ISSN 0111-4794

FISHERIES ENVIRONMENTAL REPORT NO. 20

SUBMISSION

ON THE PROPOSED

MAITAI WATER SUPPLY DAM

FISHERIES RESEARCH DIVISION
MINISTRY OF AGRICULTURE AND FISHERIES
CHRISTCHURCH

SUBMISSION

ON THE PROPOSED

MAITAI WATER SUPPLY DAM

BY

S.F. DAVIS

FISHERIES ENVIRONMENTAL REPORT NO. 20

N.Z. MINISTRY OF AGRICULTURE AND FISHERIES

CHRISTCHURCH

JULY
1982

FISHERIES ENVIRONMENTAL REPORTS

This report is one of a series of reports issued by Fisheries Research Division on important issues related to environmental matters. They are issued under the following criteria:

(1) They are informal and should not be cited without the author's permission.

(2) They are for limited circulation so that persons and organisations normally receiving Fisheries Research Division publications should not expect to receive copies automatically.

(3) Copies will be issued initially to organisations to which the report is directly relevant.

(4) Copies will be issued to other appropriate organisations on request to Fisheries Research Division, Ministry of Agriculture and Fisheries, Private Bag, Christchurch.

(5) These reports will be issued where a substantial report is required with a time constraint, e.g. a submission for a tribunal hearing.

(6) They will also be issued as interim reports of on-going environmental studies for which year by year or intermittent reporting is advantageous. These interim reports will not preclude formal scientific publication.

CONTENTS

FIGURES

TABLES

1. BACKGROUND

In December 1981, Nelson City Council (NCC) applied to the Nelson Regional Water Board for six water rights, required for a proposed urban water supply dam on the North Branch of the Maitai River (Fig. 1). The applications were:

82/49 To dam North Branch Maitai River.

82/50 Discharge of water from spillway of proposed dam to South Branch.

82/51 Discharge of water into North Branch from diversion culvert under proposed dam.

82/52 To take water from South Branch to proposed storage reservoir in North Branch.

82/53 To take water from South Branch direct to city water supply system.

82/54 To take water from North Branch for city water supply.

In accordance with Sections 24(9) and 24(11) of the Water and Soil Conservation Act 1967, the Nelson Regional Water Board appointed a Special Tribunal, comprising five members, to hear the applicant and objectors. The hearing dates were 21-24 June 1982.

Nelson Acclimatisation Society (NAS) lodged an objection to the advertised water rights, and subsequently approached Fisheries Research Division (FRD), Christchurch, for assistance in presentation of their case to the Special Tribunal.

This report contains the submission presented by FRD on behalf of NAS.

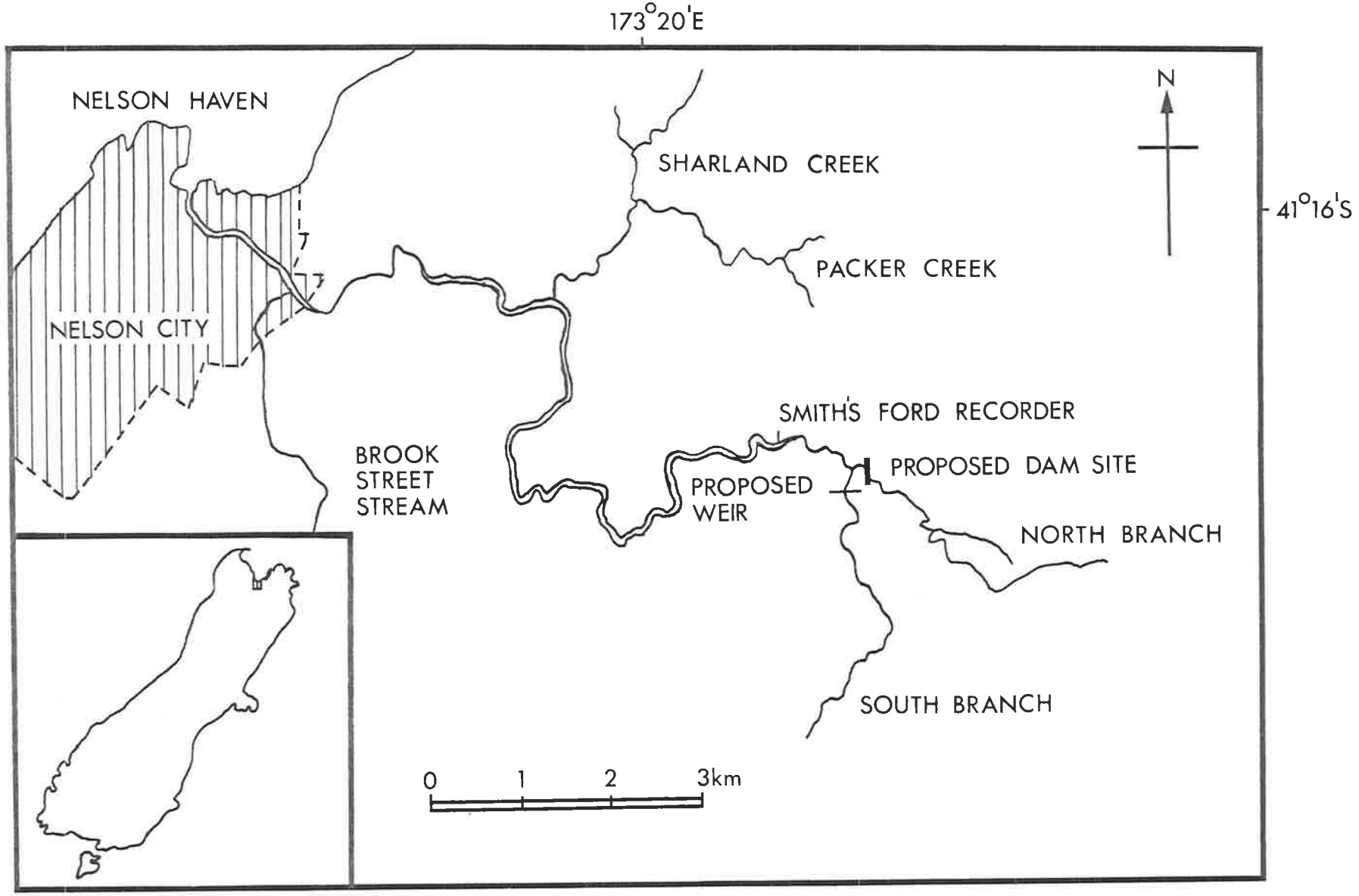


FIGURE 1. The Maitai River system.

2. SCHEME DESCRIPTION

Nelson City's current water supply is derived from three sources:

(i) Roding River - a small dam was built on the Roding River in 1939, with a pipeline through the hills to Marsden Valley. The reservoir holds approximately three days storage.

(ii) Brook Reservoir - a dam was constructed on Brook Street Stream (Fig. 1) in 1904. However, due to poor water quality, water from this reservoir is used only intermittently in emergency situations.

(iii) Maitai South Branch - Since 1963, NCC has abstracted water via a 900 mm pipeline from a weir intake on the South Branch. Up to 129 l/s is abstracted (Ministry of Works and Development 1982). However, at times during summer the full flow of the South Branch is withdrawn (Nelson Regional Water Board 1982).

In January 1980, NCC commissioned a report on potential schemes for augmenting Nelson City's water supply (Tonkin and Taylor Ltd. 1980). The report concluded that the best supply scheme was one based on maintaining the Roding weir, building a new intake on the Maitai South Branch and constructing a storage dam on the Maitai North Branch.

In February 1981, NCC commissioned a feasibility study of the North Branch dam scheme (Tonkin and Taylor Ltd. 1981) and subsequently applied for the water rights previously noted.

The scheme comprises an earthfill dam approximately 33 m high, located on the North Branch of the Maitai River, about 200 m upstream of the confluence of the North and South Branches, known as the Forks (Fig. 1). A concrete-lined spillway would pass flood flows into the South Branch (see sketch layout of dam in Tonkin and Taylor 1981, Volume I).

The existing South Branch weir would be replaced with a new weir and pipeline at a site 1.7-2.1 km above the Forks. The pipeline would branch at the dam, so that water could be taken into storage or piped directly into the main supply line to the city.

N.B. At commencement of the Special Tribunal hearing, NCC advised their intention to increase the height of the dam by 2 m and to rescind their proposal to take South Branch water into storage in the reservoir.

3. OPENING ADDRESS BY MR HAMISH RIDDOCH, NELSON ACCLIMATISATION SOCIETY'S LAWYER

It is not the purpose of the Nelson Acclimatisation Society to criticise the Nelson City Council or the need for a dam, as we have no expertise in this area.

What the Society does object to is the abstraction of waters from the Maitai River system where it clearly will affect the trout fishery.

Obviously if there was no dam and the river was left in its natural state the Society would have no objection.

If water rights are granted then the purpose of the Society's objection is to ensure that safeguards are imposed to protect the Maitai River trout fishery. In this the Nelson City Council and the Acclimatisation Society have the same aim but may differ as to the means of ensuring that the fishery is not adversely affected.

It is clear from the comments made during this hearing that the Maitai River system supports a valuable trout fishery.

Mr Hatton, Mr Shirley and Mr Armstrong in their evidence and Mr Beckett in his opening remarks concede that the fishery is of importance - particularly to young anglers.

I will be calling one witness, Mrs Sally Davis, a fisheries scientist who will in part give further information to this Tribunal as to the importance of the Maitai fishery.

If Dr Bamford's suggestion of a Management Committee is implemented by the Nelson Regional Water Board, the Society would like to have one of its members or a nominee on that committee so that they have a say in the protection and conservation of the fishery.

Mr Shirley made mention of a number of problems he envisaged which may affect the fishery and in this we agree. They are:

(i) problems with sediment

(ii) discharge of hot surface water into river system from the reservoir

(iii) discharge of cold deoxygenated nutrient-rich water from the bottom of the reservoir

(iv) rate and location of proposed compensation flow.

The Council and its advisers have obviously considered these problems and it appears that the first three mentioned can be overcome by engineering and/or reasonable management at the dam site.

To reduce the problem of sediment on the ecology of the Maitai River, settling ponds should be constructed at the dam site and in-river works reduced to a minimum.

Relating to the next two matters, the problems of the upper hot waters and low cold waters can be overcome by mixing them and/or varying the point of draw-off from the reservoir.

If water rights are granted we would ask that conditions be imposed to ensure that those measures are in fact implemented.

Where we do however differ, is that the water flow regime is unacceptable because:

(i) The South Branch under the proposed operating regime can still be abstracted until dry.

(ii) The North Branch will be totally inaccessible to fish and as a compensatory factor we would suggest that the South Branch be accessible and usable throughout the year. This is supported by Mr Hatton of Bioresearches. We would also suggest that provision be made for a fish pass through the proposed new weir.

(iii) The Nelson Acclimatisation Society has specific proposals relating to the rate of flow in both North and South branches, which will be outlined by fisheries scientist Sally Davis in her evidence.

There are two other matters which we suggest should be considered by the Tribunal if water rights are granted:

(i) The duration of the water rights if granted should be limited to a relatively short duration so that the conditions imposed can be reviewed. This is important in light of the number of unknown factors which the expert witnesses called cannot predict as to the effects the Nelson City Council's proposals, if implemented, would have on the ecology of the river.

In other words, time should be allowed to test the professional assumptions.

(ii) The Council has based its water storage needs on a projected population and demand over a 20-year period. This Tribunal may consider tying the current abstraction of the water from the Maitai River system to the population for the time being. This would limit the quantity of water stored to less than the design capacity and considerably reduce unnecessary stress on the river at the present time.

4. SUBMISSION - INTRODUCTION

Residents of Nelson and visitors to the city are extremely lucky to have the Maitai River within such close proximity to the city centre. In very few places in New Zealand is it possible to travel such a short distance and achieve a feeling of remoteness. With increasing pressure on society in the future, the availability of such scenic, wilderness areas will become increasingly important. The City fathers would be short-sighted indeed to reduce the attractiveness of this area due to lack of long term planning and consideration of the recreational needs of future generations. The Council has already recognised the value of the Maitai in creating the Waahi Taakaro Reserve and the popularity of this formal recreational facility along with other areas identified by the Nelson Regional Water Board's recent recreational survey (1982) emphasise the river's importance to the city. The high level of usage recorded by the Board's survey demonstrates clearly the value of the Maitai River to the people of Nelson. This river must rate as one of the most used rivers per head of population in New Zealand.

5. MAITAI FISHERY

NAS has had a long association with the Maitai River. The first release of trout into the river was made in July 1869. These fish were reared in the Society's hatchery in Hardy Street, from ova obtained from Tasmania.

A quotation from a letter to the "Examiner", dated 24 May 1870 describing the success of the liberation is appended to this submission (Appendix I). Trout ova from Maitai fish were sent to other streams in the area, including Marlborough, to introduce trout to these waters.

The NAS has recently expressed its on-going interest in enhancement of the Maitai as a fishery by proposing to stabilise the banks in the reach from

Gibbs Bridge to the Maitai Camp, to provide improved habitat for fish (Fig. 2). Approval has already been obtained from the Nelson Catchment Board for a 1:1 subsidy on these works and NCC has agreed to meet the costs of bulldozing work required.

The cost of the proposed works is just under $13,000 of which NCC will pay $1,500, Nelson Catchment Board $6,500 and NAS $5,000. It is proposed that the work, involving confinement of the river bed, protection of undercut banks by rock spurs and tree planting to stabilise the river bed, will be carried out this winter.

The Maitai River fishery remains popular today, being fished by both young and old. A signed statement by Mr W.H. Pegg, a Nelson Acclimatisation Society Councillor who has fished the Maitai for many years is included as Appendix II. Angling is restricted to fly fishing only. However, since 1970, children (under 16 years) have been permitted to use any angling method, in recognition of the importance of this river as a training ground for young anglers.

5.1 Fish Stocks

There is some background information available on the fish stocks of the Maitai. In 1952, the wellknown New Zealand fisheries scientist, K.R. Allen, conducted a survey of the river (Allen 1952). The survey was initiated by NAS who were concerned about the small size of trout in the river. Allen found that about 80% of the fish caught by anglers weighed slightly more than 1 lb (450 g) and measured 12-14" (30.5-35.5 cm) in length. Only about 2% were more than 18" (45.7 cm) and most of these were taken in the upper reaches.

In an average season in the early 1950's, the river yielded about 480 fish in about 600 hours of fishing, the average catch rate being about 0.8 fish per hour.

Allen identified good spawning grounds in the lower reaches of the main stem and in Packer and Sharland's Creeks. Most Maitai trout became

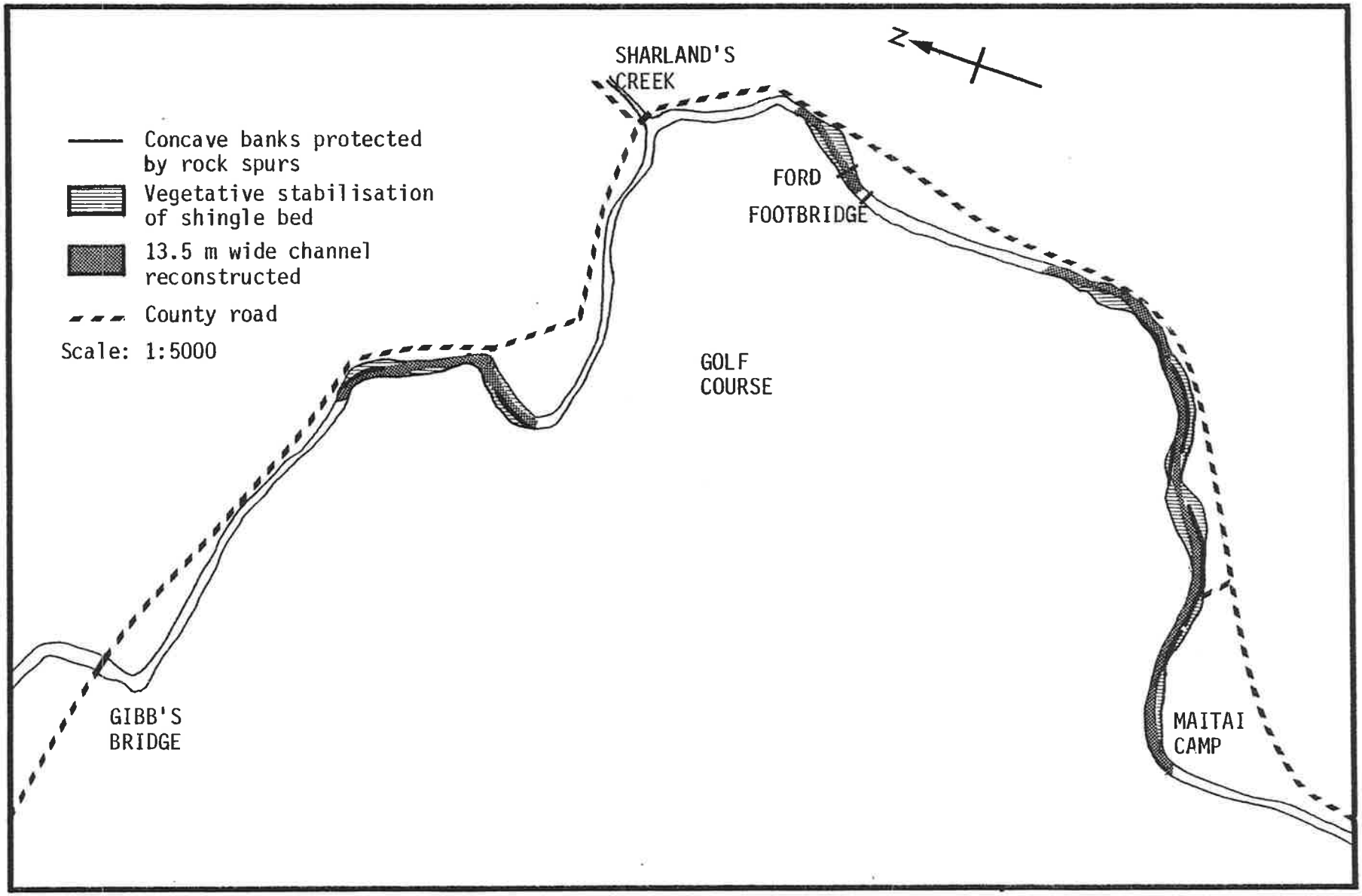


FIGURE 2. Maitai River stabilisation project, Gibb's Bridge to Maitai Camp.

mature and spawned at three years. Allen also noted that food was somewhat limited in the main stem, and was more abundant in Packer's Creek. Some trout remained in Packer's Creek for up to two years after hatching, before descending to the main stem, but their growth rate was slower than main stem-reared fish.

Allen recommended to NAS that the legal size limit for Maitai fish be reduced to 10" (25.4 cm) which would permit an increase in the number of takeable fish. In their analysis of national angling diary schemes, Graynoth and Skrzynski (1974) noted that this suggestion had been adopted by NAS, but did not appear to have affected the average size of fish caught.

The most recent information on trout stocks comes from an electric-fishing survey carried out by Bioresearches in April 1982, under contract to NCC (Bioresearches Ltd 1982). Sites in Sharland's and Packer's Creeks, the North and South Branches and several sites along the main stem of the river were sampled. Trout were present throughout the river system. Packer's Creek contained high numbers of both one and two year old fish, confirming that Allen's observations in 1952 still hold true today. There were also substantial numbers of 1+ fish in the South Branch, 100 m upstream of the Forks, indicating that the South Branch is important as a spawning and rearing area for trout.

Of the 142 trout sampled by Bioresearches, three were larger than 40 cm. These data suggest that the structure of the trout population in the Maitai has not altered significantly since Allen's study in 1952. Abundant stocks of fairly small fish are present throughout the river system.

FRD also recognises the importance of native fish species to the Maitai ecosystem. Eels and bullies are abundant throughout the river, with three bully species recorded in the recent electric-fishing survey - upland, red-finned and giant bully. One torrentfish was also recorded. With increasing pressure

by commercial eel fishermen on New Zealand's eel stocks, the value of unexploited populations as reserve breeding stocks is also increasing. Most of the information presented in this submission relates to trout, but the intrinsic value of the native species should not be forgotten.

5.2 Value of the Fishery to Adult Anglers

FRD of the Ministry of Agriculture and Fisheries has recently completed a nationwide assessment of the relative value of rivers to anglers. Among the survey's four objectives were the aims "To obtain quantitative and comparative information on every river supporting a significant sports fishery and to identify those attributes which characterised each river."

The survey sampled only adult, whole season, angling licence-holders in each Acclimatisation Society district, and I would like to present some of the NAS results to put the value of the Maitai fishery to adult anglers into a regional context. The information presented here is based only on the responses of 50% of the anglers sampled in the survey. Therefore the results are preliminary and represent only minimum estimates.

A questionnaire booklet, containing a list of rivers within Nelson Acclimatisation District, was mailed to a random sample of NAS anglers. Anglers were asked to identify rivers which they had fished over a three to five year period by assessing, for each river, its importance to them (on a 1-5 scale), and the relative importance of seven listed qualities (distance from home, access, area of fishable water, scenic beauty, feelings of peace and solitude, catch rate and size of fish) in determining why they fished that particular river. Information was also requested on average number of visits, reach of river fished, fishing methods used and any associated recreational activity.

The Maitai River was fished by 16.2% of the respondents, and ranked 18th out of 28 rivers on the basis of number of anglers fishing each river. On the 1-5 scale of importance given by anglers to each river, the Maitai rated 16th.

In their overall ranking of "importance", anglers tended to rank wild, scenic, remote rivers highest. This has resulted in rivers close to population centres coming out lower than remote rivers in the "overall importance" ranking.

However, fishing effort on the river, measured as number of visits/angler, was proportionally much higher. The average number of visits per angler was 7.0, the fifth highest in the Nelson district after the Motueka (10.8), Lee (8.1), Buller (7.3) and Tutaki (7.3). The sixth ranked river in terms of fishing effort was the Waimea at 5.9 visits/angler.

The Maitai, along with the Waimea, was rated as the closest and most accessible river to anglers' homes in the NAS district. It was above average in the area of fishable water available to anglers and anglers considered the catch rate to be comparable with the Motueka River. Only the Buller and its headwater tributaries (Sabine, Maruia, D'Urville and Travers) had better catch rates.

However, the anglers' ratings of size of fish suggested that trout landed are amongst the smallest in the district. This confirms NAS's concern over many years about the small size of trout in the Maitai.

Over 80% of the respondents fished the middle reaches of the river and 75% used the dry fly when fishing. Between 20-30% of anglers combined picnicking, swimming or enjoying the scenery with angling.

The results of this survey clearly indicate the value of the Maitai River to NAS adult anglers (Table 1).

Preliminary estimates of adult angler usage of the river are 217 ± 68, at the 95% confidence level. These anglers make 1520 ± 863 visits/year to Maitai.

TABLE 1. Relative value of the Maitai River to Nelson Acclimatisation Society adult anglers, compared with 28 other Nelson rivers.

Characteristic	Ranking
Access	1st
Proximity to home	2nd
Visits/angler	5th
Catch rate	7th
Area fishable	9th
Importance to anglers	16th
Number of anglers	18th

5.3 Value of the Fishery to Junior Anglers

NAS has always valued the Maitai as a training ground for junior anglers. It is a very safe river and so parents do not need to accompany children to fish. Ease of access is also very important, as youngsters do not require transport to reach the fishery. It is easily accessible throughout its length by push-bike or walking. Other than the Maitai River, the nearest safe fishery is the Wakapuaka, some 20 km from Nelson City.

NAS recently surveyed a random 15% sample of Nelson-resident junior licence holders to estimate the number of junior anglers fishing the Maitai during the 1981/82 fishing season. The estimates provided by this survey are absolute minima, accounting only for juniors residing in Nelson City. Juniors from other parts of NAS district have not been sampled, nor have holiday-makers fishing the river over the Christmas-New Year period.

Minimum estimates of the number of Nelson juniors fishing the Maitai are 83 ± 42, at the 95% confidence level. This estimate assumes that no juniors from outside Nelson City fished the river, which is probably not true. The number of visits made by these juniors was 2048 ± 1574, which is a very high level of usage.

As well as the random survey, children who were known to fish the Maitai were interviewed by NAS councillors. (It should be noted that none of these children were included in the survey's random sample.) Angling data are given in Table 2.

TABLE 2. Angling effort and brown trout catch data for Nelson junior anglers fishing the Maitai River, 1981/82.

Angler No.	No. of Visits	Catch
1	45	40
2	30	20
3	65	66
4	45	60
5	45	3
6	30	2
7	10	15
8	45	45
9	18	10
10	15	20
11	35	45
12	40	27

The data from the survey and interviews support the NAS's view that the Maitai is highly valued by junior anglers. Those children who fish the river visit it frequently and appear to be rewarded for their efforts by a high catch rate. The size of fish caught is not known, and many of the fish taken by the juniors may well have been below takeable size. The interviewers simply asked the children how many fish were caught, not how many fish were kept.

6. MAITAI RIVER FLOWS

6.1 Flow Records

Continuous flow records for the Maitai River are available only from March 1979 (Nelson Regional Water Board 1982), when a permanent water level recorder was installed at Smith's Ford (Fig. 1). Predictions about minimum flows and low flow frequencies are therefore difficult to make, due to the short period of records. From examination of the flows, it appears that the summer of 1979/80 was normal-wet, 1980/81 was a severe drought and 1981/82 was also a drought. Substantiation of the 1980/81 drought is given by flow records from the Wairoa River, for which records commenced in 1957. This river is the next catchment to the south of the Maitai, and has a similar elevation and climate. The flow during the 1980/81 summer recorded at the Wairoa Gorge included a 1 in 21 year frequency, 28 day duration minimum flow.

Since 1963, NCC has had the capacity to abstract up to 129 l/s from the South Branch. The maximum demand for water has invariably coincided with the minimum natural flow. From the records, it appears that the maximum capacity was being abstracted in February and March 1982, and similarly for the preceding summer.

6.2 Low Flows

During February 1981, the mean monthly discharge at Smith's Ford was 126 l/sec. This means that NCC was abstracting about 50% of the total river flow. During 1-23 February 1982 (there was a small fresh of 6000 l/sec on 24 February), the mean discharge was 186 l/sec. Therefore the city was abstracting 40% of the river's flow during this period.

The impact of the proposed dam on the North Branch will be to increase the low flow duration throughout the summer and reduce flood peaks. In my opinion, it is the low summer flows which are probably the limiting factor on the Maitai trout populations. The occurrence of freshes in the river

is vital for maintenance of the trout fishery, as well as in providing an aesthetically pleasing river, which people can swim in and enjoy being associated with. Prolonged periods of low flow result in reductions of available fish habitat, loss of food-producing areas, increases in algal growth, increased sedimentation of the substrates and possible increases in water temperature and reduction in dissolved oxygen. These features can place severe stress on fish populations and in the extreme case may result in fish kills.

NAS staff and councillors have observed the Maitai at a variety of flows over recent years. Mr Zumbach, the NAS's field officer, inspected the river on 20-21 April 1982, when the flow at Smith's Ford was 158 and 155 l/s respectively. It was his opinion that the river flow on those days was too low for the maintenance of a viable trout fishery and would have exerted a considerable adverse impact on trout stocks. Fortunately, at that time of the year, water temperatures are generally reduced and do not add to fish stress.

It is NAS's opinion that the summer flows of 1979/80 provide an indication of the flows required to maintain the fishery in good condition. During that season, the flows from December-March ranged from a minimum of 328 l/s to a maximum of 7108 l/s (a flood on 25 January). The monthly mean daily discharge for February and March was about 890 l/s.

According to NCC's consulting engineers (Tonkin and Taylor Ltd. 1981), the North and South Branches contribute respectively 670 (46.5%) and 770 (53.5%) l/s ± 20% to the mean annual river flow. From the flow duration curve for the Maitai River at Smith's Ford, a flow of 400 l/sec would be equalled or exceeded 90% of the time, if the existing South Branch abstraction did not occur. The 90% flow has been used by Regional Water Boards in New Zealand as a guide in determining minimum flows (M.J. Bowden, pers. comm.).

The 'Montana method' also has been used sometimes as a quick, expedient "rule of thumb" to assess minimum acceptable flows for protection of fish and other in-stream uses. Fraser (1978) proposed a modification of the Montana method for application in New Zealand, which stated that the optimum flow was 100% of the average flow of each month of record, 75-99% was an acceptable flow, 30-74% was poor-fair and 29% or less unacceptable.

For the period of record for the Maitai River, I have calculated the "minimum acceptable" and "unacceptable" flows, using Fraser's criteria (Table 2), which does not take into account additional flushing flows when needed.

TABLE 3. Minimum flows calculated using the "Montana method", based on Maitai daily mean discharges, 1979-1982.

Month	Mean Monthly Discharge (l/s)	Minimum "Acceptable flow" (75%) (l/s)	"Unacceptable flow" (29%) (l/s)
December	1206	904	350
January	684	513	198
February	500	375	145
March	1201	901	348
April	1603	1202	465

Table 3 suggests that the minimum acceptable flow for the Maitai River is 375 l/s (recorded for February). The "unacceptable" flow of 145 l/s in February, supports Mr Zumbach's observations and assessment of the Maitai at flows which occured in April this year.

6.3 Proposed Minimum Flow Recommendations

NAS seeks to eliminate the artificial stress currently applied to the Maitai River by abstraction of water during droughts. Therefore, NAS recommends that if the proposed dam is constructed, all abstractions from

the river be regulated so that the flow at Smith's Ford does not fall artificially below 400 l/s.

To achieve this objective, it would be necessary to monitor the river flows upstream of the proposed reservoir in the North Branch and upstream of the proposed new South Branch intake. NAS recommends that all abstractions from the South Branch cease when the flow reaches 250 l/s and below. As long as the flow in the North Branch above the proposed reservoir exceeds 150 l/s, a minimum of 150 l/s should be released below the dam, providing a residual flow of 400 l/s downstream of the Forks. Under drought conditions, if the flow in the North Branch fell below 150 l/s, a corresponding and equivalent reduction in the volume of water released from the proposed reservoir would be acceptable. In this manner, both the NCC reservoir and the river would be equally stressed at times of water shortage. It should also be clear that the NAS considers this stance to be a responsible position to adopt.

Although the recommended minimum flow is higher than the figure suggested by the NCC's consultant engineers, the NAS has not requested a compensation flow from the reservoir. At times of severe water shortage, NCC will not be required to spill water from storage. Under drought conditions, but when a slightly greater volume of water is available, the NCC and the river will share the resource.

The basis of sharing of water between the two branches in the ratio of 250 l/s : 150 l/s is based on the fact that only the South Branch will be available to fish if the dam is constructed. Therefore, the NAS would prefer the larger residual flow to occur in the South Branch and 250 l/s is a suggested compromise. (If the flows were apportioned strictly according to the estimated mean annual flows, then the figures would be 214 l/s for the South Branch and 186 l/s for the North.)

NAS is unwilling to accept the NCC's proposal of a constant release of 150 l/s from the reservoir as a residual flow. Prolonged periods of sustained low flow can cause excessive algal growth and accumulation of silt on the river bed. It is generally recognised that variability in the flow of a river is required to maintain an attractive river.

NAS also considers it desirable to retain the South Branch as a viable fishery and recreation area. Under NCC's proposed compensation flow concept, the South Branch flow could all be abstracted, and the river dried up from the intake site to the Forks, a distance of approximately 2 km. NAS considers this possibility unacceptable.

The proposed dam will totally prevent fish access to the North Branch. Therefore, the South Branch should be retained with an acceptable flow regime for use by fish. This means that the proposed weir at the South Branch intake site must be accessible to fish of all species, and that the pipe intake should be screened to prevent entrainment of fish.

As noted earlier, the occurrence of freshes in the river over the summer period is of vital importance to the fishery. For this reason, the size of the proposed new intake on the South Branch should be limited, so that the major proportion of any summer flood can continue throughout the length of the river. NAS suggests the intake should not exceed 300 l/s capacity, which is over double the size of the existing intake.

If the NAS proposal is adopted, the proposed dam on the North Branch would approximately halve freshes in the river below the Forks. Damping down of freshes to such an extent may have cumulative detrimental effects on the river if the summer drought is prolonged. It may be necessary to make provision for the release of "flushing flows" from the reservoir in certain circumstances. Flexibility to enable such a request to be made to NCC should be incorporated into management of the Maitai water resource.

7. WATER MANAGEMENT RECOMMENDATIONS

7.1 Construction Period

NAS's prime concern during the construction phase is that North Branch flows are adequately passed downstream and siltation is reduced to the minimum. Use of machinery in the river bed during coffer-damming and construction of the diversion culvert will increase water turbidity and may result in a build-up of sediment downstream of the site. This work should be timed so that it does not occur during the trout spawning and egg incubation period of May-August. An increase in sediment loads on the river during this period is highly undesirable.

Surface run-off around the construction site should be carefully controlled and large areas of silt should not be left exposed for any length of time. Stormwater drains should discharge into soak pits or settling ponds, as should waste water from any aggregate screening plant on the site, and this should be a condition of any water right. Every effort should be made to reduce sediment loads on the river.

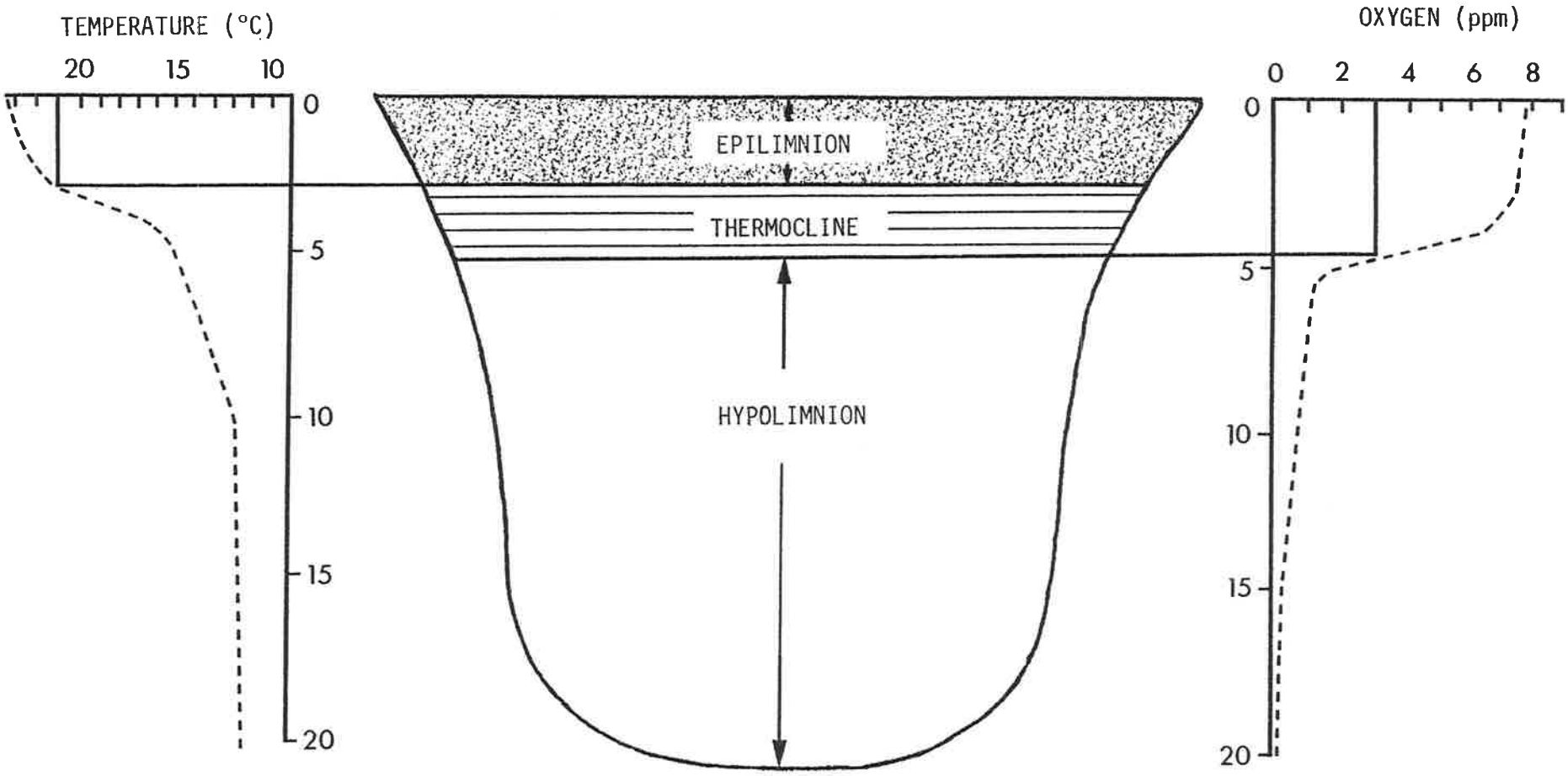
7.2 Water Quality of Proposed Reservoir

It is possible that the proposed reservoir may stratify during summer, resulting in warmer surface waters and colder, less oxygenated bottom waters (Fig. 3). The depth from which water is taken for discharge from the reservoir to the river downstream may therefore have implications for water quality, particularly at low flows.

To avoid release of water with low dissolved oxygen or elevated temperature, it is recommended that provision be made for the discharge of stored water from the upper 5 m of the reservoir, but preferably not from the top 2 m.

7.3 Reservoir Spilling Rates

Flood flows will pass over a spillway and discharge into the South Branch. The proposed reservoir may have a beneficial effect in buffering the main



Water too warm for trout
(Less than 20°C preferred)

Water acceptable for trout

Water too low in oxygen for trout
(3 ppm O_2 tolerated only for short periods)

FIGURE 3. Diagram of a stratified reservoir, with hypothetical temperature and oxygen profiles.

stem from the impact of severe winter floods. However, sudden changes in flow in the South Branch and main river due to the release of large quantities of water from the reservoir should be avoided both for reasons of public safety and ecological impact.

Flood operating procedures should allow for a gradual increase in the spillway discharge over at least an eight hour period. As the storage level of RL 158 is approached, spilling should commence, and the rate of spill slowly increased with time up to the spillway design flood of 153 m^3/s.

8. SUMMARY

1. The Maitai River is a valuable recreational asset to Nelson City, which should not be detrimentally affected due to lack of long-term planning.

2. The Maitai River contains good stocks of both brown trout and native fishes, in particular three species of bully and long-finned eels.

3. The Maitai River supports an important trout fishery, which is used by both junior and adult anglers.

4. A recent survey by Fisheries Research Division of the Ministry of Agriculture and Fisheries showed that the Maitai River was valued by Nelson Acclimatisation Society adult anglers as one of the closest and most easily accessible rivers in the district. The catch rate was considered to be good (comparable with the Motueka River), and fishing effort on the river was high - the Maitai was the fifth most-fished river in the district.

5. The Maitai River provides an important and safe training ground for junior anglers. Over 10% of Nelson Acclimatisation Society junior licence holders fished the river last season, and over 2000 visits to the river were made by these children.

6. It is noted that reliable flow records for the Maitai River are only short-term (1979 - present), which makes determination of minimum acceptable summer flows difficult.

7. From observations of the river at low flows, examination of the existing flow data and testing of the "Montana method" on the flow records, the Nelson Acclimatisation Society recommends that all abstractions from the Maitai River cease when the flow at Smith's Ford reaches 400 l/s.

8. A specific water supply management proposal is outlined. In brief:

   (i) The size of the proposed intake on the South Branch is limited to 300 l/s.

   (ii) Flows in the North and South Branches and at Smith's Ford are monitored by continuous flow recorders.

   (iii) All abstraction from the South Branch ceases when the flow in that branch reaches 250 l/s or less.

   (iv) The flow at Smith's Ford will be 400 l/s or more, unless the flow in the North Branch drops to 150 l/s or less, or the flow in the South Branch falls naturally below 250 l/s.

   (v) At this time, the quantity of water released from the proposed reservoir must be the same as that flowing into the reservoir upstream. Flows downstream of the Forks would then consist solely of naturally-occurring river flows.

9. The Nelson City Council's proposed compensation flow of 150 l/s is not supported, and reasons given.

10. Nelson Acclimatisation Society recommends that the South Branch is retained as a recreational and fishery resource, and not permitted to

be dried up by abstraction. The proposed weir should be accessible to fish (a small fish pass may be necessary) and the intake structure screened to prevent entrainment of fish.

11. Recommendations to reduce the input of sediments to the river during dam construction are made.

12. The intake for water being discharged from the reservoir should be located between 2-5 m below the water surface to minimise potential downstream water quality problems.

13. It is recommended that there are no sudden changes in the flow regime downstream of the dam due to spillway discharges. Spilling should increase slowly over, say, an eight hour period.

9. ACKNOWLEDGEMENTS

I sincerely thank Laurel Teirney (FRD) for making the preliminary Nelson Acclimatisation Society (NAS) national angling survey results available for inclusion in this submission; Doug Zumbach of NAS who surveyed Nelson junior anglers; and Martin Unwin (FRD) who analysed the results. Special thanks to NAS Councillors Green and Smith for helpful discussions prior to preparation of this submission.

10. LITERATURE CITED

Allen K.R. 1952. The Maitai River (Nelson). Unpublished report. N.Z. Marine Department, Wellington. 6 pp.

Bioresearches Ltd. 1982. Proposed Maitai River water supply reservoir - Ecological investigations. Report to Nelson City Council. 71 pp.

Fraser, J.C. 1978. Suggestions for developing flow recommendations for in-stream uses of New Zealand streams. Water and Soil Miscellaneous Publication No. 6. 13 pp.

Graynoth, E. and Skrzynski, W. 1974. The Nelson trout fishery. N.Z. Ministry of Agriculture and Fisheries, Fisheries Technical Report No. 119. 35 pp.

Ministry of Works and Development. 1982. TIDEDA records of Nelson City Council pipeline flow, Site 57805.

Nelson Regional Water Board. 1982. Maitai River Hydrological and Recreational Survey. 33 pp.

Tonkin and Taylor Ltd. 1980. Nelson City Water Supply Augmentation, Evaluation of Resources and Supply Schemes.

Tonkin and Taylor Ltd. 1981. Nelson City Council Water Supply Augmentation. Maitai Scheme Feasibility Study. 2 vols.

APPENDIX I. Quotation from letter to the "Examiner", 24 May 1870.

"Trout in the Maitai. The growth of the trout in the Maitai is really extraordinary. On Saturday last, a splendid fish, fully 18 inches in length and estimated to weigh upwards of two pounds (2 lbs), was seen in one of the holes in the river, a little above the Nile Street bridge, and attracted quite a concourse of people. As the spawn from which this trout was raised was brought from Tasmania less than two years ago, the size of this and other fish which have been seen in the river is highly satisfactory, as showing the suitability of our streams for trout, and promise of sport given to the angler in a very few years."

APPENDIX II. Signed statement by W.H. Pegg.

THE MAITAI RIVER AND TROUT FISHING

My name is William Harold Pegg of 15 Mill Street, Nelson. I am a Councillor of the Nelson Acclimatisation Society and have prepared this statement in support of the Society's objection to the issue of water rights to the Nelson City Council for construction of a dam, abstraction of water and their allied requirements in the Maitai.

I have known the Maitai River all my life. I held my first fishing licence when I was six and have had a licence and fished the Maitai every year since, making a total of 43 years.

The fishing was at its best, with regard to size and number in my time, in the 40's. The limit bag then was 12 fish per day. The small fish were so numerous in the 50's that the then controlling body the Freshwater Fisheries Division of the Marine Department reduced the takeable size from 12 inches to 10 inches in an endeavour to improve the fishing. In more recent years the fish are more varied in size but the largest now caught rarely exceeds 1 kilogram, which is much smaller than in earlier years. The limit bag is now 10.

In my early years the river from the Motor Camp to the sea had more deep holes and more generous clear-water flow than exists now. It seems that the river bed has degraded from Hanby Park to the sea and this may be a contributory cause to the changes. Much willow removal has been carried out, particularly following the 1957 flood. The open river from the Motor Camp downstream bears witness to this. In the 40's the catchment above the forks was grazed. Having helped Tom Elliot to muster sheep there at that time I have a very clear recollection of the vegetation being mainly grass with odd bushes and trees here and there, gorse growth was just starting . Now that catchment is mainly covered with Manuka and well established gorse. I suggest that this change of vegetation has contributed to a diminution of the flow of the Maitai. In like manner the flow in Sharlands Creek is appreciably less than in earlier years and there too the establishment of exotic forest has changed the vegetation from predominantly grass.

With the installation of the pipe line to the forks, in 1965 or thereabouts no noticeable changes of river flow were observed. In the drought of 1973 the summer low flow of the river did not appear unduely low.

The drought in the summer of 1980-81 was the most prolonged and lowest flow I had seen in the Maitai to that time. It was very hard on the fish life because of the much reduced area of bed covered by water and the severest growth of long green algae I have ever seen in the lower reaches of the river. This algae growth occured to a small extent most summers but never before to such proportions.

The drought of summer 1981-82 saw the river flow fall to even lower levels than the previous year. No doubt the adverse effect upon the fish life was also more severe.

Fishing in the Maitai is at its best in October, November and early December. As the water warms up the fishing activity declines until a fair recovery commences in mid March and endures through April. The number of anglers using the river I believe has increased slowly over the years even though the size and number of fish has reduced.

It appears to me that changes of catchment conditions have contributed to reduced flows in the river. Floods and their effects have changed the river form for the poorer and removal of trees has reduced the good fish habitats in various localites. These pressures on the fishery have taken their toll. The droughts of 1980 to 82 have been made more severe by the abstraction of water for City uses further threatening the fishery. I believe that there has been excessive reduction of flow and some restructive action is called for now.

DATE 17 June 1982

SIGNED .....

In the presence of ..... A. L. Savage

SECRETARY NELSON ACCLIMATISATION SOCIETY