February flood – Linda Patterson Ringawhati Rd.	N/6/30/5 vol 3
6/3/96	WRC letter to Paterson. 10 year flood 7 th February, 20-25 year flood on 20 th February. Latter caused damage to Paterson left bank, and destroyed 80-85% of routine maintenance on stream carried out under resource consent after 13 February. Dispute claim that flood damage caused devaluation of \$20,000.	
29/2/96	KCDC to be invoiced for 6 hours labour and \$794 plant hire for edge protection and works associated with bridges.	N/6/30/5 vol. 3
1/3/96	Photos and summary of flood damage from February events.	N/6/30/5 vol.4
18/4/96	Gabion work being constructed by TranzRail under left rail abutment.	N/6/30/5 vol.4
24/4/96	File note – Inspection. Further work to repair the 30? year event 20 February.	N/6/30/5 vol.4
13/6/96	WRC letter re protection options Johns and Waterworks Bridge. Snub groyne option at Johns (cost \$26,200). Willow planting/toe rock protection options at Waterworks bridge.	N/6/30/5 vol.4
10/6/97	WRC wishes to carry out in-channel works adjacent to Johns, prior to 30 June. Concrete block edge protection and concrete block grade control, rather than groyne option, as KCDC declined to contribute. Johns letter. Sketch of current and past river courses from Waterworks bridge to Johns. Believes restoring straight alignment under Ringawhati Bridge will alleviate	

17/6/97	problems at his property. February's flood cut 6m off right bank downstream of bridge, and bank is now less than 6m from edge of seal.	
27/6/97	Works (other than willow planting) completed 21 June.	
8/7/96	Proposed planting programme for 1996	N/6/30/5 vol.4
15/7/94	Martin letter (see May 1994 letter) – mouth drifting north and eroding sand dunes	N/6/30/5 vol.4
Undated	Baber? Letter re flooding 49/51 Convent Rd	N/6/30/5 vol.4
2/8/96	WRC letter re flood concerns from Waitohu overflowing within Winterburn property. Propose (long-term) to build deflector bank to return flow back under Old Coach Rd bank.	
2/8/96	Sims concern over mouth – believes last cut (\$9000) was waste of money.	N/6/30/5 vol.4
18/11/96	WRC Response amend erosion trigger in Proposed Regional Coastal Plan to add additional clause - mouth to be cut when a vertical scarp in sand dunes exceeds 2m	
24/2/97	Summary of works (incl. costs) of direct benefit to KCDC, 1990-present.	N/6/30/5 vol.4
9/10/97	Walkover notes, Askew to Valley Bridge. Problems and requirements.	N/6/30/5 vol.4
31/7/97	Propose to cut mouth 4-5 August. Mouth currently 1100m north of Konini St and eroded scarp is over 3m high on Sims property. Water levels immediately upstream of CMA are 300-350mm above normal low flow levels	N/6/30/5 vol.4
1/9/97	Letter to Wootton. Tree stumps to be removed from stream channel	N/6/30/5 vol.4
14/10/97	Laurenson letter –concern over willow blockage and over 15m high slip, Old Coach Rd.	N/6/30/5 vol.4
7/11/97	WRC reply – Some stabilisation to be done – willow planting and place river boulders. Willows clearing over 2-3 years.	
20/11/97	Flood 15-16 Nov 1997 - damage summary, estimated repair costs (total \$5260).	N/6/30/5 vol.4
June 1998	Resource Consent application – maintenance for 15 years. Summary of stream issues, works in place, types of works possible, flood history (and photos)	N/6/30/5 vol.4
24/7/98	KCDC – provided May/June 98 survey data for channel at and near Valley Rd, Ringawhati and Waterworks Bridges	N/6/30/5 vol.4
7/8/98	Propose to cut mouth 10/11 August. Both northern distance and sand face height triggers have been met.	N/6/30/5 vol.4
28/8/98	Invoice Sims for \$1507.50, being 1/3 of total cost.	
19/10/98	Willow planting 98/99 actual – 750 plants (Holmes)	N/6/30/5 vol.4
Nov 98	Phillips bridge – replacement of bridge damaged in floods in October. Flood Protection – no objection to Malcolm Phillips bridge consent application. Overflow path to east to be maintained, soffit 1.3m higher than old bridge soffit.	N/6/30/5 vol.4
21 Jan 99	Compliance report consent WGN990089 – to undertake mitigation works at Wakapua Farm and 1.4km upstream of Waitohu Valley Rd bridge. At former site, stream rediverted to original path, concrete blocks to be used to construct a permanent core for the diversion. At latter site, willow planting true right bank, material eroded from left pier had been restored (consent and application held in box file in Rivers Library) Wakapua Farms - Stream cut through loop in recent floods – aim to return stream to original course. Waitohu Valley Rd bridge- left abutment undermined. Propose to replace rock around bridge and to cross-blade. 1.4km upstream of bridge – plant willows but as buffer lost in floods, need to realign stream. Consent granted 9 December 1998	N/6/30/5 vol 4 (consent and application held in box file in Rivers Library)
23/8/99	Phillips letter – Flood early Sat morning 21/8 and Sat afternoon. Extensive damage, land under water. Taylors have farmed land since 1907.	N/6/30/5 Vol 5

17/2/2000	Further letter, raining again. Work carried out 20 December, but flood 19 December broke through to old course of river	
25/2/2000	WRC sketches of proposed works	
8/9/99	River mouth cut 12-13 Aug	N/6/30/5 Vol 5
13/9/99	Simpson letter – river eroded a week ago, erosion rapidly approaching Waitohu Valley Rd.	N/6/30/5 Vol 5
16/11/99	WRC reply – bank edge repair programmed for prior to Christmas.	
21/12/99	Simpson letter –further flood damage	
6/9/99	Robinson letter (Taylor Rd) – erosion south of her property from recent floods. Photos enclosed 20/9/99	N/6/30/5 vol 5
15/11/99	Summary of 1999 willow planting – 2081 planted Waitohu Stream to 12 Nov 1999	N/6/30/5 vol 5
20/12/99	Flood 19 Dec – maybe 15year event. Erosion to Kaihau Trust land downstream of Waitohu Valley Rd, stream 3m from road fence, and at Johns – concrete blocks undermined	N/6/30/5 vol 5
18/1/2000	Official Info Request – re mouth. Info provided - Environment Court reference by Sims withdrawn 19 March 97. File X/9/6/5 following site visit, and expectation that mgt plan can be prepared? Sims wanted trigger points amended to (1) 500m north of Konini St and (2) 200m inland from mean average high water (declined by Hearing Committee) Photos of mouth cuts attached to info	N/6/30/5 vol 5
29/2/2000	Moffat Letter – Previously (when?) stream had floodplain area at Waitohu Valley Rd bridge, which allowed excess water to flow across farm land into a small creek and pass under main road via 2 culverts. Not so now – all water in main channel.	N/6/30/5 vol 5
22/3/2000	NZAM letter – surveys 1992 1:10250, 1988 1:10000 available Further fax 24/5/2000 1966 available (SN 1847) _ obtained by WRC	N/6/30/5 vol 5
18/5/2000	Otaki and Porirua Trust Board – concern over erosion over past two years, from Waitohu and Mangapouri floods	N/6/30/5 vol 6
30/6/2000	Stream Baseline Survey prepared by MW, 17/7/2000 – GJW report	N/6/30/5 vol 6
5/9/2000	File note – meeting Environment and Flood Protection re each's work re stream. FP no longer seeking global consent	N/6/30/5 vol 6
3/10/00	Flood damage 1-2 Oct, Wakapua Farms and Kaihau Trust. Propose at first site, bund off old stream channel – threatens 2 houses. Reinforce bund with concrete blocks, willows. Flood overflow bund to east will be reinstated with residual gravels over approx 100m, to prevent downstream migration of shingle fan onto farmland. Approx 300m above this overflow bund, stream is about to breach RB willows and enter old stream braids that lead to house. Propose to crossblade At second site – reinstate meander loops and concrete block bund, plant willows – divert stream back into loop.	N/6/30/5 vol 6
Jan 2001	Report on Convent Rd stopbank – proposal – to reduce overflow from Waitohu and hence reduce risk to Convent Rd houses	N/6/30/5 vol 6
27/03/01	Transit NZ consent application and drawings – proposed culvert/gabion headwall under SH bridge – tributary at Taylors Rd.	N/6/30/5 vol 6
May 01	Consent application – works Ringawhata Bridge to Wakapua Farm cow race, until 30/6/04, to replace the global 15 year consent sought earlier.	N/6/30/5 vol 6
21/06/2001	Consents for river channel maintenance between Ringawhata Bridge and Wakapua farm access bridge, for 3 years	N/6/30/5 vol 7
30 June 2001	Works summary for June 2001 (25-30 June)- include <ul style="list-style-type: none"> • stream mouth alignment, as outside trigger points, • willow layering, clearing, planting (931 poles total) Askew – Kaihau Trust 	N/6/30/5 vol 7

	<ul style="list-style-type: none"> • Johns RB 22m cabled concrete block protection • Askew :cross-blading RB, add 20m cabled concrete block protection LB • CabrachCadmair – RB cross-blade • Kaihau Trust RB– at power lines RB divert channel to old LB position, cross-blade above rail bridge RB • No extraction April – June • October 2000 – “10-15 year” flood • Cross-blading – 200m – 90m at Askews RB, 30m at CabrachCadmair RB, 80m Kaihau Trust RB above rail bridge • Two channel diversions – Simpson’s below Waitohu Valley Rd bridge and Kaihau Trust RB– at power lines RB divert channel to old LB position 	
30 June 2002	<p>Works summary for 1 July 2001 – 30 June 2002 include</p> <p>June - stream mouth alignment, as outside trigger points,</p> <p>Cross-blading – 160m total (March), – 80m at Julls LB 20m at Simpsons RB, 60m Kaihau Trust LB</p> <p>One channel diversion March – Kaihau Trust LB below SH1</p> <p>No gravel extraction</p>	N/6/30/5 Vol 7
18/12/02	Askew – erosion	N/6/30/5 Vol 7

3. Press Articles

Date	Summary	Reference
9 December 1989	Note that large flood in Otaki 5 April 1931	Levin Chronicle
26 February 1990	Waitohu Bridge flood damage 17 January	Kapiti Observer
14 March 1990	March 1990 floods. 80 acres of Taylor land flooded. Unfinished dredging and realignment work by WRC blamed for damage. Also flood damage 17 January. Waitohu Bridge photo. Water around Ken Enoka house	Chronicle
2 March 1990	Photos – Waitohu bridge repairs needed.	Chronicle
18 January 1990	Waitohu Valley Road bridge damage. Note that the water supply mains pipe (steel) runs across this bridge. Water supply intake pipe sheared off.	
24 February 1990	Waitohu bridge repairs. “Three of the four crib walls have been washed away prior to 1982”	Kapiti Mail?
2 March 1990	Waitohu bridge and water supply access bridge repairs needed.	Chronicle
24 February 1990	Waitohu bridge – photos, repairs (gabions).	Mail
12 March 1990	Waitohu bridge photo.	Chronicle
May 1990	Waitohu bridge being monitored following heavy rain.	Chronicle
21 November 1990	Maintenance on Waitohu – tree removal and layering, channel realignment, gravel extraction (3000m ³ removed, more available).	Kapiti Mail?

Date	Summary	Reference
1 November 1990	Heavy rain on 31 October would have caused flooding to farmland if mouth had not been out last week. Mouth had moved to its most northerly position since 1879.	
18 February 1991	Waitohu burst its banks after rain last night.	Chronicle
No date	WRC-KCDC agreement on water courses. WRC to manage Waitohu and Mangapouri streams and their tributaries	Not sourced
29 November 1991	Ringawhati bridge – end washed out Eric Johns says OBC rebuilt bridge 8 years ago – original bridge was wooden and 7m longer. Since that time the riverbed had dropped by two feet	Chronicle

The GW (WRC) intranet contains a summary of all newspaper clippings of relevance to the council, from late 1992. Those that are relevant, to the end of May 2003, to the Waitohu Stream are listed below.

Illegal dam angers council staff

Chronicle, Page: 1,06/04/1994

- An illegal private dam built by a farmer on the **Waitohu** Stream has appalled Wellington Region Council staff. The dam contributed to a situation where water and oxygen were so scarce that fish in the stream were dying.

Work on SH1

Dominion, Page: 3, 18/06/1994

- Transit New Zealand is replacing the railings on several bridges and improving road signs on State Highway 1 this month. Old concrete sides of the **Waitohu** bridge, north of Otaki, the two Mangaone bridges at Te Horo, the Paraparaumu rail overbridge, and the Paekakariki rail overbridge will be replaced with continuous steel guard railing.

Rivers test flood works

Kapiti Magazine, Page: 20, 25/11/1994

- River protection in the region stood up well to a severe test said WRC deputy chair Alison Lawson. "When we see the region's rivers raging like this we can see how potentially difficult they are to manage. "The performance of the WRC rivers staff was also crucial in ensuring the damage caused by rising water levels was kept to a minimum, she said. In Kapiti, Garry Baker, Operations Manager, was out checking the Otaki and the Waikanae rivers, as well as the Mangaone and the **Waitohu** streams, both well swollen.(storm)

Fears for water pipes

Chronicle, Page: 3, 17/06/1995

- Concern over the safety of important Otaki-supply water pipes on **Waitohu** Valley Road will be dealt with by laying 1000 tonnes of rock along the river's western bank by the bridge. The Wellington Regional Council has granted a resource consent and a tender is about to be issued for the job

Bridges protected

Kapiti Magazine, Page: 6, 27/06/1995

- Following recent heavy rain, washing out material from the foundations of the **Waitohu** Bridge, Kapiti Coast District Council plans to lay 1000 tonnes of rock protection along the western side bank. The Otaki Railway bridge has also received some extra rock protection. The Regional Council and NZ Rail are acting to prevent further scouring out of the south bank around the bridge abutments. (Full text).

Is the river eating away our farm? Sequel

Otaki Mail, Page: 9, 28/07/1995

- Andrew Phillips of Otaki took a Special Prize at the Kapiti Science Fair with his continuing investigation of erosion on the family farm. He has been recording a profile of the **Waitohu** riverbank since 1993. With a notable increase in flooding in the past year, his hypothesis is proved to be true. Photo.

River reaches second highest flow peak

Chronicle, Page: 3, 13/03/1996

- Wellington Regional Council figures released this week show in November 1994 the Otaki River reached its second highest flow peak in 40 years. The figures were part of the WRC's 1994/95 hydrology report which was due to go to the Environment Committee on Thursday. Report author Jon Marks said it was quite common for high levels to be experienced in November, though he could find no reason why. Meanwhile, two floods in Otaki's **Waitohu** Stream last month were also seen as significant by WRC.

Reports of pump station incorrect

Chronicle, Page: 3, 08/05/1996

- Reports of an \$840,000 pump station to be built in Otaki to help prevent floods were incorrect, according to the Wellington Regional Council. However, the regional council conceded one of its own press releases caused some confusion which led to the report that the pump station would be installed. WRC project engineer Peter Blackwood said it had already been agreed that stopbanks would go in at Chrystalls bend and South **Waitohu** and floodgates would be duplicated at Rangiuuru.

More drainage woes

Otaki Mail, Page: 3, 29/07/1996

- "We don't want any more wet feet" a "Flood Action" group told staff of the Wellington Regional Council last week. WRC staff came to look at the problem of flooding at the northern end of Convent Road. The residents group says an inadequate culvert under Convent Road can't drain the overflowing paddocks. Several things in February contributed to the problem, according to Otaki river supervisor Garry Baker. To minimise future flooding, the Kapiti Coast District Council are taking responsibility for keeping the culvert clear. The Regional Council will check & clear the **Waitohu** and Mangapouri stream channels.

Culvert is worth \$31,000

Otaki Mail, Page: 9, 29/07/1996

- Freemans Road residents are, after three years wait, going to get protection from surface flooding by the replacement of a stormwater culvert under the road. However, it does not come cheap, reports stormwater engineer Blair Murray. The Wellington Regional Council have included that part of the Waitohu catchment in their floodplain plan, meaning that a larger 1350mm pipe will be used and non-notified consent is necessary, he says.

Council blows out flood works budget

Chronicle, Page: 3, 03/09/1996

- The Wellington Regional Council spent more than \$30,000 more than it budgeted for in the last financial year on flood management works in the Otaki River. The regional council also spent another \$28,000 repairing damage in the Waitohu Stream caused by flooding in February this year. In total, the rivers department spent \$1,802,518, well over the projected budget of \$1,457,150.

Waitohu water shutdown

Chronicle, Page: 3, 12/11/1996

- Water supply to the Waitohu Valley plateau will be shut down on Wednesday night while the Kapiti Coast District Council carries out flood protection work on the water pipes. Council hopes to raise the pipe to the level of the bridge.

Otaki River Work

Chronicle, Page: 1, 26/05/1998

- Contractors are pictured installing huge piles of stones to protect the Otaki River riverbank beneath State Highway One. Heavy rain in the past 24 hours has caused the river to rise two metres, according to the Wellington Regional Council. WRC officer Barry Rolton said the Waitohu Stream was being watched as it had a smaller capacity.

Resource Management Act

Evening Post, Page: 23, 01/08/1998

- Public Notices: notification of application for resource consents WGN 980263 (Waitohu Water Treatment Plant) and WGN 990012 (Flood Protection Group).

Waitohu Stream mouth cut

The Mail Kapiti, Page: 5, 20/08/1998

- Letter to the editor from R K Bloxham of Otaki, includes: "Through your paper I would like to ask the Wellington Regional Council why they cut a drainage ditch across Otaki Beach approximately 1km south of the natural Waitohu Stream. I cannot see any justification for what I consider a complete act of vandalism." Also, a lengthy reply from Cr Ernie Gates.

Beach cutting is 'futile' says residents

Otaki Mail, Page: 1, 28/08/1998

- The Wellington Regional Council's cutting of a new channel for the Waitohu Stream is an act of vandalism, says beach resident Roger Bloxham. The stream had reached trigger points (set by the WRC) which enabled them to cut into the beach without further notice to anybody. The cut was made at the request of a neighbouring farmer, who doesn't want the stream wandering towards his land.

Heavy rains cause havoc

Chronicle, Page: 1, 21/10/1998

- A Fielding man narrowly avoided death early this morning on the Waitohu Bridge after heavy overnight rain and floodwaters combined to gouge a 500mm hole in the bridge surface. The Otaki River below the highway bridge was flooded from bank to bank and the access road to the gravel extraction plant was reported to be under water. A second slip is also reported to have blocked the Otaki Gorge Road near the swing bridge which gives access

Floods, slips cut off Kapiti Coast

Evening Post, Page: 1, 21/10/1998

- Kapiti Coast was cut off today, with SH1 closed by slips and bridges made impassable after torrential rain lashed the Wellington region overnight. A civil defence emergency was declared on the coast. The Waikanae River burst its banks in several areas. The main trunk railway line was blocked by slips north of Waikanae. Highway engineers feared the Waitohu bridge could collapse after floodwaters scoured out abutments.

Highway damage bill \$1.2m

Evening Post, Page: 2, 26/10/1998

- Highway damage in the Wellington region last week will cost Transit New Zealand about \$1.2 million. Transit spokesman Peter Bailey said that was a "rough cost order" following heavy rain and flooding on the east and west coasts. Work on the Waitohu Bridge, at Kaitoke and on the Rimutaka Hill was estimated to cost \$800,000.

Toddler drowns in stream

Dominion, Page: 1, 26/10/1998

- A 23-month boy drowned in the swollen Waitohu stream in Otaki yesterday. Whitebaiters found the body of Kumea Te Aroha Murray-Abraham at the mouth of the stream.

Flooding takes toll on region

Chronicle, Page: 2, 29/10/1998

- Photos of flooding in the region, includes photo of digger repairing damaged abutment to Waitohu River bridge.

Limited funds for the 'wild Waitohu'

Otaki Mail, Page: 3, 26/11/1998

- Wellington Regional Council made an urgent application for a resource consent (to itself) to deal with the wild Waitohu this month. The two damaging floods have eaten dramatically into farmland and altered its course. But the WRC has limited funds, according to river operations manager Geoff Dick.

Flooding reveals buried treasures

Otaki Mail, Page: 1, 26/11/1998

- Last month's floods revealed some long-hidden treasures in Otaki. At the height of the flood, the Otaki River swept away a long section of the road beside Streecrete's concrete plant. An old army vehicle was discovered. Rivers staff reburied the vehicle. A wooden viaduct was also found in the Waitohu. Andre Visser of

Wellington Regional Council said it was important to record and protect and historical feature at a local river.

After the deluge

Otaki Mail, Page: 12, 27/11/1998

- Two photographs of recent floods, includes damage at the Waitohu Bridge.

5 million bill for flood repair

Chronicle, Page: 1, 01/12/1998

- A \$5 million bill to repair recent flood damage in the Hutt, Otaki and Waikanae rivers and improve flood protection is faced by Wellington regional ratepayers. Repairing the rivers and the Waitohu Stream, north of Otaki, will cost \$1.9 million. Another \$2.9m is needed to boost flood protection. Wellington Regional Council flood protection manager Geoff Dick said about \$1.7m could come from reserves and a claim from Transit New Zealand. The flood protection improvements would probably be funded by a loan - which could add about 1 per cent more to rates.

River rate possible

Weekly News Kapiti, Page: 2, 09/12/1998

- Kapiti residents could have their rates increased to pay for the \$2.5 million bill to fix the district's rivers after damage caused by recent floods, said the Wellington Regional Council. Wellington regional ratepayers face a \$623,000 bill to repair the Waitohu Stream and Otaki and Waikanae rivers. Another \$1.9 million will be spent boosting flood protection. WRC flood protection manager Geoff Dick said the cost of the repairs would come from maintenance monies, reserves and a claim from Transit.

Regional council to vote on flood repairs

The Mail Kapiti, Page: 7, 10/12/1998

- In the wake of the two floods in the Wellington region in late October, Kapiti could benefit from \$2.5 million on repairing and improving flood protection on the major rivers. Wellington Regional Council will decide today whether to commit this amount for the Waikanae, Otaki and Waitohu rivers. Kapiti regional councillor Chris Turver says the council's Landcare division has, within one month of the floods, done an outstanding job in assessing priorities and recommending urgent action. "What ratepayers will be getting for their money is not just remedial work for the damage caused by the floods but improved flood protection for the future," says Mr Turver.

Children's plea for swimming pool answered

Chronicle, Page: 5, 06/01/1999

- Last week the kids who live in Waitohu Valley Road were bravely facing the prospect of a long hot summer. That is until the Wellington Regional Council came to the party with a Christmas present the children will never forget. They installed a water hole for the children to enjoy. Their plight was brought to the attention after children left a note asking for a water hole on a bulldozer. WRC Kapiti area flood engineer Garry Baker said: "it just goes to show the council does do positive things for people from time to time." (Includes photo).

Farmers plead for help as Waitohu floods

Otaki Mail, Page: 3, 27/08/1999

- Otaki farming couple Malcolm and Rachel Phillips have made a plea to the Wellington Regional Council for better maintenance on the Waitohu river. At 2am last Saturday, as acres of the Phillips farm began to go under water, Rachel Phillips was writing a heartfelt appeal to river operations manager Geoff Dick for preventive maintenance. The Regional Council seemed to have a hands-off policy, said Malcolm. The council brought in large concrete blocks for river control on the property, but they are still there unused. Chris Turver regional councillor is going to visit the Phillips property this weekend.

Waitohu may be cut again soon

Kapiti Observer, Page: 8, 13/09/1999

- Letter to the editor from Jo Rosier, Secretary Waitohu Stream Care Group Otaki, includes: "Whitebaiters are not the only people bemused by channel works in the Waitohu Stream. The Waitohu Stream Care Group is disappointed by both the timing and location of the works. The group would like to comment on (Wellington Regional Council engineer) Garry Baker's statement. The re-routing of the Waitohu should not be an annual task. Cutting of stream mouths has ecological effects and the reasons for each cut should be clear. the Waitohu Stream Care Group does not understand why the WRC has adopted inconsistent approaches erosion on northern and southern banks. The WRC engineers did not delay works to allow the residents to have a say. Council officers TOLD residents that they had the right to cut and that they would cut."

Geoff Dick, manager Flood Protection (Operations) Wellington Regional Council comments: "The Waitohu Stream Care group appears to disagree with the way the stream mouth is being managed by flood protection engineers from the Wellington Regional Council. Rather than debate this issue in detail in this letter I will arrange a further meeting with the group. Residents' views are important, particularly as we may need to cut the mouth again in the near future."

'No recreation activity'?!'

Otaki Mail, Page: 3, 24/09/1999

- The Regional Council, in its application for a resource consent, describes the Waitohu as having "practically no recreational activities" (other than walking and fishing at the mouth) something that these residents dispute.

residents defend the Waitohu

Otaki Mail, Page: 3, 24/09/1999

- The Waitohu River Care Group was formed out of locals' dismay at the cutting of the mouth last year, as well as the erosion of the dunes, the lowering of the riverbed and the reduction in habitat for birds, particularly. They are also concerned at the deteriorating water quality over the last 6 years, said Pearlie Reeves. The residents established their River Care group, guided by Nigel Clarke of the WRC, in May. The group are concerned the lack of information from WRC staff and especially at the low status they seem to give the river in their resource consent application.

River wipes out \$3500 channel
Otaki Mail, Page: 3, 24/09/1999

- Wellington Regional Council river staff discovered last month that the Waitohu river has a mind of its own, when flooding wiped out \$3500 worth of excavation work a few days after it was done. Regional Council contractors put a new exit channel at the mouth of the Waitohu on August 7th, in an effort to realign the river mouth further north and prevent it cutting into the dunes. Council staff Geoff Dick and Garry Baker listened to residents concerns last week; they have suggested a new curved alignment in future for any cutting of the river mouth.

Flood work on the Waitohu
Otaki Mail, Page: 3, 22/10/1999

- Wellington Regional Council staff expect to start flood protection work on the Waitohu river early next month, as soon as the resource consent is issued. Geoff Dick, manager of flood protection, said council's contractors would be removing gravel build-up and reinforcing vulnerable sections of bank adjacent to the Phillips property, which has been hit by floods in the past 12 months.

Residents get WRC to realign Waitohu Stream
The Mail Kapiti, Page: 5, 02/12/1999

- The Friends of the Lower Waitohu met with WRC area engineer flood protection manager, Gary Baker and Geoff Dick, flood protection operations manager, recently after repeated high tides had caused the river to cut into sand dunes to the south of the Waitohu Stream. Following discussions with residents, the WRC officers agreed that action was necessary and will arrange for a new cut to be put in nearer the northern sand dunes. Mr Baker said there would need to be some consultation with the land owner concerned and WRC would need to provide flood protection at the base of the dunes.

Waitohu will move when ready
Kapiti Observer, Page: 9, 13/12/1999

- Letter to the Editor: John Simcox, Otaki. Commenting on the shifting of the mouth of the Waitohu back to its original course. "The WRC (Wellington Regional Council) can waste our rates on moving the mouth northward, then a good old Nor-Wester will change it again. Don't mess with loose sand and the river".

Down pour causes flooding in Otaki
Evening Post, Page: 3, 20/12/1999

- Continuous heavy rain early yesterday morning in the hills behind Otaki closed a bridge and flooded several residential areas. Worst hit was Waitohu Valley where streams overflowed and an approach to Ringawhati Bridge eroded away. Residents of Greenwood Boulevard, off Waitohu Rd, had to prevent floodwaters entering early in the morning and Trinity Farm, closer to the hills, had a wall of water go through its rose nursery, eroding the driveway and leaving deposits of silt.

Council better prepared for floods
Chronicle, Page: 3, 22/12/1999

- Sandbags from last October's floods helped minimise damage from severe, but localised flooding around Otaki on Sunday. "Fortunately we had a couple of hundred sandbags ready in the Otaki store," said Kapiti Coast District Council stormwater engineer Blair Murray. The rain began in the early hours of the morning and

emergency calls began about 6am, he said. By 11am, the rain started to let up and the worst flooding moved from the foothills to the lower reaches of the streams. The **Waitohu** Stream also flooded in the Greenwood Boulevard area.

Stream savers to the rescue

Evening Post, Page: 16, 20/07/2000

- Concerned Otaki Beach residents and Wellington Regional Council are turning **Waitohu** Stream's dying estuary into a place where fish and native frogs can thrive again. WRC has budgeted \$438,000 for it over the next three years.

Waitohu guardians test the water

Otaki Mail, Page: 4, 28/07/2000

- The **Waitohu** Stream Care group are working with the Wellington Regional Council on a new initiative to reduce pollution and erosion of the stream. Five of their members have been trained to test the water quality, stream life and silt levels of the **Waitohu** and they will provide the results to Regional Council to monitor the stream quality.

WRC disappointed with resource consent compliance

Evening Post, Page: 10, 13/09/2000

- Thirty-five percent of resource-consent holders are failing to comply with the conditions of their consents, Wellington Regional Council says. The council even had to issue warnings to itself as a consequence when Te Marua water treatment plant released an unauthorized discharge of sludge, **Waitohu** Stream silted up after carrying out works on the riverbank and a medical waste incinerator at Miramar (Medical Waste) breached its discharge to air resource consent four times in 1999-2000.

Dune planting gets under way on Waitohu

Otaki Mail, Page: 4, 29/09/2000

- The **Waitohu** Streamcare Group, after a lot of planning and preparation, carried out its first dune planting with native plants at the end of Moana St on September 9. The area was cleared of boxthorn by the KCDC and plants were grown-on from seedlings supplied by the Wellington Regional Council. Spokesman Geoff Monk said the group had requested a WRC Environment Care Group grant to allow it to tender for the right to establish and operate a nursery at Te Wananga O Raukawa, which would supply plants for riverbank planting, a major job.

Downpour drenches Kapiti

Weekly News Kapiti. Page: 1, 04/10/2000

- Blue skies returned to Kapiti yesterday after days of heavy rain, flooding and washouts, disrupting roads and water supplies. The Otaki River at Pukehinou rose 5.2m above normal, greater than a five year flood, almost 1m of rain fell in the Tararua ranges over the weekend - the usual total for the whole of October. Several streams like the **Waitohu**, also had "significant flows," said Brendan Paul flood protection manager for Wellington Regional Council. Ironically, the rain also disrupted Kapiti's water supply over the weekend.

**Heavy rain threatened repeat of 1998
Kapiti Observer, Page: 1, 05/10/2000**

- Civil Defence organisations were on standby until 6pm Monday as days of heavy rain in the Tararua region raged down the region's waterway threatening a repeat of the 1998 floods. After touring the Kapiti district to check damage on Monday, Wellington Regional Councillor Chris Turver said the hardest hit were land and property owners on the **Waitohu** Stream north of Otaki. "The \$1m of flood protection works along Kapiti's major rivers has done the job," Mr Turver said.

**Flood protection work needed, says council
Dominion, Page: 7, 13/12/2000**

- Extra flood protection work for the Hutt River and on the Kapiti Coast would help keep communities safe, Wellington Regional Council said yesterday. Repair and bank-strengthening work would be carried out on the Otaki, Waikanae, **Waitohu** and Hutt Rivers, flood protection (operations) manager Geoff Dick said.

**Extra flood works to keep communities safe
News Release Page:, 13/12/2000**

- Additional flood protection work on the Kapiti Coast and in the Hutt River this financial year will help keep local communities safe, says the Wellington Regional Council. Last Thursday, the Council approved \$550,000 for flood damage repairs in the western rivers needed after damage caused by heavy rain in October. The Council also brought forward \$480,000 of programmed edge protection improvements for the lower Otaki River. "We'll be able to carry out necessary flood repair and strengthening works on the Otaki, Waikanae, **Waitohu** and Hutt rivers." says WRC Manager, Flood Protection (Operations) Geoff Dick.

**Extra flood works planned
Petone Herald, Page: 3, 21/12/2000**

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**More protection work needed on Kapiti rivers after floods
Horowhenua Mail, Page: 15, 04/01/2001**

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**More protection work needed on Kapiti rivers after floods
Kapiti Observer, Page: 15, 04/01/2001**

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Council. The Council has approved \$550,000 for flood damage repairs in the western rivers needed after damage caused by heavy rain in October. They also have brought forward \$480,000 of programmed edge protection improvements for the lower Otaki River. "We'll be able to carry out necessary flood repair and strengthening works on the Otaki, Waikanae, **Waitohu** and Hutt rivers." says WRC Manager, Flood Protection (Operations) Geoff Dick.

Streamcare group get funding

Otaki Mail, Page: 8, 26/02/2001

- The **Waitohu** Streamcare group had some good news this month. They will get some support funding from the Wellington Regional Council, \$5000 this financial year \$10,000 for the next. This is for their ongoing revegetation project for the banks of the **Waitohu** Stream.

Consultation on flood protection

Weekly News Kapiti, Page: 9, 04/04/2001

- Land and property owners near the **Waitohu** and Mangaone streams will be consulted by Wellington Regional Council this year in relation to future flood protection. Kapiti's regional councillor Chris Turver said the consultation would help the WRC assess where long term priorities lay in relation to present and future land use, and the extent of protection needed.

Council to consult land owners on flood protection

Chronicle, Page: 3, 04/04/2001

- The Wellington Regional Council is to consult land and property owners on the **Waitohu** stream north of Otaki and the Mangaone stream at Te Horo about future flood protection. Kapiti's regional councillor Chris Turver said the consultation, to start later this year, will help the Wellington Regional Council to assess where long term priorities lie in relation to present and future land use and the extent of protection needed.

Discussion on flood protection

Kapiti Observer. Page: 4, 12/04/2001

- Wellington Regional Council will start consultations late this year with property owners on the **Waitohu** Stream in Otaki and the Mangaone Stream at Te Horo about future flood protection. Regional councillor Chris Turver says this is to help the WRC to assess long term priorities on land use and the extension of protection needed.

Waitohu mouth cut again

Otaki Mail, Page: 8, 29/06/2001

- Wellington Regional Council recut the mouth of the **Waitohu** this month, because the river was once again heading north beyond the agreed marker points and threatening farmland. This 'bund' is the reason that the **Waitohu** tends to pond behind the dunes, said Garry Baker, WRC operations supervisor. The Regional Council do their best to keep machinery away from the river in the whitebait season. But safety issues and river management sometimes required it, he said.

Nursery is a tribute to Waitohu volunteers

Otaki Mail, Page: 9, 29/06/2001

- Longtime Otaki beach residents Pearlle and Francie Reeves were guests of honour at the opening of the new **Waitohu** Streamcare nursery last Saturday. Pearlle cut the

ribbon, and then they both gasped with surprise as the cover was pulled back from the large plaque naming it the 'Reeves Nursery.' The new shade-house, built with a grant from the Wellington Regional Council, will enable the streamcare group to propagate native plants. Pearlie was a prime instigator of this voluntary group said regional councillor Chris Turver and what they had achieved in the past two years was remarkable. At a meeting in 1999 with the residents, the WRC recognised the plight of the stream and Nigel Clark became adviser to the group.

Nursery milestone for conservation group

Kapiti Observer, Page: 2, 02/07/2001

- The official opening and blessing of the new Reeves Nursery, purpose-built to propagate plants for restoration of the **Waitohu** Stream and sand dunes, was a milestone for an Otaki conservation group. The **Waitohu** Stream Care Group was initially formed to lobby Wellington Regional Council over the repeated cutting of the river mouth and destruction of the sand dunes at the northern end of the beach. With the help of the WRC's Take Care community environmental care programme co-ordinator Nigel Clark, the Otaki group collected, planted and potted hundreds of seeds from foreshore plants and grasses. Kapiti's regional councillor, Chris Turver, said the group and the WRC have formulated a 5-10 year landscape plan.

Committee endorses consultation strategy

Weekly News Kapiti, Page: 19, 18/07/2001

- A consultation strategy for a coastal management project was endorsed by members of the Kapiti Coast District Council infrastructural services committee last week. The consultation would include identifying key parties that are or could be affected by coastal erosion, include iwi consultation, and confirm key stakeholder groups for consultation. Consultation could begin in September and would regard Paekakariki (from north end of SH1 to southern end of QEII park), Raumati South (northern QEII Park to Wharemauku Stream), Raumati North (Wharemauku Stream to southern end of Marine Parade, Paraparaumu), Paraparaumu (Marine Parade to Waikanae River Mouth) and Waikanae to Otaki from the Waikanae River mouth to the northern boundary of Kapiti Coast District Council at **Waitohu** Stream.

Saving the dunes at Waitohu Estuary

Otaki Mail, Page: 12, 26/04/2002

- With the help of the Wellington Regional Council and Kapiti Coast District Council, the **Waitohu** Stream Care Group are making some progress with their dune restoration programme. The Regional Council will be putting up an orange tape barrier to indicate the restoration areas where the group are planting.

An award for Waitohu group

Otaki Mail, Page: 2, 30/08/2002

- The **Waitohu** streamcare group were "thrilled" to find they won recognition in the recent Regional Conservation Awards, made annually by the Minister of Conservation. The group was formed in 1998 when several beach residents discovered how polluted the stream was. With ongoing help from the Wellington Regional Council, particularly Nigel Clark, conservation manager, they set about recording the level of pollution, and also propagating native plants to plant the banks.

Stream care group receives grant

Chronicle, Page: 2, 12/05/2003

- Otaki's **Waitohu** Stream Care Group has received \$2000 from the Transpower Landcare Trust Grants Programme. Stream group chairman Geoff Monk said the group was thrilled to receive the money, which would fund an information board telling people about the stream environment. A three year grant from the Wellington Regional Council (about \$20,000) was already having a good effect.

4. References

The following references contain material relevant to Waitohu. Copies of most are held by the GW library.

Adkin.G.L (1948); *Horowhenua*, Dept of Internal Affairs, Wellington

Includes sketch maps of the Waitohu.

McKerchar, A.I. (1991); *Kapiti Coast Flood Plain Management: Hydrology and Climatology*. Hydrology Centre.

Manawatu Catchment Board and Regional Water Board (1978); *Otaki Scheme Review 1948-1978*

1948-1978 Scheme Review – published May 1978

In 1948 – Waitohu Stream was blocked by willows and shingle deposits. Considerable land area was flooded and Waitohu overflowed to Mangapouri and Rangiruru. Prior to 1948 the Mangapouri had been diverted to Waitohu via the Waikatu drain. Proposed works under Scheme –

- new mouth shortening route to the sea and protect with fascines £500, poison and remove willows to 4.8km £450,
- dredging, improving channel, making cut-offs where necessary to 4.8km £1800,
- stabilise banks from 4.8km to 8.8km by planting willows and poplars £1000
- Improve Waikatu Drain and build stopbank to prevent Mangapouri/Waitohu overflow to Rangiruru, 30 chains, £150
- Pipe and sluice gate to Waikatu Drain £100.

Otaki Scheme works completed in 1962. Other drainage works carried out 1950-78: 2000m Ngatotara Stream, 2600m Waiorongamai Lake inlet and outlet

Review of benefits 1948-1978: Flooding from Waitohu across Tasman and Rangiruru Rds has been reduced. Need for further remedial works to prevent flooding in lower reaches of Waitohu. Improved drainage of areas adjacent to Waitohu Stream.

**Manawatu Catchment Board and Regional Water Board (1981);
*Objectives, Policies and Management for the Water and Soil
Resources of the Otaki River, Waitohu Stream and Mangaone
Stream Catchments. Report No. 38.***

Adopted by the Board 20 October 1981 to assist it in carrying out its powers and functions under the Water and Soil Conservation Act and the Soil Conservation and Rivers Control Act. River Control and Land Drainage Policies in the document included

1. To ensure the maintenance of river control and land drainage works already constructed under the Otaki River Scheme...
2. To ensure that the Otaki River Scheme leads to improved stabilisation of the banks of the Otaki River and Waitohu Stream
3. To ensure that access to the edge of rivers, streams and drains for the purposes of flood control, bank protection and maintenance is possible without any undue hindrance...
4. To identify all areas alongside the Otaki River, Waitohu Stream and Mangaone Stream and their tributaries, including wetlands, likely to be periodically or permanently flooded or subject to inundation and areas necessary for flood control and include them in the Board's Flood Hazard Map for the respective catchments.
5. To ensure that areas likely to be periodically or permanently flooded or subject to inundation due to ponded water are indicated in the Otaki Borough or Horowhenua County District Schemes so as to prevent unwise development or buildings from being sited in such localities.
6. To consider overall schemes for whole catchments and to extend river control and drainage schemes to whole catchments wherever necessary
7. To provide for land drainage related to flood conditions so that the full potential of land can be realised consistent with the appropriate conservation of wetlands and wildlife habitats.

Manawatu Catchment Board and Regional Water Board (1985); *Processes of Coastal Change Manawatu-Horowhenua.*

Nothing specific to Waitohu, but detailed data and analysis of sand size, beach profile, wave observation, transport rates for the entire coast.

“River mouth instability a feature of all major drainage outlets along the coastline. ... All of the major river outlets and several of the minor stream outlets have required Board work at some stage to combat erosion or flooding problems.”

Manawatu Catchment Board and Regional Water Board (1988a); *Otaki Scheme Review, 1979-1982 and Proposed Works 1983-1988.*

Second review of the Scheme, following the first in 1978.

Manawatu Catchment Board and Regional Water Board (1988b); *An Economic Appraisal of the Otaki River Scheme Review 1983-88.*

Nothing specific to Waitohu, more general

Manssen, S.R., (1997); *Otaki Floodplain Management Plan : Phase Two and Three Investigations : Hydraulic Modelling. Flood Protection (Strategy and Assets), Landcare Division, Wellington Regional Council, December 1997. Report No. WRC/RI-T-95/16.*

Montgomery Watson (2000); *Waitohu Stream Environmental Survey. Report prepared for Wellington Regional Council, June 2000.*

Robb, C. (1992); *Otaki Floodplain Management Plan : Phase One: Floodplain Hydraulics. Rivers Department, Operations Division, Wellington Regional Council, December 1992. Report No. WRC/RI-T-92/57.*

Te Runanga o Ngati Raukawa (2000); *Ngati Raukawa Tangata Whenua [Values Assessment] Report on Waitohu Stream: Wellington Regional Council Proposed Resource Consent for Waitohu Stream.*

Wellington Regional Council (1994a); *Otaki River Floodplain Management Plan – Phase One Investigations: A History of the Management of the Otaki River and Flood Control Scheme. Report No WRC/RI-T-92/58*

A comprehensive summary of the historical management of the Otaki River and a database of records relating to the Otaki Scheme. Includes some records relating to the Waitohu Stream.

**Wellington Regional Council (1994b); *Hydrology of the Kapiti Coast.*
Hydrological Services Group. Report No. WRC/CI-T/G-94/13**

Analysis of the surface water and groundwater hydrology of the Kapiti Coast. Predates the Waitohu Stream recorder.

Wellington Regional Council (1998); *Otaki River Floodplain Management Plan.* Publication No. WRC/FPSA-G-98/28

Culmination of considerable investigations relating to the Otaki flood hazard. Range of structural (eg stopbank and river works) and non-structural methods selected to mitigate the flood risk. Also contains flood maps for various design flood scenarios. Covers the Waitohu area, but not in detail.

Wellington Regional Council (2000); *Targeted Investigation of Ecosystem Health within the Waitohu Stream.* Publication No. WRC\RINV-T-00/17

Williams, G.J. (2000); *Waitohu Stream – Resource Consent: Review of Stream Management and of Potential Changes Over Time.*

A supporting document for the Flood Protection Group of WRC in its application for a 25-year resource consent for maintenance.

5. Drawings

Drawings held by GW (Flood Protection) – Waitohu Stream Drawings Database Summary

General Drawings

Plan Number	Sheet s	Title	Description	Size
O-5	3	Otaki River – Proposed Scheme Improvements	Sheet 1 covers Waitohu - 1948	
Wt-8	1	Waitohu Stream Mouth	Plan B Knox Subdivision & Wooton Accretion. Ref Plan 1749 - 1974	A1
Wt-9	2	Waitohu Stream	Headworks Protection & Pipeline Alteration to Otaki Bore - 1973	A0
Wt-18	1	Pukehou Swamp - Between NIMT & SH1	Gen. Location Plan - Drains Cleared / Uncleared within Swamp - 1982	A1
Wt-22	2	Waitohu Valley Road	Right Bank contours in vicinity of Ringawhatai Road, Spot Heights - 1985	A1
Wt-30	1	Waitohu Stream - Waitohu Valley Road - Flood Protection Works	Pritchard Family Property - 1987	A1
Wt-32	1	Waitohu Stream	Levels along State Highway 1 - 1987	A1

Aerial Photography Drawings

Plan Number	Sheet s	Title	Description	Size
Wt-24	1	Ngatotara Siphon - Aerial	Aerial - Waitohu - Mangapouri	A2
Wt-34	2	Waitohu Stream - Aerial Photograph mosaics 1990	1990 Colour Aerial mosaics & Views taken at River Mouth	A1
Wt-38	3	Waitohu Stream - Composite Aerial Prints	Current Position of Stream + Planned Diversion Cuts NZAM ref.920 - 1992	A1
Wt-39	11	Waitohu Stream - 2002 Colour Aerial mosaics Photography	2002 Colour Aerial mosaics	A3
Wt-40	5	Waitohu Stream - 2001 Colour Aerial Mosaics Photography	2001 Colour Aerial mosaics	A1
Wt-41	5	Waitohu Stream - 2000 Colour Aerial Mosaics Photography	2000 Colour Aerial mosaics	A1
Wt-42	3	Waitohu Stream - 1999 Colour Aerial Mosaics Photography	1999 Colour Aerial mosaics	A1
Wt-44	2	Waitohu Stream - Colour Aerial Photograph mosaics 1996		A1

Survey & Cross Section Drawings

Plan Number	Sheets	Title	Description	Size
Wt-4	1	Otaki Scheme - Lake Ngatotara Drainage	Site Plan & Long. Section - 1963	A1
Wt-6	1	Waitohu Stream - Rock Work for Stabilised Mouth	Plan & Cross Sections of Proposed Work - 1967	A1
Wt-7	1	Waitohu Valley Road Bridge	Bridge & Locality Plans. Long Sections of Road & Bridge	A0
Wt-10	10	Waitohu Stream - Cross Section Survey - 1978	Survey Control & Plan & Cross Sections	A1
Wt-12	3	Waitohu Stream - Railway Culverts	Over Railway Culverts - Cross Sections & Contour Plan - 1982	A1
Wt-14	1	Ngatotara Drain	Longitudinal Section & Location Plan	A1
Wt-16	1	Ngatotara Stream	Longitudinal Section & Location Plan	A1
Wt-20	3	Waitohu Stream - J R Palamountain, Bridge Site	Site Plan, Long & Cross Sections - 1985	A1
Wt-26	3	Ngatotara Stream - Proposed New Underpass	Ngatotara Siphon:-Site Plan, Long & Cross Sections & Details of Culvert - 1987	A1
Wt-28	4	Waitohu Stream - Simcox-Sims Drain	Site & Locations Plans, Long. & Cross Sections of Drain - 1987	A1
Wt-36	21	Waitohu Stream - Cross Section Survey - 1992	Cross Sections, Aerial Location Plans, Contract Cover Page	A1
Wt-43	3	Waitohu Stream - Cross Section Survey 1992	Bridge As Built Plans	A1

6. Photo Database

Flood Protection - Waitohu Stream Photograph Database Summary

Folder Number	Date	Location	Description
2	Apr-90	Otaki River, Waikanae River, Waitohu Stream	Otaki - Hughes diversion cut (7), Willow layering at Taylor's (4), beach opposite Chrystalls (2), Mansells (1), Waikanae Pylon erosion repair (8), Waitohu - erosion at Laurensen's (2)
4	Sep-90	Otaki River, Waitohu Stream	Waitohu - shingle build up at Askew property (5), Otaki mouth (4), Waitohu cut below NZR (2)
6	Oct-90	Waitohu Stream, Battle Hill	Waitohu cut & mouth (20), Askew (1), Johns (1), Battle Hill excFloodtions (4)
13	Sep-91	Hutt River, Otaki River, Waikanae River, Waitohu Stream	Waitohu - waterworks bridge and planting at Jull's (3), Melling berms buildings prior to demolition (5), Otaihanga footbridge erosion (1), Otaki - Mansell, Taylor, Pritchard (4)
14	Nov-91	Otaki River, Waitohu Stream, Mangaone Stream	Waitohu - Rangawhati bridge repairs (8) and diversion cut (1), Otaki stopbank cleanup at bridges (2), aerials of Mangaone (4)
49	Oct-91	Hutt River, Waitohu Stream, Otaki River	Melling berm demolition (1), Belmont erosion (2), Totara Pk erosion (3), Otaki rail bridge (1), Waitohu gravel removal (2)
89	Jan-92	Hutt River, Waitohu Stream	Hutt-Pomare Groynes (5), Belmont bank edge and groynes (2), Mill St berm reshaping (5), Waitohu mouth cut (5)
90	Dec-91	Otaki River, Waitohu Stream	Aerial photos and flooding at Riverslea (12), Frasers cliff (3), Hughes (2), Cresswells (2), Andrews (1), Waitohu mouth (1)
91	Aug-91	Otaki River, Waitohu Stream	Otaki - erosion at Cresswell (3) Pilot cut above Riverslea (6), Hughes erosion (4), Waitohu - Break out & pilot cut - Taylors (8) KCDC waterworks bridge (2)
93	Jan-90	Otaki River, Waitohu Stream	Otaki - Chrystalls erosion right bank (4), Upper (7) & Lower (3) Harpers erosion, Hughes erosion (8), Cresswell Murphy (1), Waitohu bridge erosion (4), McGaveston erosion (2)
95	Mar-90	Otaki River, Waitohu Stream, Waikanae River	Waitohu - debris at Taylors (6) and Logan (1), KCDC bank protection (6), Ngatotara drain erosion above syphon (3), Otaki - Chrystalls pilot cut (2), Pritchard (4), Harpers (2), Hughes pylon (2), gas crossing (6), Taylors (1), Bolland Reikorangi (1)
96	Dec-91	Waitohu Stream, Waikanae River	Ringawhati Bridge Abutment failure RB (4), El Rancho - erosion protection gas pipeline left bank (5), plus other neg.s
97	Nov-90	Waimeha Stream, Hadfields Creek, Waitohu Stream	Waimeha Stream mouth and beach (6), Aerials of Hadfields Creek (9), Cut at Johns, Waitohu (2)
104	Aug-91	Waikanae River, Waitohu Stream, Otaki River,	Otaki - planting LB Mansell (4), pilot cut Chrystalls (2), erosion at Riverslea (2) and Hughes (2),

		Waimeha Stream	break out at Taylors Waitohu (3), beach above Jim Cooke Park pylon Waikanae (1), Waimeha mouth (1)
105	Sep-90	Te Horo, Otaki River, Waikanae River, Waitohu Stream	Pipe/Culvert Beach Rd Te Horo (2), Waikanae - Te Karaka (1), Edgewater (1), Ferguson (1), Te Moana Rd (1), Otaki - Taylors (2), Hughes (3), Chrystalls (6), Swing bridge (1), NZ Rail site (2), Swamp Rd (1) Pahiko (1), Rangioru (1), Waitohu - Plunketts (1)
110	Mar-90	Waimeha Stream, Waitohu Stream, Mangaone Stream	March 1990 flood ... Waitohu Stream - Broad (2), Simpson (3), Taylor (5) and Koolman (5) properties, Waimeha Stream mouth (4), Te Horo - Lucinsky property (4)
111	Mar-90	Otaki River, Waitohu Stream	March 1990 flood ... Waitohu Stream - Askew (3) & Taylor (6) properties, Waikanae - Te Karaka (1), Otaki - Pritchard (2) & Hughes (2) properties, Rangioru Stream and floodgates (11)
112	Mar-90	Otaki River, Waitohu Stream, Waikanae River	March 1990 flood ... Rangioru Stream and floodgates (9), Otaki road/rail bridges (3), Waitohu Stream SH1 bridge (2), Waikanae - Ferguson property (7)
114	Jun-91	Waitohu Stream, Te Mome Stream, Takapu Stream, Waikanae River	Willow planting and berm clearing u/s of Waitohu Valley Road bridge (12), erosion and rock weir at Waikanae road/rail bridges (6), fencing around silt pit at Te Mome Stream (1), Takapu Stream - ponding area upstream of motorway culvert (3)
191	May-95	Waitohu Stream	Waitohu Stream mouth and upstream scenes (9)
216	Dec-93	Otaki River, Waitohu Stream	Tracey's bank porotection (3), Waitohu Rail bridge bank protection (2)
217	Mar-90	Waitohu Stream	Waitohu flood of March 1990 (9), Old coach road bridge protection works 1994 (2)
241	Jul-97	Hutt River, Otaki River, Waitohu Stream	Rubbish on Otaki berms (2), Waitohu at Laurensen's - tree removal (6), Waitohu Stream mouth cut (8), block stolen by Gary Holland (2), Rahui test pit (7), Taylor's groynes (6)
267	Jan-90	Otaki River, Waitohu Stream	Photos of Otaki River and floodplain used to determine Mike11 model (16)
269	Nov-95	Otaki River, Waitohu Stream	Debris after flood : Chrystalls Bend d/s groynes & Old Coach Rd bridge
303	Feb-96	Waitohu Stream	flood damage to Wakapua farm - Ray Taylor's (11)
309	Jun-97	Waitohu Stream, Otaki River	Johns retention works - Waitohu Stream (20), cars dumped on berms near Rangioru (4)
330	Nov-97	Otaki River, Waitohu Stream, Waimeha Stream, Waikanae River	Otaki Gas Crossing (2), Waitohu Stream flooding (2), Waimeha Stream clearing (3), Walnut Grove bank reinstatement (9), vandalised tractor (1), Waimanu haul road crossing (1), Waitohu Stream - Taylors etc. (7)
394	Nov-98	Waitohu	Waitohu u/s from Waitohu Valley Road Bridge, taken in conj. with Res. Cons Appl. to clean stream
436	Mar-99	Otaki, Waitohu	4 Oaki aeriels, Waitohu aeriels 1
437	Mar-99	Waitohu	2 Waitohu aeriels 2nd stage
438	Mar-99	Waitohu	3 Waitohu aeriels transverse shots
451	May-99	Waitohu, Otaki, Waikanae	Waitohu mouth change, Eric Johns, Otaki, Taylors debris fences, mouth in flood, Waikanae Edgewater & Jim Cook Parks

453	May-99	Waikanae, Otaki, Mongonoe, Waitohu	Waikanae flooding, Otaki flooding Mangaone, Waitohu, Eric Johns
458	Jun-99	Waikanae, Otaki, Waimeha, Katiuku, Waitohu	Otaki crossblading Huns, Barratts, Waikanae Maple Lane, Kebbles, Waimeha, Waitohu Johns/Askews Plunkets
459	Aug-99	Waikanae, Otaki, Waitohu	Flood 8/99: Waimanu bridge Otaki, Johns Waitohu, Edgewater, Nimo Ave, Jim Cook Pk, Greenaway, Kauri Puriri, El Rancho
460	Jul-99	Waimeha Mongonoe, Waitohu	Mouth cuts, Mongonoe river level gauge, Waitohu Wootons property-fence debris
507	Feb-00	Otaki, Waikanae, Waitohu	Otaki gas crossing, Mangahanene, Tracy's, Rangiuru: Waikanae Edgewater Park, Waimeha mouth: Waitohu Taylors, Askews
512	Dec-99	Porirua, Whakatiki, Waitohu, Black Creek	Porirua debris arrester: Rubbish dumping, Whakatiki: Debris removal, Ava rail bridge: Waitohu recorder tower: Black Creek erosion
542	Oct-00	Otaki, Waikanae, Mangapouri & Waitohu Stream Flooding	Manapouri-Bennetts Rd Culvert, Winterburns flood
543	Oct-00	Otaki, Waitohu, Manapouri, Rangiuru	Kapiti floods Oct 2000
544	Oct-00	Waikanae, Otaki, Waitohu, Nartotara, Philips	Kapiti Floods Oct 2000
546	Oct-00	Otaki, Waitohu, Waimeha, Waikanae	Channel realignments, berm filling, open gap for flood waters, landslips
580	Dec-94	Hutt, Waitohu	Cross Blading, Ebdentown St, Hutt River, Weeds, Waitohu
604	Nov-00	Otaki, Waikanae, Waitohu	Lower Otaki - Winstones, Mangahene: Mid Otaki - Chrystalls refl: Upper Otaki - Thurley: Waikanae - Pillion Corner, rock wall at edge of water park: Waitohu - Holmes
605	Oct-99	Otaki, Waikanae, Waitohu	Upper Otaki - Taylors debris fences: Waikanae - Maple Lane groynes: Waitohu - Rangawati Bridge
622	Jun-01	Waitohu	Mouth cut, River gauge
623	Jul-01	Waitohu	Blocks - Eric Johns, Pole planting & layering - Simpson RB
665	Apr-02	Mangaone, Waitohu, Waikanae, Kapiti minor works	Mangaone: Mouth Cut, Waitohu Valley Rd Bridge-Askews Willows Planting, Waikanae: New mouth & bund, swamp drain: New Rangiuru floodgates, Removing old Lutz S/B, Starting new depot, crossing Winstones rock wall Otaki.
687	Feb-02	Waitohu, Otaki	Hughes S/b, view Mansells, U/Taylors-Groyne, warning fence: Waitohu Mouth Cut, d/s Convent Rd Bridge
704	Nov. 02	Otaki River, Waitohu Stream	Tree in Waitohu Stream at Laurinsons Property. Crystals Blocking brade & New Channel at Barretts Property. Long Reach Mower At Lower Otaki Stopbank, Digger & Dumper for New Channel & Backfilling at Lutz Property. Tree at Kebbles Corner
714	Feb, March 03	Otaki and Waitohu	Vehicle Mazda Ute Crossing River, Removing Silt at Otaki, Mangahanene Island, Waitohu Stream Mouth Cut, Fire at Gas Crossing Otaki River, Fire at Stresscrete

In addition, GW (Flood Protection) holds the following photographs:

- Aerial Photographs 1948, 1966, 1983, 1999, 2000, 2001, 2002

Otaki Depot Photographs of the Waitohu Stream are held in the Otaki Depot. A copy of most of these will be in the Flood Protection photograph archive, but some will be some exceptions. For example, photographs reproduced in Appendix 1 of the 1998 25 year resource consent application by Flood Protection don't appear to be in the archive.

Photo albums in Flood Protection storeroom

“Kapiti Coast Misc. General 1” Aerial and oblique aerial photos 11/4/90, Sept 90 mouth (from ground)

“Kapiti Coast Misc. Flood 1” 13/3/90 – view from Ringawhati Bridge and left bank West property.

“Mangapouri Stream July 1987

“Aerial and Ground Photographs of the Otaki River, ... 1980”. Red folder includes oblique aerials of lower Waitohu Stream, stream mouth and Forest Lakes

7. **Recollections of George Gray – Overseer from 1952 to 1992**

Garry Baker and I met with George Gray on 2 May, to record his recollections of the Waitohu Stream management and history.

George started with the Manawatu Catchment Board in June? 1952, staying with it until its disestablishment in 1989. He transferred to the Wellington Regional Council until his retirement in 1992. He prepared fortnightly (or maybe monthly?) reports which would provide the best summary of the stream management. He also kept diaries after 1958. Both of these sets of information should be stored somewhere – the diaries at least were bundled up and sent into the WRC in Wellington upon his retirement. (Barry Rolton’s diaries may also be of some use).

Garry Baker produces a 6-weekly report for the Landcare Committee – that covers significant works. His monthly work records sheets cover these and less significant works; those monthly records are copied to the Consents Department. Photo albums for each stream, including the Waitohu, are held in the Otaki Depot.

The works on the Waitohu as proposed in the 1948 Scheme had been finished when he started.

George’s grandfather lived adjacent to the stream (Figure 7), and George can remember orchards in the vicinity and a swimming hole downstream of the Ngatotara Stream. The lower stream used to be good for whitebaiting (not so now – no swampy habitat).

George didn’t know when the diversion at Wakapua farms was made – early 1900s perhaps. The current course of the stream would have been an old watercourse of some sort – i.e. it wasn’t a complete new channel. A water wheel/mill was powered by the original (?) stream. The Waitohu linked up briefly with the current Waitohu course above Convent Rd, but then headed south parallel to Convent Rd to join up with the Mangapouri near the Tainui marae. (Figure 4).

Likewise he didn’t know when the Mangapouri was diverted into the Waitohu via the Waikato was made. That was done by the Public Works Department? Nor did he know when the original Ngatotara Siphon was installed. (Garry knows the Ngatotara downstream of the siphon as the “Waikato Cut”.)

During George’s time with the Manawatu Catchment Board, works were mostly restricted to occasional willow clearing and planting. If there was any erosion, the affected area was planted up. There wasn’t much that could really be done (probably the case now). (Garry: - subdivisions now are putting extra pressure on the WRC to maintain river banks and to protect land).

Not much work was ever done above SH1 until the WRC took over. Dave Scott effectively extended the boundary of the works area.

The Waitohu usually flooded when the Otaki was in flood; it didn't take much for the Waitohu to leave its channel. George couldn't recall many significant/specific floods. One he could recall was just after the siphon was replaced (i.e. c 1983?), where floodwaters backed up nearly to the lakes. (Floods also c1955, 1990 and in the 1970s). Garry – 1998, 2000 floods there was no flooding of houses – settlers tended to know the risks and to build accordingly. They also accepted the erosion problems more than those in more recent times. Floodwaters went around some houses e.g. at Taylors and one near the stream at Taylors (Figure 5), at Rod Agar's and Enoka (Figure 4). Water would also go around houses down Convent Rd.

A small drain was dug to take overland floodwaters back to the Waitohu Stream just upstream of Wairongomai Rd. (Figure 6).

George cannot recall the mouth being cut prior to 1967. The rock from the Knox experiment is still buried in the beach. The MCB assisted in the stream mouth cut around this time. Some rock was placed on both banks (when?) (Figure 7).

The 1999 photos show a bund in the river before it flows down the beach to the sea: Garry put that in to prevent further erosion to the sand dunes to the north. The bund is constructed only of sand, but it is still there now – possibly because velocities are low. (Figure 8).

George didn't know the background to the Knox subdivision eventually being approved.

Three urupa are in the Convent Rd/Wairongomai Rd area. The downstream one was on outside of small loop and was being eroded until cut put across it (i.e. the c1950 works?). (Figure 9).

People that may have some information regarding the 2000 flood (i.e. for hydraulic model calibration) include Rod Agar, Phillips, Golf Club staff, the sea captain on Convent Rd (Robertson?) and the occupant of the Enoka house (Te Kareroa?).

The landowner just upstream of Convent Rd was permitted to take gravel from the stream (and still does – Garry).

The SH1 culvert to the north of the stream near Taylor Rd was enlarged last year? (See Phil Purves for details). Garry was concerned that this may lead to more water flowing to threaten the house on the corner if no measures to the railway were undertaken. Thus some channel works done just below SH1.

The left approach to the Ringawhati bridge was built up by KCDC. The Water Supply bridge has had a significant impact – being too constricting. Floodwaters used to jump out of the channel just upstream on the right bank (Figure 9). George believes the reason for this not happening is that the cut made to the channel downstream of the bridge has caused the bed to degrade in the reach so that the capacity upstream is now greater. These floodwaters used to flow back to the main stream via a drain (Figure 10).

The current resource consent for channel maintenance held by Flood Protection is for the reach downstream of Ringawhata Bridge. The KCDC are able to do some works above this under the Regional Freshwater Plan. Earlier, the WRC had done some works as far as 100m upstream of the bridge on behalf of the KCDC and charged the KCDC for these. Since the shortened Water Supply bridge was built and the cut downstream made, the reach above the Ringawhata bridge has been considered the responsibility of the Otaki Borough Council (pre 1989) and the KCDC.

The Ringawhata bridge north abutment was eroded in the March 1990 flood, and the southern abutment has eroded twice (1998&2000) since Garry has been with the WRC (ie post 1993).

The MCB did some drainage maintenance work – clearing etc – up to SH1 and also up to the lakes (including the Waiorongomai, although that was in an advisory capacity only).

Today the WRC only does about 1 day per year on maintenance of one drain and collector drain, as well as clearing the Ngatotara around the siphon when required. Much of the area in the Ngatotara/Pukehou catchment is being split into lifestyle blocks and the landowners are more interested in recreating wetlands. (Landowner between railway and SH1 – ex Winiata block – has government funding to recreate wetland).

Figure 4



Figure 5

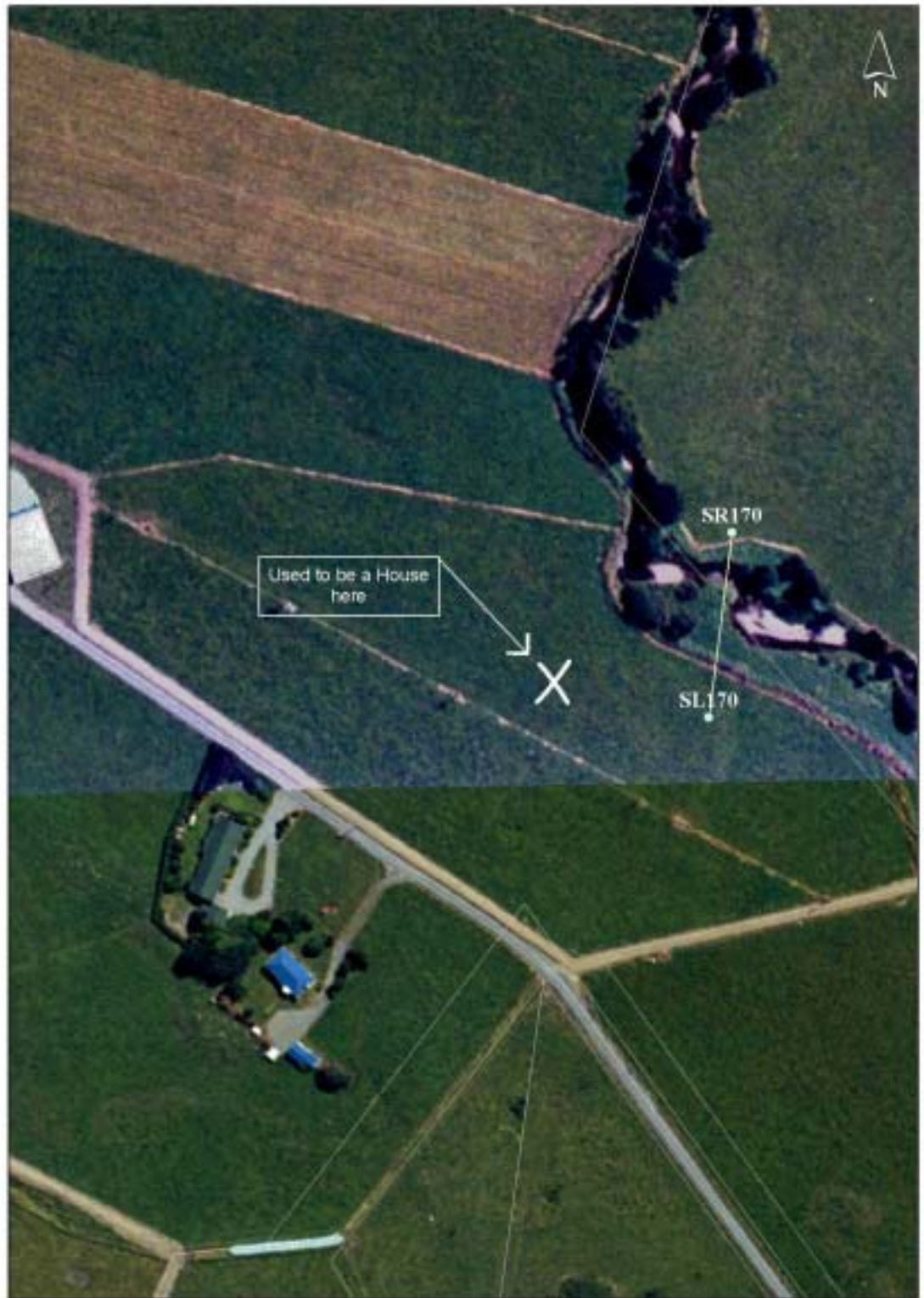


Figure 6

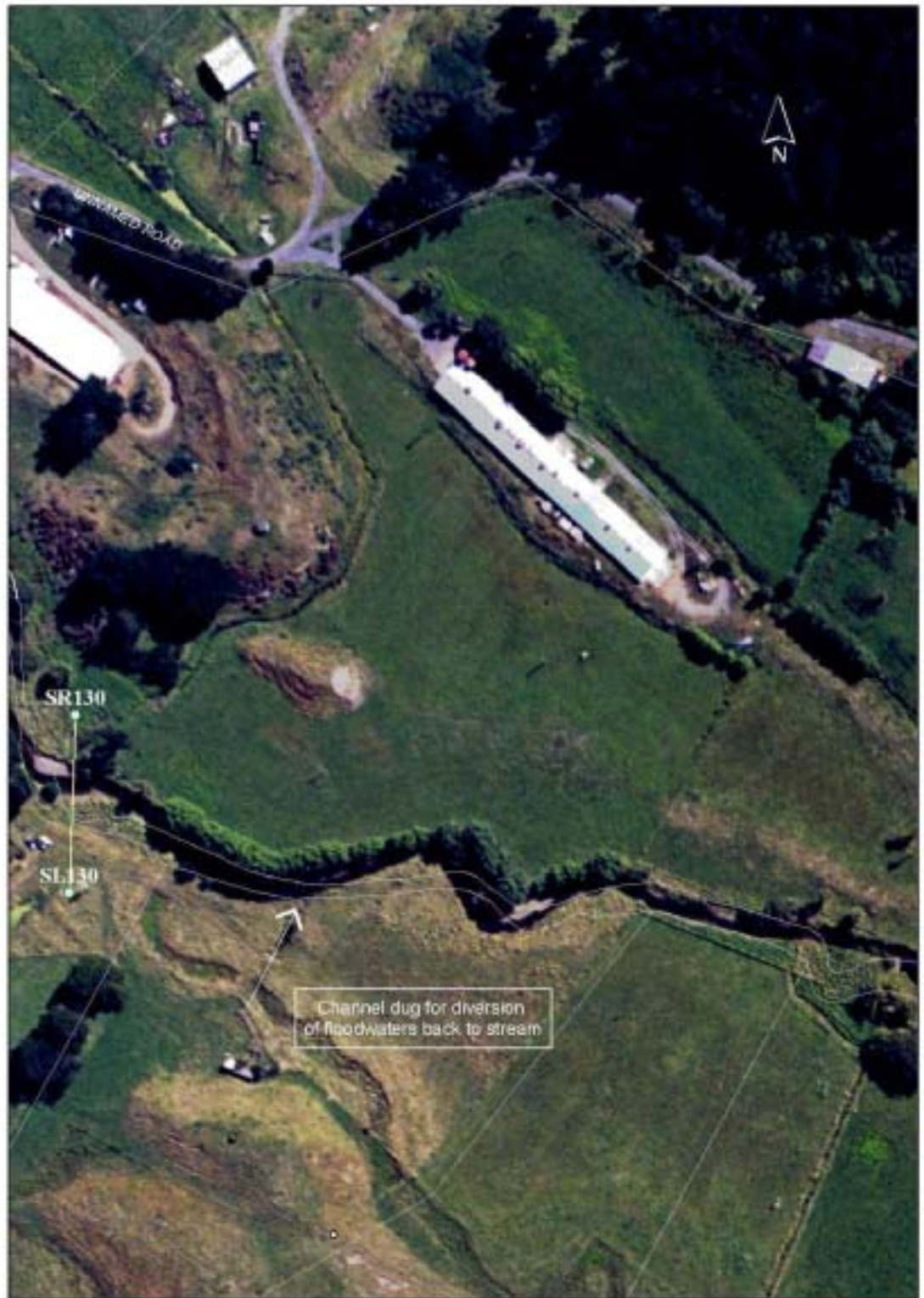


Figure 7

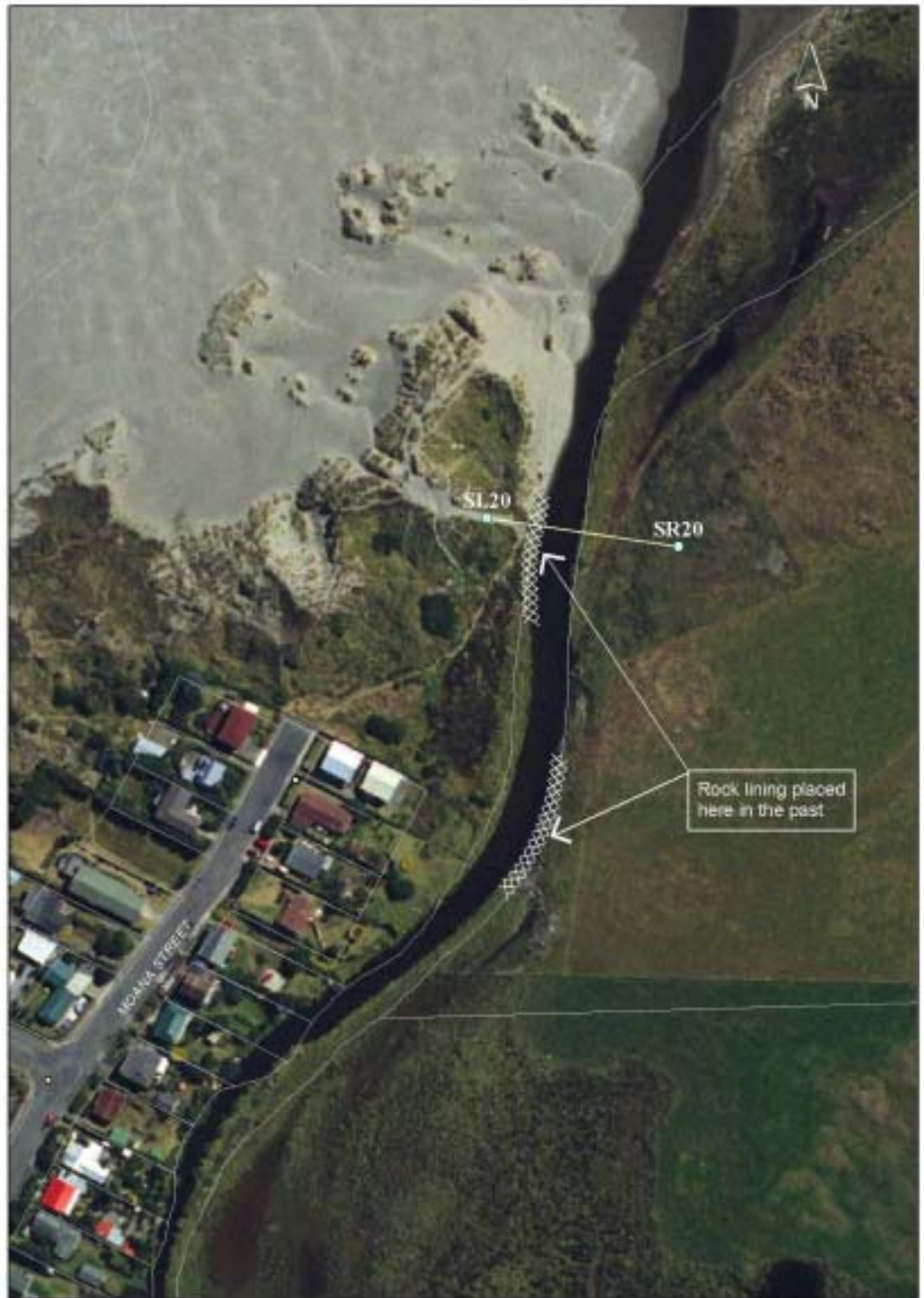


Figure 8



Figure 9



Figure 9

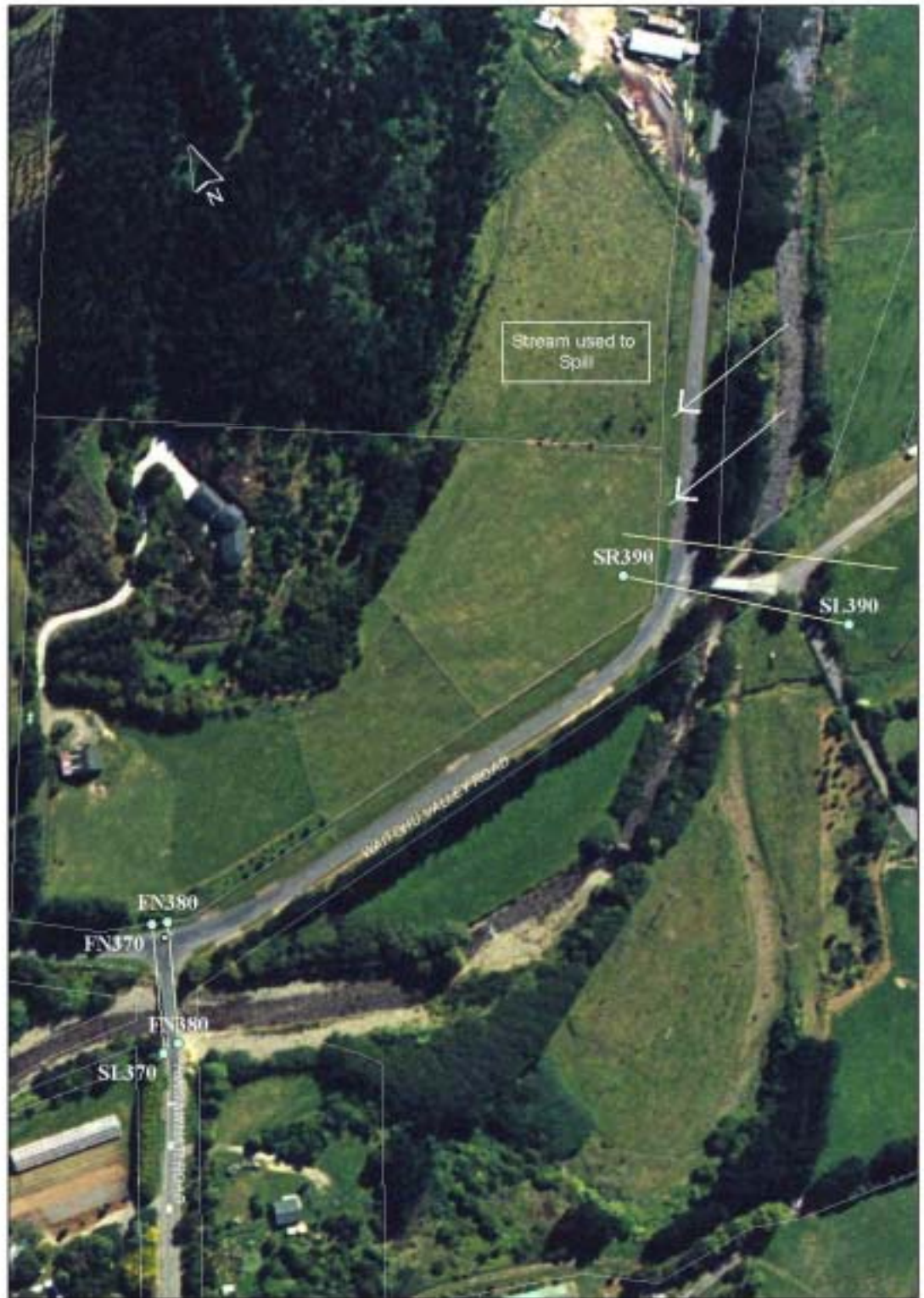


Figure 10

