



STYX RIVER
ISSUES AND OPTIONS REPORT

CHRISTCHURCH CITY COUNCIL

DRAINAGE AND WASTE MANAGEMENT UNIT

OCTOBER 1990

FOREWORD

In 1988 a Styx River Catchment Advisory Group was set up by the Christchurch Drainage Board to advise it on the preparation of a flood mitigation plan for the Styx River catchment.

The Advisory Group comprised Councillors, Board members and staff of the following local authorities:

- Christchurch Drainage Board
- North Canterbury Catchment Board
- Canterbury United Council
- Christchurch City Council
- Waimairi District Council

Two Government Departments and various interest groups were also represented:

- Department of Conservation
- Ministry for the Environment (observer)
- Waimairi Federated Farmers
- North Canterbury Acclimatisation Society
- Royal Forest and Bird Society
- Ngai Tahu Maori Trust
- Brooklands Community Centre
- Spencerville Residents Association
- Redwood Action Committee

Gabites Porter and Partners were engaged to advise on Town Planning matters.

The first meeting of the Advisory Group was held in November 1988. At this meeting it was decided to prepare a draft Issues and Options document to assist the Advisory Group in the formulation of a plan. The preparation of this document was undertaken by Gabites Porter and Partners in consultation with staff of the Christchurch Drainage Board.

The draft with additions and changes was adopted by the Advisory Group at its meeting the following May, after which it was released as an Issues and Options Report for public comment.

Four submissions were received to this report.

The purpose of the Issues and Options document was to assist in the formulation of a Draft flood mitigation plan for the Styx River.

The Issues and Options Report is available as a resource document for further floodplain and catchment studies of the Styx River.

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PLANNING ENGINEER

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STYX RIVER CATCHMENT MANAGEMENT ISSUES AND OPTIONS REPORT

1.0 INTRODUCTION






- 1.1 In dealing with flooding issues and proposed schemes to lessen the impact of flooding in metropolitan Christchurch, the Drainage Board has been made increasingly aware over recent years of those areas of policy and implementation which vitally affect such schemes, yet are outside the Board's prerogative to control.
- 1.2 In particular, detailed land use planning and strategic (regional) planning as well as building and subdivision controls are all exercised by other local authorities. Community, environmental and neighbouring land ownership interests are also difficult to adequately incorporate into any proposed plans.
- 1.3 It is generally accepted that schemes designed to address flooding issues in any catchment should be seen within an overall management plan for that catchment. Such management plans necessarily involve co-ordination of policies and interests from all parties if they are likely to be successfully implemented. For the time being, even when such plans have been prepared, statutory responsibility for dealing with component plans may still rest with a number of different agencies.
- 1.4 Against this background the Drainage Board has resolved to set up advisory groups to assist its officers with the preparation of their plans, so that the plans can be seen in the context of catchment management planning overall.
- 1.5 The Styx River Catchment Advisory group has been formed with representatives drawn not only from officers of interested local authorities but also elected members, community and environmental representatives. Its function is to advise the Board on the preparation of its flood mitigation and drainage schemes and its management plan for the Styx River and tributaries.
- 1.6 The first meeting of the Group was held in November, 1988 at which it was resolved that a report dealing with the issues and options relative to flooding in the Styx catchment would be prepared and circulated for consideration by the Group in mid February 1989. This is that report.
- 1.7 It is hoped that reasonably swift progress can be attained in agreeing both the range of matters to be tackled in any flood mitigation scheme and management plan and an outline of the components of such a scheme which are likely to prove generally acceptable to all parties.

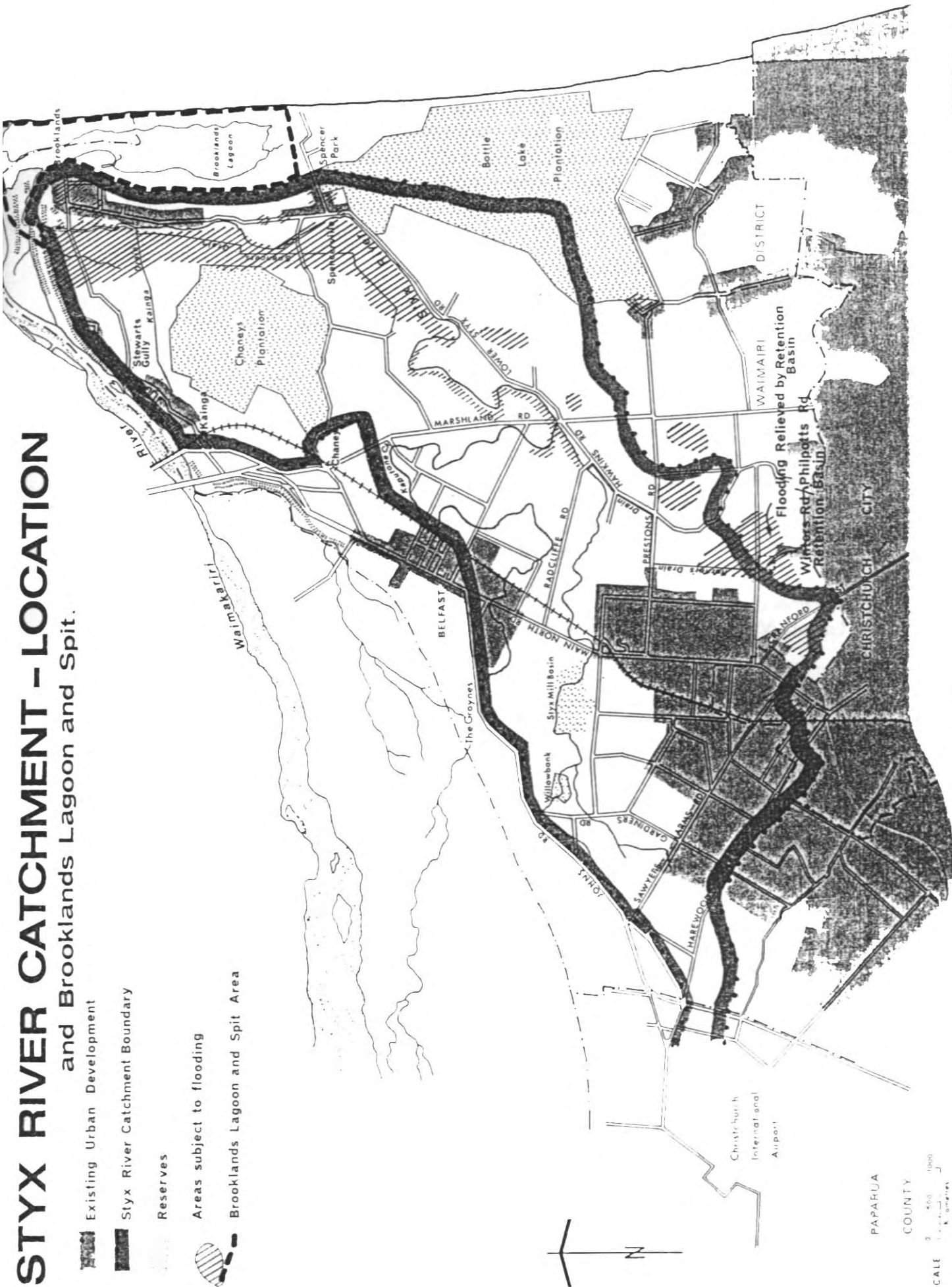
2.0 GENERAL DESCRIPTION STYX RIVER CATCHMENT MANAGEMENT

The Catchment

- 2.1 On early maps the Maori name for this river was shown as Purareka-nui. It may have derived its present name from lines of marker flax sticks set in the ground to point the way to a ford across the river at the main north road.(1)
- 2.2 The head of the present catchment lies between Christchurch Airport and Harewood Road and the catchment runs roughly parallel and adjacent to that of the Waimakariri River until the Styx River arrives at a point about 1.6 km from the coast where it turns to run parallel to the coast. The river enters the stopbanked flood channel of the Waimakariri River via floodgates 300m north of Harbour Road, and follows this channel for a distance of about 2.0 km to the tidal Brooklands lagoon which is kept open to the sea by the Waimakariri River. See Fig. 1.
- 2.3 The length of the catchment is just under 20 km; its width varies from 0.8 km and 1.20 km at either end to some 4.0 km in the central section. Its area is just over 54 sq. km or about 5,485 ha (including the Kainga Drain catchment). The greatest height above mean sea level reached in the catchment is only 30 metres, immediately north of the Airport. Other than a small part of the urban area to the north of Harewood Road (Christchurch City) and perhaps part of the Airport site (Paparua County) the remainder of the catchment lies in the present Waimairi District Council area. As at 1986 the approximate population of the catchment was some 23,000, comprising about 8,000 households.
- 2.4 In general soils in the catchment are all alluvial in origin and range from small patches of stony sand, coastal sands and dune soils to much more extensive areas of well to poorly drained silt loams, sand loams and peat loams. The catchment overall contains a high proportion of the intensive horticultural areas of Waimairi District.
- 2.5 A main tributary of the Styx, the Kaputone Creek, is just over 11.0 km long, drains an area of 556 ha. It joins the Styx River immediately above Marshland Road, and is the main drainage outlet for part of Belfast and adjacent rural lands.
- 2.6 The other principal tributaries of the Styx are Kainga Drain and Homers Main Drain which together with Rhodes Main Drain joins the Styx River about 300 metres above the Radcliffe Road bridge. The combined drainage area of these tributaries is some 979 ha, including a low-lying high-producing area of just over 400 ha on the outskirts of the City of Christchurch. Homers Main Drain was constructed in 1880 to serve a rural area. A third drain, the Kainga Drain, has a catchment of just over 560 ha and flows into the Styx near Brooklands.
- 2.7 At present about 64% of the area of the catchment is given over to rural uses with other significant land uses being reserves and plantations (17%), and residential (14%).

STYX RIVER CATCHMENT - LOCATION and Brooklands Lagoon and Spit.

-  Existing Urban Development
-  Styx River Catchment Boundary
-  Reserves
-  Areas subject to flooding
-  Brooklands Lagoon and Spit Area



PAPARUA COUNTY
SCALE 1:1000
1000m

Fig 1

The River

- 2.8 The Styx River and the Kaputone Creek are spring fed with good dry weather flows. The Styx River above the floodgates has a total length of well defined channel (which meanders through the catchment) of some 22 km, 17 km of which lies below the Main North Road. For the first 14 km above the floodgates it has a bed gradient of only 0.18 m per kilometre, this increases to 1.56 m per kilometre which is held for a distance of 1.7 km until just below Main North Road, where it again increases to about 2.4 m per kilometre which is held to Harewood Road near the top of the catchment except for a length of 1.2 km between Gardiners Road and Sawyers Arms Road where it increases to 3 metres per kilometre.
- 2.9 The river is generally very well entrenched below the adjacent country, until it reaches a point 3.6 km below Marshland Road. From this point down to the floodgates, a distance of 4.7 km, its banks can only contain very small floods although there are in places low stopbanks of a very poor standard.
- 2.10 For its full length below the Main Trunk railway line, the river is lined with willow trees which in many places form a dense vegetation of some width in the low-lying berms between the main channel and flood banks. A cleared channel is maintained and weed growth is cleared annually by weed harvesters. Dredging with a dragline, and manually when required, (generally from only one bank because of difficulty with willows) is also carried out over those stretches with the very flat gradient.
- 2.11 When the river is in flood, with the floodgates closed by the rising tide, floodwaters can be backed up as far as the Radcliffe Road Bridge, a distance of some 11.66 km and over this length the incoming drains are also backed up.
- 2.12 From Marshland Road to the floodgates the original boundaries of the river on both banks are flanked by reserves of varying width and purpose. On both banks the reserves appear to have originally been Crown Grant Reserves for tow path purposes 4.57 m wide and this is still generally the case for the full length on the western bank. On the eastern bank the reserves have been increased in width by various amounts and below Earham Road also appear to have been changed to a road reserve. None of the reserves are developed and few are fenced off from the adjacent properties. Because of diversions, natural erosion and meanders and river works, there are short lengths where reserves are now either in the river or removed from it.
- 2.13 There are no continuous flow records available for the Styx, however from guagings of the Kaputone Creek at the Styx River confluence and of the Styx at Marshland Road Bridge, the NCCB(4) has calculated the likely (most frequently occurring) flows to be 0.3 and 1.65 cumecs respectively. Drainage Board measurements confirm these flows.

History of River Control

- 2.14 Prior to 1952 the Drainage Board's district did not include the Lower Styx area and only about one third of the catchment came under its control, although the Lower Styx, under the control of the Waimairi County Council, provided one of the Board's main drainage outfalls.

- 2.15 Little is known of the construction of the low stopbanking system on the east side of the river which has been in existence for very many years between the present floodgates and Earlham Road. It was built when the Styx River was completely tidal, and probably by early property owners before the present urban sections along Lower Styx Road were subdivided many years ago. It appears to have been built to the height equalled by very high spring tides several times a year with no provision being made for the passage of river floods and was constructed to a poor standard. Over the years it appears to have been badly neglected and is in poor order. An elevated dragline platform on the western bank also acts as a stopbank and effectively reduces flooding of land to the west in most storms.
- 2.16 The original floodgates were constructed about 1930 by the Waimakariri River Trust as part of its stopbanking scheme for the Lower Waimakariri River. Its purpose was to exclude the waters of the Waimakariri River when in flood while allowing the Styx River to pass through at other times. The gates also conferred an extra benefit to the Lower Styx district in that they acted as tidal gates and excluded tidal saline waters from entering the river on the rising tide and enabled drains to function to better effect. New and larger floodgates were built in a different position in 1982 and are maintained by the NCCB.
- 2.17 In 1952 the complete Styx catchment except Kainga Drain came under the Drainage Board's control and the Board immediately carried out an extensive 2 year dredging programme, not only to remove accumulated silt deposits from the previous works, but to deepen and widen the channel to provide extra storage for normal flows when the gates were closed by the rising tides, for the benefit of the internal drainage system. Since then the Board has maintained the river channel in good order and relatively free of weed by means of weed-cutting launches and periodic dredging to remove accumulated silt. Old or over mature trees, or trees that have fallen or blown over also need to be removed or trimmed from time to time to prevent blockages of the channel. The principal species is the crack willow, notorious for shedding branches and being unstable in attitude.

Siltation of Brooklands Lagoon

- 2.18 In 1968 interested residents of Lower Styx and Brooklands drew the attention of the Drainage and Catchment Boards to the fact that there appeared to have been considerable building up of the bed of the Brooklands Lagoon over many years and that they considered this could be the cause of rising flood levels in the Styx River.
- 2.19 Independent inspections of the outfall channels below the flood gates had previously been carried out by engineers of both the Drainage Board and Waimairi authorities. This and the fact that low tide levels outside the flood gates had not appreciably altered since they were constructed about 1930, indicated that flood flows were not being raised by any siltation which had occurred in the Lagoon. Nevertheless in 1969 the Catchment Board re-levelled a number of 1931 cross-sections over the lagoon and the lower end of the Styx outfall channel just above the Lagoon. Further surveys were carried out by the Drainage Board in 1977.
- 2.20 These results revealed that while considerable aggradation to the Lagoon had occurred since 1931, particularly in the main channels, it has not been sufficient to increase tidal or river levels at the flood gates.

Biology

- 2.21 The Board's Biologist, Dr. J.A. Robb, has initiated three comprehensive biological surveys of waterways within the Styx River catchment within the last ten years. Those conducted in 1978 - 79 (1) and 1987 (6) considered the composition and distribution of both the aquatic invertebrate life and the aquatic weeds whereas the 1984 - 85 (7) survey dealt exclusively with the weed beds.
- 2.22 The current data base provides a useful reference against which future changes can be assessed. Conclusions have already been reached regarding changes that took place between 1979 and 1987. The present species composition (which includes more than a dozen species of caddis (Trichoptera) larvae) is indicative of a generally high standard of water quality throughout the catchment. It is concluded that most of the species changes (both short and long-term) observed to date are due to fluctuations in the abundance and/or species composition of the aquatic weed beds rather than to variations in water quality. Virtually all of the streams and rivers within the Styx catchment have been modified to some extent by repeated channel-maintenance operations - some quite extensively. Nevertheless they continue to support a significantly more diverse assemblage of invertebrate taxa than the more urbanized Avon and Heathcote catchments and in this respect have much in common with streams servicing the predominantly rural Halswell catchment.
- 2.23 Although fish and bird-life were not considered in these surveys reference is made to them in three independent studies. The question of fish-food availability was the subject of a University study in 1978 (8) while a list of fish species recorded from the Styx River is included in the North Canterbury Catchment Board's Waimakariri Resource Survey published in April 1986 (4). These include long and shortfinned eels, lampreys and torrentfish in the Upper Styx and brown trout, yelloweyed mullet, black flounders, common, giant and bluegilled bullies and Stokells Smelt below Marshland Road. A study concerned primarily with landscape and recreational values in the Styx catchment (1) makes passing reference to the species of birds observed in the vicinity of the Styx River. So too does a report prepared by the Estuarine Research Unit, University of Canterbury in 1978 (9).

Water Qualities

- 2.24 Also cited in the above landscape study was information on water quality in the Styx, taken from an unpublished paper of 1972(3) by the zoology department of Canterbury University. At that time the river was described as "probably the least polluted of the Waimakariri system", with few effluent outfalls (2 milking sheds) and some minor input from wastes draining to the Kaputone Creek.

Specifically the water quality was assessed in the following terms:

pH.	- slightly alkaline
Conductivity	- dissolved ions - low
Turbidity	- suspended/dissolved sediment - low
Dissolved Oxygen	- high and relatively constant
Biochemical Oxygen Demand	- low - very clean
Salinity	- low - effective tidal/flood gates
Species Diversity	- Benthic invertebrates - high - low organic pollution

- 2.25 Water quality management in the Styx Catchment is divided between the NCCB and the CDB, the latter having been granted a 'General Authorisation' for "unpolluted storm and land drainage water" in 1969, also allowing other users to discharge "unpolluted storm and natural water". Occasional complaints are made regarding the quality of the Kaputone Creek downstream of the industrial area, when spillages are washed down the stormwater system. There are no water rights issued for major discharges into the Styx River system. One right for a vegetable washing plant has conditions relating to suspended sediment, BOD content and pH of the effluent.
- 2.26 Limited sampling by the CDB in 1979 and the NCCB in 1983/4 showed few differences down the length of the river, except in the case of faecal coliform levels and total non-filterable residue. TNR at Marshland Road was substantially greater than in the lower reaches of the river as were faecal coliform concentrations (possibly influenced by the Kaputone Creek which joins at this point). The Styx River is only classified as Class D water near the mouth, so no faecal coliform standard applies. Other Class D requirements such as dissolved oxygen content and pH were met for both the classified area and the remainder of the Styx River system.
- 2.27 In summary, the water quality of the river reflects the source of the water and the land use in the catchment. Water quality is seen as being "satisfactory" despite passage through an intensive horticultural area and an industrial zone. If increasing urban development takes place within the catchment or certain categories of rural development occur a deterioration in water quality is likely (4).

Landscape

- 2.28 An extensive study of the catchment was made in 1975 as part of a thesis in fulfilment of a landscape diploma at Lincoln College. Griffin(1) characterises the landscape into three broad structural elements as follows:
- "The river flows through a distinct basin from below Sawyers Arms Road until it reaches the housing cluster at Selkirk Place (Hawkins Road). Thereafter there is no longer a distinctly separate valley containing the river, which now becomes part of the general landscape.
- The upper limits flow through a consistently flat area. The middle section, associated with the basin is planal, gently sloping, with some minor topographical undulations in the fringe areas, the topography within the basin being varied and interesting. In the lower area the topography varies according to the dominant influence - sand dune or floodplain. Sand dunes became quite conspicuous from Marshland Road towards the sea, their presence being mainly on the coastal side of the river."
- 2.29 The upper reaches of the catchment contain two significant landscape/wildlife areas - the Willowbank Wildlife Reserve on Hussey Road and the Styx River Basin Reserve north of Styx Mill Road. The Christchurch City Council has extensive production forestry plantations at Chaney's and at Bottle Lake on the eastern edge of the catchment. Though not yet built, the proposed northern arterial road will introduce a significant new landscape feature in the middle of this catchment, extending from just east of Cranford Street to intersect with the existing motorway at Chaney's.

Recreation

- 2.30 Griffin (1) identifies the considerable linkage potential of the Styx in recreation terms, potentially providing walkway connection from the Groynes to Spencer Park and the mouth of the Waimakariri. In addition to walking, other recreation potentials identified include picknicking, fishing, pleasure driving (access to Spencer Park, Brooklands Lagoon) canoeing, and camping. Duck shooting areas exist adjoining the catchment at Chaney's and below the floodgates at the Waimakariri mouth.
- 2.31 Detailed plans are being developed for the Styx basin area by Waimairi District Council and fisheries and recreational values will need to be safeguarded against water level fluctuations if part of that area is also to serve as a flood water retention facility.
- 2.32 Some mention has been made of powerboating on parts of the Styx. Little specific evidence of any incidence or scale of such activities is available although it seems likely that with more mobile craft, such as water-bikes, some people may attempt to use the river for such purposes. As a general observation powerboating activity would seem incompatible with the other recreation activities and potentials this area has to offer.

3.0 FLOODING AND DRAINAGE PROBLEMS Areas Affected by River Flooding

3.1 River flooding affects flood plains and low lying areas adjacent to the main channel. *It may affect the rate at which drainage from areas of incatchment flooding can occur, e.g. drainage from the Brooklands residential area.* Principle areas of river flooding are as follows: (see Fig. 2).

- West of the Styx River from approximately Richards Farm to Harbour Road.
- East of the Styx River approximately opposite Richards Farm Bridge to near Harbour Road. The eastern limit is defined by the Lower Styx Road although some low lying areas of the road are at times crossed by flood water.
- Local flood plains upstream either side of the river to approximately Radcliffe Road.

Areas Affected by In-Catchment Flooding

3.2 In-catchment flooding usually occurs in low lying former swamp land (Winters Road, Rhodes Main Drain), adjacent to drainage channels (e.g. Kruses Drain) and in areas where there is poor surface drainage due to the topography of the land (e.g. Farrells Road, Spencers Drain and Brooklands/Spencerville areas east of Lower Styx Road). See Fig. 1.

Frequency and Nature of Flooding

3.3 Flooding normally occurs throughout the catchment once or twice a year but can be more, or less frequent depending on weather conditions. Principal in-catchment flooding affecting residential and some rural property is usually caused by rapid runoff from highly impermeable commercially zoned areas. Although this flooding may cause minor damage and some inconvenience, the duration is usually limited to a few hours. An example is the flooding that occurs in Kruses Drain as a result of upstream runoff particularly from the Northlands commercial area.

3.4 River flooding usually occurs in the lower catchment channel where the gradient is very flat. It is the result of insufficient channel capacity caused when catchment storm inflow is greater than channel storage and outflow. Outflow is restricted by the effects of downstream tide and to a lesser extent Waimakariri flood levels.

Scale of Flooding

3.5 Flooding may range from localised ponding resulting from bank overflow, to widespread inundation of land within the catchment flood plains. The scale may be affected by prior rainfall events which influence ground water levels. This will generally exacerbate the flooding as surface water is unable to soak away.

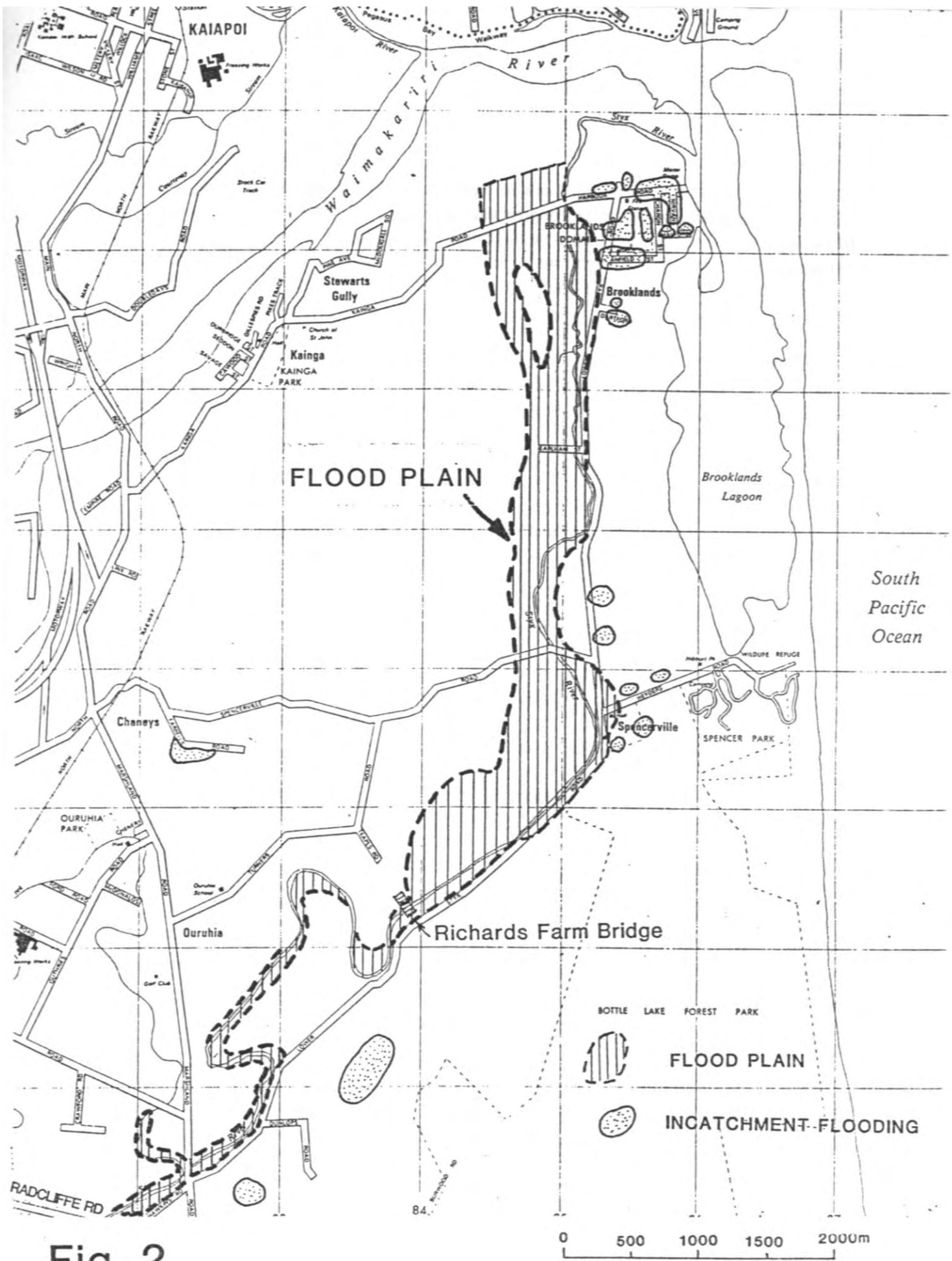


Fig 2

LOWER STYX RIVER – FLOOD PLAINS

Distribution and Nature of Damage

- 3.6 There has been little reported flood damage in the Styx River catchment. The main damage reported has been in the lower catchment below Marshland Road, the most substantial involving the loss of crops valued at several thousand dollars. Residential damage has ranged from a few dollars to one or two thousand dollars. Crop damage depends on type of crop, season (i.e. time of flooding), period of inundation, and preceding and subsequent rainfall events.
- 3.7 The Lower Styx flood plain has been inundated in the past (1957) by the Waimakariri River overflowing its banks, and allowing floodwater to flow down Kainga Drain. Other possible flow paths may become apparent on completion of the North Canterbury Catchment Board's Waimakariri River Study.

Community Perception of Catchment Flooding

- 3.8 Perceptions of flooding vary between communities, individuals and households depending on the location, length of residence etc. Some commonly held perceptions are:-
- Stormwater runoff from upstream development affects downstream water levels.
 - Development permitted in flood plain areas exacerbates problems.
 - High river levels cause ground water levels in adjacent properties to rise.
 - Lack of good drainage facilities exacerbates problems.
- 3.9 It is likely that the existing catchment, including areas already partially developed, will become increasingly impervious as new buildings and paved areas increase. This will increase the volume and rate of runoff in storms and some of this will get into the river. Development can be expected to increase flooding in both the river and the catchment.

Impact of the Greenhouse Effect

- 3.10 Considerable debate is currently taking place in scientific circles as to the existence and implications of the so-called 'Greenhouse Effect'. A wide range of conflicting information is being published. The relevance of this issue to considerations of drainage is primarily what allowance to make for its possible impact on sea level and consequently river outfall levels in schemes currently being conceived.
- 3.11 A recent DOSLI report suggests that a prudent range within which to expect sea levels to rise in New Zealand is 180 to 400mm over the year 2050. Other workers suggest different figures - higher and lower. If an increase of say 300mm took place in the next 50 years, it would have a substantial effect on both river flood levels, and low tide, and drainage levels, up to Marshland Road.
- 3.12 In the first instance a decision must be made as to whether to make any allowance, in view of uncertainties at this stage of knowledge. If such an allowance is to be made in the case of the Styx, the second issue is then at what scale?

4.0 ISSUES AND CONCERNS

- 4.1 The following issues and concerns about flooding and the management of drainage in the Styx catchment have been identified by the Board over the years from its own studies, together with submissions from other local authorities, interest groups and the general public at various times. The list is not intended to be exhaustive, but is to enable members of the Advisory Group to focus on what are thought to be the principal matters of concern.
- 4.2 There is increasing recognition of the values of Maori culture in the management of natural resources such as water and soils. While such values may not constitute "issues" as such, it is important that they be provided for as far as is possible in the development of any management plan for the Styx catchment. Often concerns reflecting such values are widely shared by all in the community and no attempt is made below to ascribe issues to any particular ethnic group.
- 4.3 The sequence of matters which follows is not meant to suggest any form of priority or weighting of significance. Priority and weighting are, of course, important matters for all members of the group to address. In the first instance however it is more important to ensure that all the issues felt to be of significance are identified.

LIST OF ISSUES AND CONCERNS

(Note: policy options and implications are summarised in the next section).

1. Flooding from the Styx River

- costs and benefits of flood protection measures
- implications of flood prevention and damage reduction measures.

2. Flooding from external sources (Waimakariri overflow, rising sea levels).

3. Development within the Catchment

- urban development - intensification under existing rural and urban zoning, or rezoning
- rural development - drainage types and standards.
(Comment: the concern is to ensure that any potential increase in storm runoff is planned to be accommodated in such a way as not to be detrimental to downstream water levels).
- *airport*
- *catchment treatment*

4. Recreation

- conflict between types of recreation e.g. wet bikes and passive recreation
- conflict between river maintenance work and recreation e.g. weed cutting and whitebaiting
- conflict between public access and private property rights.

5. Minimum Flows

- effect of water extraction from the Styx and tributaries
- effect of groundwater exploitation including irrigation on sources of the Styx and tributaries
- agreement on minimum flows to maintain instream values.

6. Water Quality

- industrial discharges in the *Catchment* area.*
- effect of stormwater soakage on potable water supplies
- possible contamination from the Airport area or other urban activities
- horticultural *and agricultural* runoff

7. River Works

- channel maintenance
- protection works, channel improvements
- retention basins

(Comment: maintenance consists mainly of drag lining to remove silt left after floods, weed clearance and riverbank tree clearing and removal. Regular weed clearance is considered necessary because weeds increase silting up, catch floating debris which would eventually cause blockage, and interfere with boating. Excessive weed growth would eventually affect fish, partly through deoxygenation of the water. Fallen trees are removed and others trimmed to prevent channel blockage.)

- *stopbanks*
- *diversion works*

8. Ecological Issues

- identification of fish spawning areas within the catchment
- identification of any fish species that may warrant conservation measures
- identification of bird species and their habitat that may warrant conservation measures.
- identification of invertebrate life and aquatic macrophytes found within the Styx River (completed).
- *assessment of impact of possible river works*
- *assessment of impact of existing marginal vegetation on the ecology of the river life*

9. Landscape

- definition of present landscape character areas so as to highlight landscape
- elements sensitive to potential changes
- *definition of present natural undeveloped qualities*
- potential conflicts between plant species and management needs

10. Esplanade Reserves and Public Access

- * • feasibility of extending reserves *and walkways*

11. Administration

- * • area to be covered by the Management Plan
- appropriateness of controls

5. POLICY OPTIONS

- 5.1 This section of the report outlines the range of possible policy responses to the issues and concerns listed in the previous section. These responses have management and engineering implications. The options listed are not necessarily alternatives - often a combination is possible.
- 5.2 It is hoped that the Advisory Group will indicate its firm preferences for action at an early stage so that a small number of alternative Draft Schemes (along the lines of those outlined at the first meeting) might be further developed for more detailed consideration by the Group.

1. Flooding - from Styx River and Catchment

Option: Do nothing - accept some loss or damage

Option: Improve stop banking, in particular preclude floodwaters from residential areas on floodplains (e.g. Brooklands)

Option: Minimise flood potential by restricting up-stream runoff

Option: Minimise flood damage by precluding further * development within

floodplain areas (particularly Brooklands) and/or imposing * *other restrictions*.

Option: Flood warnings. Option: Insurance

2. Flooding from External Sources

Option: Make no additional provision for sea level rise.

Option: Make provision for sea level rise by modifying anticipated flows and/or river levels.

- set new building levels high enough to deal with projected sea levels 50 years hence, and fill surrounding land when, and if, necessary
- specify transportable buildings
- abandon areas which are not worth saving from the sea
- consider the economics of a radical diversion of the Styx River, away from the lower areas of Brooklands and Spencerville. The low areas could then be bunded and local drainage could be supplemented by pumping.

(Comment: problem in determining what scale of additional provision to make, having regard to probability and cost factors, and for what period in the future).

Option: Postpone consideration of Waimakariri overflows until NCCB finishes its investigation in 199?)

Option: Seek a preliminary estimate of Waimakariri overflow probabilities and magnitude from NCCB.

3. Development within the Catchment

Option: Deal with stormwater provisions for new urban development on a site-by-site basis.

Option: Plan stormwater retention areas of sufficient capacity to cater for anticipated development within the catchment as a whole.

Option: Impose no restraint on rural drainage.

Option: Require rural drainage systems limited by the capacity of the total river system.

4. Recreation

Option: Impose no restrictions on recreation activities.

Option: Impose restrictions on some recreation activities such as wet bikes at certain times (e.g. waterfowl nesting season) and/or places.

Option: Consider recreation users when planning and undertaking river maintenance programmes.

5. Minimum Flows

Option: Prohibit further abstraction from surface sources

- river flows remain largely unmodified
- instream values are protected as much as possible
- no river water available for irrigation on adjacent land
- only limited water available for irrigation from groundwater and spring-fed streams.

Option: Permit unrestricted abstractions

- severe impacts on fish habitat, wildlife and recreational values

Option: Set minimum flows

- need for much more information in order to establish impacts of various possible flow levels/periods and locations on river system (e.g. Gardiners Road)

6. Water Quality

Option: Investigate, monitor, and if necessary control, sources of potential contamination.

- industrial discharges in the *Catchment* area.*
- stormwater soakage

- possible contamination from the Airport area or other urban activities
- horticultural and agricultural runoff
- *water quality of river itself*

7. River Works

- Option: Increase/decrease dragline and weed clearance operations.
- Option: Monitor effects of maintenance works and consider alternative methods.
- Option: Institute a programme of removing crack willows and replanting with other species (natives?).
- Option: Plan and execute capital works *and/or modify existing works* with regard for possible impacts on scenic, wildlife, fisheries and recreation values.
- Option: Continue assessment of options for stormwater retention *basins and other works* in the light of information coming forward from other investigations (e.g. wildlife).
- Option: Ensure basins are managed so that silt deposition and pasture drainage are minimised, and lessees of basin land and the local authority are given adequate notice of the filling of basins.
- Option: Diversions. Investigate possibility of diverting part of the river to lagoon. Option: Stopbanks.*

8. Ecological Issues

- Option: Arrange investigations (Department of Agriculture and Fisheries) and a report on the fisheries of the Styx catchment, in particular identify any species requiring conservation measures and areas of importance for spawning.
- Option: Arrange investigations and a report on bird species and habitat that may warrant conservation measures. This investigation to include an assessment of the significance of flooding for wildlife.
- Option: Assessment of impact of existing marginal vegetation on the ecology of the river life.*

9. Landscape

- Option: Carry out landscape study to identify various character zones.
- Option: Formalise in the management plan the Council's existing policy regarding existing trees. (*Note: The Waimairi District Council is the only party permitted to undertake maintenance of trees, and such maintenance is limited to fallen or damaged trees*).

Option: Remove existing planting and re-establish over an extended period of time in accordance with defined parameters.

Option: Define planting strategy for river between the outlet and the Styx Mill Basin Reserve that will enhance environmental values and public enjoyment. This will need to tie in with Esplanade Reserve policies.

Option: Establish or intensify native planting.*

Option: Minimise disturbance to significant areas of landscape quality.

10. Esplanade Reserves and Public Access

Option: Investigate feasibility of extending esplanade reserves and walkways. *

- need for one side only in some locations
- define minimum widths compatible with access and maintenance needs
- effects of adjoining land owners activities on riverbank
- ease of public access for walking, fishing and other suitable river based activities
- maintenance responsibilities

- * • investigate compensation requirements.
- establish policy to deal with private fences across Esplanade Reserves (e.g. Spencerville area).

Option: Confirm river channel requirements as soon as possible so that surveying of Esplanade Reserves can be finalised.

Option: Install physical measures to control the course of the river within the Esplanade Reserves.

11. Administration

Option: Include the entire catchment of the Styx and tributaries in the Management Plan.

Option: Investigate appropriateness of existing *controls* in relation to uses on the Styx River and to proposals for Esplanade Reserves and increased public access.

Option: Include spit area and Brooklands lagoon as a management area.

6. CONCLUSIONS

- 6.1 This report is intended to provide a general overview of the Styx Catchment, its existing problems in relation to drainage and flooding, and the various options which face the Board in dealing with these via a management plan. The report is not intended to provide the "answers" to these issues.
- 6.2 A number of issues and possible policy responses have been identified in this report. In some cases further investigation of the problems or values highlighted is needed. In some cases conflicts between objectives and values are evident.
- 6.3 The Advisory Group includes a breadth of interests and expertise able to critically assess the above matters, to identify any gaps and to now advise the Board as to likely responses from the various interest groups represented to the particular options for action suggested.

References

- (1) GRIFFIN G. 1975: A comprehensive study of the Styx River and River Catchment with regard to its recreational value". Landscape Diploma Thesis. Lincoln College.
- (2) ROBB Dr. J.A. 1980: A biological survey of rivers in the metropolitan Christchurch area and outlying districts - The Avon, Heathcote and Styx Rivers and their tributaries. Christchurch Drainage Board.
- (3) McCAMMON R. 1972: An ecological survey of the Styx River. Unpublished paper, Zoology Department, University of Canterbury.
- (4) COWIE B.(etal) 1986: An ecological survey of the Styx River. Unpublished paper, Zoology Department, University of Canterbury. Waimakariri River and Catchment Resource Survey. Volume 2. North Canterbury Catchment Board and Regional Water Board.
- (5) CHRISTCHURCH DRAINAGE BOARD (1980)

"A biological survey of rivers in the metropolitan Christchurch area and outlying districts: the Avon, Heathcote and Styx Rivers and their tributaries." Unpublished report prepared for the Christchurch Drainage Board by the Laboratory Division, March 1980. 214pp.
- (6) CHRISTCHURCH DRAINAGE BOARD (1986)

"A botanical survey of rivers in the metropolitan Christchurch area and outlying districts: the Avon, Heathcote and Styx Rivers and their tributaries." Unpublished report prepared for the Christchurch Drainage Board by the Laboratory Division, May 1986. 91pp.
- (7) CHRISTCHURCH DRAINAGE BOARD (in preparation)

"A re-evaluation of the ecology of rivers within the Styx River catchment." Unpublished report for the Christchurch Drainage Board currently being prepared by the Laboratory Division.
- (8) HAYES J.W. (1978)

"The importance of surface food in the diet of brown trout (*Salmo trutta* L.) in the lower Styx River, Canterbury, New Zealand." Unpublished BSc (Hons) project in Zoology, University of Canterbury, New Zealand.
- (9) KNOX, G.A. & L.A. BOLTON (1978)

"The ecology of the benthic macroflora and fauna of Brooklands Lagoon, Waimakariri River Estuary." Estuarine Research Unit (Zoology Department, University of Canterbury) Report No. 16. 125pp.

APPENDIX

SUBMISSIONS:

- 1 MINISTRY FOR THE ENVIRONMENT
- 2 MR C V J BERGMAN
- 3 NORTH CANTERBURY CATCHMENT BOARD
- 4 DEPARTMENT OF CONSERVATION



MINISTRY FOR THE ENVIRONMENT

Southern Regions — Christchurch • 6th Floor, 159 Manchester St. • PO Box 22-285, Christchurch, New Zealand • Telephone (03) 654-540. • Fax (03) 651-730.



FILE REF: PSL-0025	
ENV	ADMIN
19965	19965
Mr Adams	Mr Hunter

your ref:
our ref:

npr 2/1/13

14 July 1989

Chief Engineer
Christchurch Drainage Board
PO Box 13-006
CHRISTCHURCH

Attention: M D Binnie

Dear Sir

Styx River Catchment Management ; Issues and Options Report

Thank you for the opportunity to comment on the Issues and Options report on management of the Styx catchment.

The information contained in the report describes the catchment in some detail and discusses the scientific and technical data available. I have not considered the adequacy of this information.

However there were a number of questions relating to the process being followed in preparation of the management plan which were not covered. If the process has been decided then a summary would have been useful, otherwise if the process and timetable have not been determined then various options could have been discussed in this report.

The covering letter notes that the report has been made available for public comment but there is no indication what assessment is going to be made of the public submissions.

In view of the reorganisation of local and regional government and the changes in the laws relating to resource management the relationship of this project to the proposed statutory management plans would be useful.

The report has been prepared for the Advisory Group, presumably by the Board's staff. A general indication (para 1.5) of the members of that group is given but a full list would be useful to understand the representation and breadth of consultation that will occur in that group. The terms of reference of the Advisory Group would also help understand the process.

Please do not not hesitate to contact me if you wish to discuss these comments further.

Yours sincerely

Claire Mulcock
for Manager, Southern Regions, Christchurch



47 Basingstoke St
Christchurch, 7
26th June 1989

Chief Administration Officer
Christchurch Drainage Board

Dear Sir

Submissions "Styx river Catchment
Management Plan"

The measures to minimize flood damage
not include preventing the development
of Brooklands and Spencerville.

The Mud flats area of the Brooklands
lagoon as seen from the end of Harbour
Rd be dredged to below low water
level for Recreational water use, to make
the area look attractive and help control
flooding.

Yours faithfully
C.V. J. Bergman

P52-0045

Suggest acknowledge
receipt & explain
degree of development restraint
~~is~~ involved in issues. Options
Comment on dredging
in reply.

Revised response in
message SRCA6 system
MP

✓
19365
Mr Adams ✓
Mr Hunter



North Canterbury Catchment Board & Regional Water Board

Cnr. Latimer Sq. & Worcester St. Christchurch



IN REPLY PLEASE QUOTE

4/40/36947
REFERRING ASK FOR

Dr Griffiths

TELEPHONE 790-060

Fax No 791-867

23 June 1989

The Chief Engineer,
Christchurch Drainage Board,
P.O. BOX 13006,
CHRISTCHURCH.

PSL-0025

Dear Sir,

STYX CATCHMENT MANAGEMENT
ISSUES AND OPTIONS REPORT

Board staff have examined this report and in our view it is a sound one. We have the following comments to make at this stage, recognising that considerable work has to be done.

- (1) Minimum flows will be set or revised by this Board as part of the production of the Waimakariri River Management Plan, due for completion later this year.
- (2) Although mentioned in the report on page 11, staff wish to emphasise the importance of planning for stormwater discharges from the airport. Currently these flows discharge to groundwater which is considered to threaten the quality of the Christchurch groundwater supply.
- (3) In the Styx, water quality is of a satisfactory standard - Class D is probably the most appropriate achievable classification. With increased land drainage and horticultural development pesticide levels could become a problem in the waterways.
- (4) Styx River should not be used for industrial waste disposal. Belfast requires an industrial sewer. Belfast ?
- (5) In respect of flooding, the document covers the likely range of options. Comments will be made on the appropriateness of particular options after the hazard mapping and economic assessment of flooding damage has been completed.

Yours faithfully,

J D Talbot

J.D. Talbot,
ACTING MANAGER - RESOURCES.

GAG:SDT

*Recent decision allows for
some trade waste to Belfast
system & ponds - doesn't
require an industrial sewer.
Please comment on 1
& 4 in reply.*

RF



CONSERVATION



Our Reference. 5/8/9/2
PP:AK

Your Reference P52-0025

5 July 1989

Chief Administration Officer
Christchurch Drainage Board
PO Box 13-006
CHRISTCHURCH

PS:
✓
M. Binnie
Mr Adams of
~~Mr Hunter~~
M. Binnie MB

ATTENTION: M. Binnie/l. Hunter

Dear Sir

STYX RIVER CATCHMENT "ISSUES AND OPTIONS REPORT"

The department has previously provided information on the conservation values of the Styx River and Brooklands lagoon and Bruce Arnold has attended the Advisory Group meetings. The opportunity to now comment on the "Issues and Options" report is appreciated.

The Christchurch Drainage Board is supported in its aim of integrating flooding and drainage issues within an overall catchment management strategy, it is noted that this approach is consistent with the regional goals and objectives for land and water management as set out in the Canterbury Regional Planning Scheme Draft Section 3.1, Land and Water. A catchment management approach is currently being promoted by this department for several water issues in Canterbury, along with the desirability at times to look beyond single catchments eg how does the Styx River compare to other lowland Canterbury rivers?

The department sees an important function of management plans and preparatory reports being to detail the statutory authority from which the plan is being prepared and upon which the plan's policies etc can be implemented. The Issues and Options report is lacking in this respect. Submissions are being sought on a document without an adequate explanation of the statutory and public process framework which encompasses the document. This is especially important in this case as the North Canterbury Catchment and Regional Water Board are currently preparing Waimakariri River catchment and floodplain management plans (which include the Styx River) in terms of their responsibilities under the Water and Soil Conservation Act 1967. Although not currently so these latter plans will most likely be statutory documents (as opposed to the present Board policy documents) under the proposed new legislation. They will contain the already statutory components regarding water quality and minimum flows, will likely become binding documents on the new Christchurch City Council and will have public rights of submission, objection and appeal. It is imperative that the Christchurch Drainage Board fully consider and clarifies the relationship of this current report and its proposed management plan with those of the NCCB and RWB.

There is another reason for looking at statutory authorities - they can pose some constraints on possible river management options. For example, the department has certain land holdings alongside the lower Styx River and adjoining Brooklands Lagoon. These land holdings must be managed in terms of the conservation or protection mandate of the Conservation Act and/or Reserves Act. Some river control options may conflict with that mandate. Also the Board does have responsibilities with respect to the Water and Soil Conservation Act 1967 and this act requires equal consideration of a wide range of water values. It would also be worthwhile thinking of management plan implementation in terms of the proposed new legislation.

The content of the Issues and Options Report has, despite the stated intentions of the Board in the report's introduction, a clear emphasis on flood control and drainage. This emphasis discounts the report from being an objective approach to the management of the catchment; it is not the basis for a catchment management plan. For example, while an entire section of the report is given to "Flooding and Drainage Problems" (Is it a "problem" to ecological values?), there is no comparably detailed section on maintaining instream and adjoining natural qualities and their conservation, cultural and recreational values.

It is noted that reports on fisheries, birdlife and recreation are yet to be completed. These will presumably be more than descriptive reports and will describe management practices necessary to protect and enhance the respective resources. Without the information from these reports' it is difficult to meaningfully discuss the "policy options".

What is clear from various sources, however, is that the Styx River is a high quality resource in terms of water quality and quantity, fisheries, wildlife, Maori culture, recreation and landscape. Within the lowland Waimakariri River catchment it ranks highly with the South Branch and outclasses most of Canterbury's other lowland rivers and streams. For this reason the department would favour "conservation" being a high priority objective and other objectives (eg flood control, drainage, catchment development) being extremely sensitive to their ecological impacts. The choice of the existing policy options is fairly clear when viewed from this perspective. One additional option is to look closely at the operation of the existing flood gates - do they unnecessarily restrict normal tidal flows at the expense of fisheries when their operation may only be needed at flood periods?

In summary, the department:


supports river management within a catchment plan where all values are considered.

believes management plans and supporting documents must be set within a clear statutory framework.

requests that resource information for all management issues be brought up to an equal standing before any decisions are made on policy operations.

promotes the maintenance and enhancement of the wide range of conservation values.

The department's representatives are happy to discuss this submission at any time. Please contact either Mr Poma Palmer or Bruce Arnold.



Poma Palmer
on behalf of
Mike Cuddihy
Regional Conservator



CONSERVATION



Our Reference: 5/8/9/2
PP:AK

Your Reference: P52-0025

5 July 1989

Chief Administration Officer
Christchurch Drainage Board
PO Box 13-006
CHRISTCHURCH

P52-0025
✓
M. Binnie
✓
M. Hunter
M. Binnie

ATTENTION: M. Binnie/l. Hunter

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CONSERVATION



Our Reference: 5/8/9/2
PP:AK

Your Reference: P52-0025

5 July 1989

Chief Administration Officer
Christchurch Drainage Board
PO Box 13-006
CHRISTCHURCH

P52-0025
✓
Mr. Adams of
Mr. Hunter
Mr. Binnie ✓

ATTENTION: M. Binnie/I. Hunter

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