

MEMORANDUM

TO: IAN MAYHEW
FROM: DOYLE RICHARDSON
DATE: 14 OCTOBER 2020
SUBJECT: WEIR AND FISH PASSAGE – APP-20191339

Following a review of the 4Sight Consulting Technical Review – Mataura Processing Plant Resource Consent Applications Water Quality and Ecology Report and the Pre-hearing Meeting on 30th September 2020, please find below additional information on the weir and fish passage requested to support consent application App-20191339.

Detail of any alternative options or means of diverting flow that have been considered, such as a reduced or remodeled weir structure

The application is for the use of an existing weir for the diversion of water.

The weir and diversion channel are also used to exercise a Water and Discharge Permit (AUTH-20171566-01 and AUTH-20171566-02) held by Alliance since February 2019. This permit was granted to dam, divert, use and discharge water for hydro-electric power generation. Previous versions of this permit date back to 1978 where a Right in Respect of Natural Water was held under the *Water and Soil Conservation Act 1967* (**Appendix 1**).

It is important to note that the existing weir is also lawfully used to assist with the diversion of water to the western side of the Mataura River for the Mataura Industrial Estate hydro-electric turbine (Consent No: 203311).

The weir is designed to maintain a hydraulic head for the operation of the hydro-electric turbines on the eastern (Alliance side) and western (Mataura Industrial Estate) side of the Mataura River in accordance with the above consent. It also assists to provide a reliable level of water for the plant processing and cooling water abstractions.

No alternative means of diverting flow have been considered as the application is for the use of an existing structure and it is considered that the effects of using the existing structure can be mitigated.

Detail of the features of the weir structure, including height, shape and face, and the means of maintaining flow over the weir face, particularly during low flow. Detail of the proportion of flows overtopping the weir in comparisons to that discharged to the hydro race.

The hydro-electric plant, and former versions of it have been in place since the 1890's with diversion and structures installed in the 1920's or 1930's therefore detailed as built construction plans are not

available. However, information critical to the assessment of the effects of the weir are available as discussed below.

The weir is approximately 595 m long in total length including the concrete side walls (which make up the 'extended weir') of the hydro-electric turbine headrace channels. The weir apex (the middle section of the weir) is a broad crested weir with a 71.3 m crest length. The 71.3 m weir apex is 0.15 m lower than the extended weir which carries water to the hydro-electric turbines located on either side of the river. Figure 1 shows flow over the weir apex.



Figure 1 Flow over the broad crested weir apex

A condition requiring a minimum flow height of 0.05 m over the centre of the weir is recommended for this consent consistent with the Right in Respect of Water issued in 1978 and subsequent versions of this permit. Maintaining this minimum flow height while exercising this consent across the 71.3 m crest length equates to a residual flow of 2.49 m³/s over the weir apex. This excludes flow through the fish pass. Flow through the fish pass was estimated to be 0.1 m³/s, meaning that a residual flow of 2.6 m³/s must be left in the river while water is being diverted and used through either the hydroelectric power turbines, and/or the plant water abstractions. The extended weir, beyond the 71.3 m apex, begins operating when residual flow is 7 m³/s (Dean Hamilton and Associates, 2006 (**Appendix 2**)).

Maintaining this flow while exercising the consent is consistent with the objective of the Maitava River Water Conservation Order to maintain the existing "outstanding fishery and angling amenity features".

Effects of the weir on the migration of native fish other than eels, particularly lamprey and koaro, and any mitigating measures proposed to alleviate any adverse effects on those species

Background

The Maitava Falls are located immediately below the weir and the falls extend the full width of the Maitava River with the walls of the Alliance and Maitava Industrial Estate plants adjoining the true river right and left margins of the rock formation.

A list of diadromous fish species present in the Mataura River is summarised in Table 1.

Six of the eleven diadromous native fish species are considered poor or moderate climbers so have not historically migrated past the Mataura Falls pre-development. Shortfin eels are not commonly found above the falls which is accepted as a natural phenomenon for the Southland area where eel stocks are predominantly longfin eels (Golder Associates 2007 (**Appendix 3**)). Both shortfin and longfin eels migrate upstream in a juvenile form called elvers. The term 'elvers' is used to describe both shortfin and longfin juvenile eels. Although a landlocked population of giant kokopu is found above the falls, juveniles are not known to migrate past the falls with koaro only being reported below the falls. Although data is considered deficient for giant kokopu and koaro, they have been considered with elvers and adult lamprey (kanakana) in reviews of fish passage.

Table 1: Diadromous native fish species found in the Mataura River.

Scientific species name	Common name	Climbing ability (poor, moderate, good)
<i>Anguilla dieffenbachii</i>	Longfin eel	Good (elvers)
<i>Anguilla australis</i>	Shortfin eel	Good (elvers)
<i>Cheimarrichthys fosteri</i>	Torrentfish	Poor
<i>Galaxias argenteus</i>	Giant kokopu	Good (juvenile form)
<i>Galaxias maculatus</i>	Inanga	Poor
<i>Geotria australis</i>	Lamprey (kanakana)	Good
<i>Gobiomorphus cotidianus</i>	Common bully	Moderate
<i>Gobiomorphus huttoni</i>	Redfin bully	Moderate
<i>Reptropinna retropinna</i>	Common smelt	Poor
<i>Galaxias brevipinnis</i>	Koaro	Good
<i>Rhombosolea retiaria</i>	Black flounder	Poor

The falls are considered a natural barrier for the upstream migration of diadromous species with poor to moderate climbing ability. Kanakana, elvers, giant kokopu (juvenile) and koaro are able to climb the falls but require certain physical characteristics such as moisture on lateral margins of rock chutes, low velocities, non-overhanging rock ledges and the presence of moss or other similar vegetation to promote climbing. The falls are not considered a total barrier for climbing species, but a partial barrier dictated by river flow and rock surface characteristics such as moisture and variable flow (Golder Associates 2007 and Holloway 2016 (**Appendix 4**)).

Kanakana

Observations at the Alliance Mataura plant suggest that kanakana are migrating upstream past the falls and diversion weir. Kanakana have been observed climbing the vertical surfaces including concrete channel walls and getting over into the hydro race (refer Figure 2). Observations at the plant have noted that accumulations of kanakana can disappear overnight. Based on this, it was concluded that

there is strong evidence that kanakana are ascending the race and diversion walls and continued to migrate upstream (Golder Associates 2007).



Figure 2 (left) Kanakana congregating in a wetted area of the diversion structure and (right) a kanakana ascending the diversion wall

Shortfin and longfin eel

Observations of upstream elver migrations have found that smaller elvers are more capable of climbing waterfalls, dam spillways and other potential barriers. This is due to the smaller lighter elvers maintaining better adhesion to the surface being climbed via surface tension than larger elvers. Therefore, the expectation is that smaller shortfin elvers will ascend higher or steeper vertical surfaces than larger longfin elvers. It was concluded that it is unlikely that the weir represents a significant barrier (Golder Associates 2007).

Holloway 2016 concluded that elver accumulation below the falls corresponds with river flow. It is likely that when river flow increases the potential climbing areas (chutes and rock ledges and low velocity areas on the water take weir structure) also increase. Golder Associates 2007 identified that if longfin elvers do ascend the falls during suitable flow conditions, the weir presents a difficulty because longfin elvers have very limited ability to bend dorso-ventrally which leads them to having difficulty climbing over a 90° angle from vertical to horizontal, but it was noted that there are variations in the weir construction that provide water flows suitable for elver passage.

It was concluded that passage for longfin elver at the Mataura Falls is likely to be restricted at times due to the natural functioning of the falls, the size of the elvers and volume of water in the river. Elvers

that successfully climb the falls may also have difficulty negotiating the diversion weir where the vertical side meets the horizontal upper surface.

As a result of the above, an elver trap and transfer plan was developed for low flows periods (i.e. when flows are less than 80 m³/s). It was considered that the trap and transfer plan will work well if implemented by someone suitably qualified and experienced in such work. Currently, suitably qualified people from Hokonui Rūnanga are undertaking this work on behalf of Alliance. It is proposed that this work will continue, and it may be prudent to include conditions to this effect on any consent granted to use the existing weir to divert water. This would emulate the conditions that are attached to Alliance's hydro-electric plant consent.

Giant kokopu

Adult Giant kokopu would be unable to climb the falls. Upstream populations are either landlocked or juvenile populations that have yet to make a downstream migration. As a result, there is no effect on the migration of the Giant kokopu from the weir (Golder Associates 2007).

Koaro

Koaro are known for their ability to climb very high waterfalls (McDowall 1990 cited in Golder Associates 2007), vertical concrete weirs (Allibone pers. Obs. Cited in Golder Associates 2007) and penetrate far inland. It is expected that koaro juveniles that successfully ascend the Mataura Falls will be capable of climbing the diversion weir. The range of water depths over the weir and the relatively short height of the diversion will provide wetted surfaces that koaro can easily climb (Golder Associates 2007).

Summary

In addition to the above, in evidence for the Alliance Group Limited Resource Consent Application APP-20171566, Dr Mark James stated the falls and the weir do not pose a significant barrier for eels, koaro, lamprey, and possibly brown trout (addressed below). He stated the 'trap and transfer' system that was proposed (and is proposed to be continued here) is 'best practise' and commonly used in other parts of New Zealand. His evidence was that while the trap and transfer was not 'essential', its use would enhance upstream migration.

The Report and Decision of the Independent Hearing Commissioner (Dr Rob Lieffering) agreed that the trap and transfer 'enhances' the upstream migration of fish (**Appendix 5**).

Detail of the fish ladder design and installation, including any benefits for fish other than trout

A fish ladder is located below the apex of the of the broad crested weir. It was understood this was installed to provide for salmonid fish passage.

Condition 6 of AUTH-20171566-01 and AUTH-20171566-02 required Alliance to review the existing fish ladder to assess whether the fish ladder adequately provides for the upstream passage of salmonids that would normally migrate past this point in the river. Findings of the inspection were included in the Mataura River Weir, Fish Ladder Inspection report (Freshwater Solutions, 2020 (**Appendix 6**)).

As required by the consent conditions, this assessment was done by a suitably qualified, independent and experience freshwater fisheries biologist from Freshwater Solutions.

The assessment identified that the fish ladder appeared to be functioning as designed at the time of the inspection but noted there was a small amount of woody debris caught at the top of the ladder. Assuming the original design was fit for purpose, and because it was still in undamaged condition it was considered that the ladder continues to provide fish passage for salmonids that can first traverse the Mataura Falls.

Because the Mataura Falls are located downstream of the ladder, it only presents a potential barrier to those fish that have already navigated the falls. It was noted that salmonids are generally strong swimmers that can negotiate their way upstream through a wide array of fishways, with close to 100% efficiency in some structure such as pool and weir ladders similar to the on the Mataura River weir. No physical work on the ladder was recommended, but it was recommended that regular visual checks of the fish ladder be undertaken for damage and blockage, with remediation undertaken is needed. This inspection process has been implemented and is proposed to continue to be implemented through this consent.

Regards



DOYLE RICHARDSON
Group Environmental Manager

Appendix 1 – Water Right



SOUTHLAND CATCHMENT BOARD

143 SPEY STREET, INVERCARGILL, N.Z.

TELEPHONE : 89-129

RIGHT IN RESPECT OF NATURAL WATER

PURSUANT TO SECTION 21 (3) of the Water and Soil Conservation Act, 1967, a right is hereby granted by the SOUTHLAND CATCHMENT BOARD

to Southland Frozen Meat and Produce Export Company Limited of (ADDRESS) P.O. Box 839, Invercargill.

(OCCUPATION) Meat Processors for a period of ten (10) years

from 10 November 1978

DETAILS OF RIGHT

Purpose for which right is granted to divert water for hydro power generation.

Location of diversion - Mataura River - Map Ref: S178:783:303.

Legal description of land at site where diverted - Sect. 32 Blk XIII Town of Mataura

Rate 1,250,000m³

imum Rate

(per day or

(per minute or

CONDITIONS OF RIGHT

(a) ~~GENERAL CONDITIONS~~ — The general conditions listed on the back of this form shall, unless amended by the Board, apply to this Water Right.

(b) SPECIAL CONDITIONS (if any) —

- (1) This water right is to be exercised within five years of the granting of the right.
 - (a) When there is insufficient water to meet special condition (4) one of the N.Z. Paper Mills turbines shall be progressively reduced in water demand to meet that condition.
- (2) This Right is not to be exercised unless there is at least 0.05 metres of water passing over the centre of the existing weir on the Mataura River.
 - (b) Should it be necessary to shut down the generator referred to in condition (6) (a) the next step is for the usage of water by the larger remaining turbine to be reduced until both N.Z. Paper Mills and the Southland Frozen Meat water demand for power generation is the same.
- (3) The company to have installed and operating prior to exercising this Right equipment to provide immediate warning to its staff that overflow of the weir has ceased.
- (4) The company shall share in the maintenance of an adequate fish ladder in terms of the fish pass regulations at weir at all times.
 - (c) Any further reductions in water usage necessary to meet special condition (4) shall be obtained by a parallel reduction in water usage through the generators by both companies.
- (5) No alteration to the existing weir or diversion channel shall be carried out by the company without the express written permission of the Board.
- (6) When a reduction in water demand for power generation is necessary to comply with special condition (4) the following operating rules shall apply - and the Southland Frozen Meat and Produce Export Co. Ltd. shall comply in meeting its obligations under the rules set out below:-
 - (7) Special Condition (6) shall not affect the rights held by both companies for processing water for any future rights granted for that purpose.
 - (8) The Board reserves the right to review this right as a result of any decision of the Town and Country Planning Tribunal in an



Appendix 2 – Maitara Industrial Estate 2nd Generator Alliance Impacts

Impact on Alliance Group Ltd Water Take From Second Hydro-Electric Power Generator for Mataura Industrial Estate

1. Introduction

An existing hydro-electric generation plant has operated for many years on the true left bank as part of the Mataura Paper Mill. The current owner of the closed mill, Mataura Industrial Estate, has continued to operate the electricity generating plant. A second hydro generation plant at the site of similar size to the existing installation is proposed and consents to authorise this are being sought.

This report is to assess the impact of the changed flow arrangements on the operations of Alliance's consents on the true right bank.

2. Existing operation

At Mataura a low weir/dam exists across low falls and rapids in the Mataura River for the purposes of supplying water for the freezing works who also operate a generator, and the paper mill on opposite sides of the river. The paper mill is now closed but Mataura Industrial Estate continues to operate the hydro-electric facility.

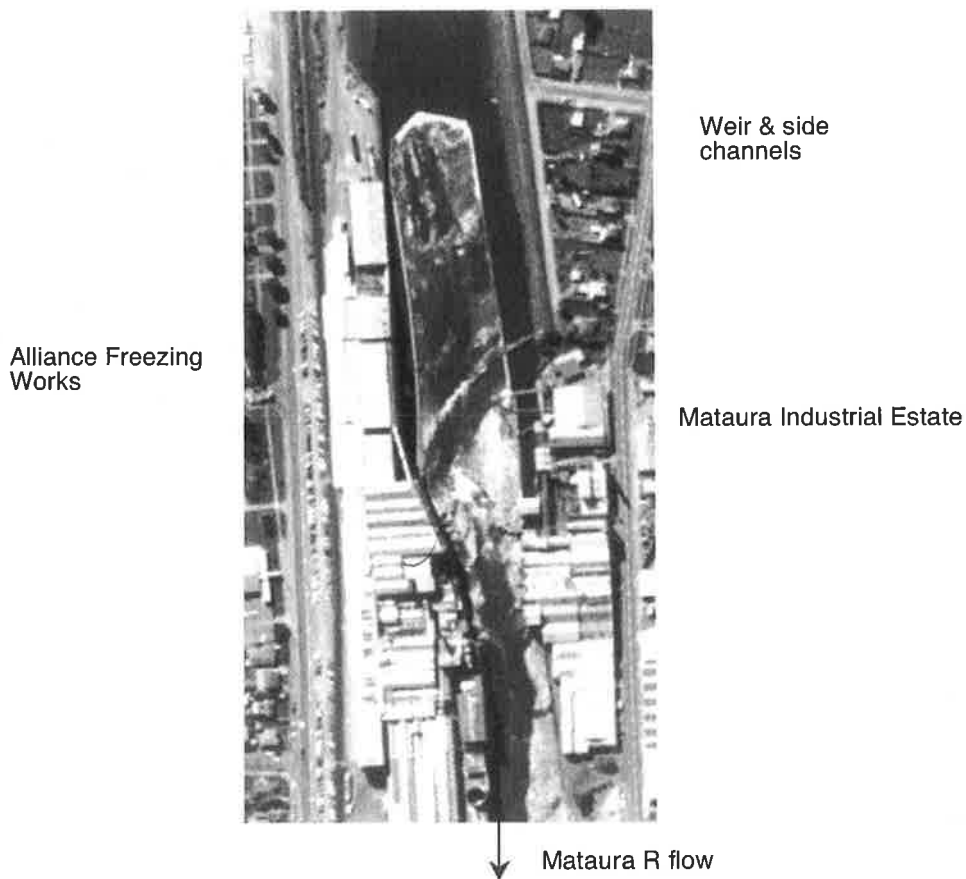


Figure 1: 1991 Aerial Photo (EnviroSouth) of site

There is requirement for a minimum flow to pass over the weir and this is stated as “the flow at centre of the existing weir on the Mataura River shall not be at a lesser depth than 0.05 metres due to the exercise of the consent.” This is interpreted as meaning a head upstream of the weir of 75mm (0.075m). See Figures 3A & 3B that explain the interpretation. The normally accepted engineering definition would be that the water level upstream of the weir relative to the crest level would be the “head” on the weir. The difference in weir flow between using 0.05m or 0.075m as the head on the weir for the 71.3m crest length is 1.13 m³/s (from 1.36 m³/s to 2.49 m³/s). Figure 4 shows the low flow rating for the weir. Average velocity across the weir crest is 0.73 m/s for 50mm depth.



Figure 2: Photo of weir shows fish pass in centre from Alliance (right side) bank. Estimated total river flow above weir is 23 m³/s at 1100 hrs 14 Feb 2006

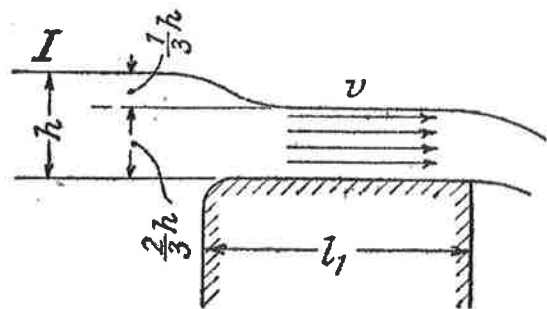


Figure 3A & 3B:
Relationship between head upstream of a broad crested weir and depth of flow over the crest as occurs at low flow over the Mataura weir

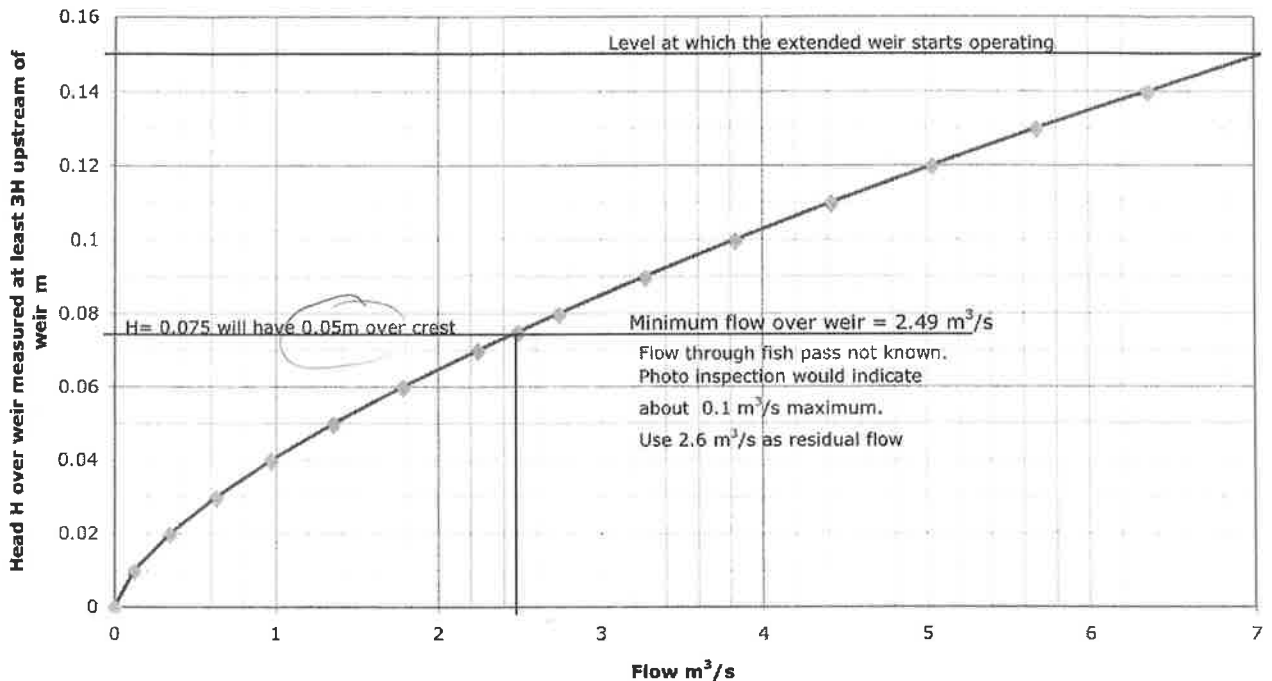
Mataura Weir Low Flow Rating (71.3m Broad crested weir)

Figure 4: Mataura Weir Low Flow Rating

The existing MIE generator takes a flow of 14 m³/s through a Francis turbine and generates between 800 kW and 1 MW depending on flow and head difference. The available head changes with upstream and downstream conditions and reduces with higher flows as the downstream water level increases at a faster rate than the upstream water level.

The freezing works takes up to 12 m³/s and can generate about 650kW (1983 drawing 322A/4 shows rated power output of 530 kW with a flow of 9.5 m³/s and a head of 7.25m). Their consent does not refer to quantities or rates of flow but the application and report on the consent decision refer to 820,000 m³/day that equates to a daily average flow of 9.5 m³/s. A take for water use and cooling equates to a further 0.41 m³/s. For the purposes of this report the higher figure of 12 m³/s has been taken.

If the river drops below about 28.6 m³/s then MIE must first reduce their flow to equate to the Alliance flow. Should further reductions be necessary, to meet the 0.05m water depth condition over the weir crest, then this further reduction is to be equally shared between the two major consent holders on both sides of the river.

Under high flow conditions, greater than about 250 m³/s, generation also ceases because of low head differential.

The total existing flow that may be drawn before a second generator at the paper mill could operate is thus about 2.6 + 14 + 12 = 28.6 m³/s.

Figure 5 shows the proposed second generator layout diagrammatically in relation to existing operations.

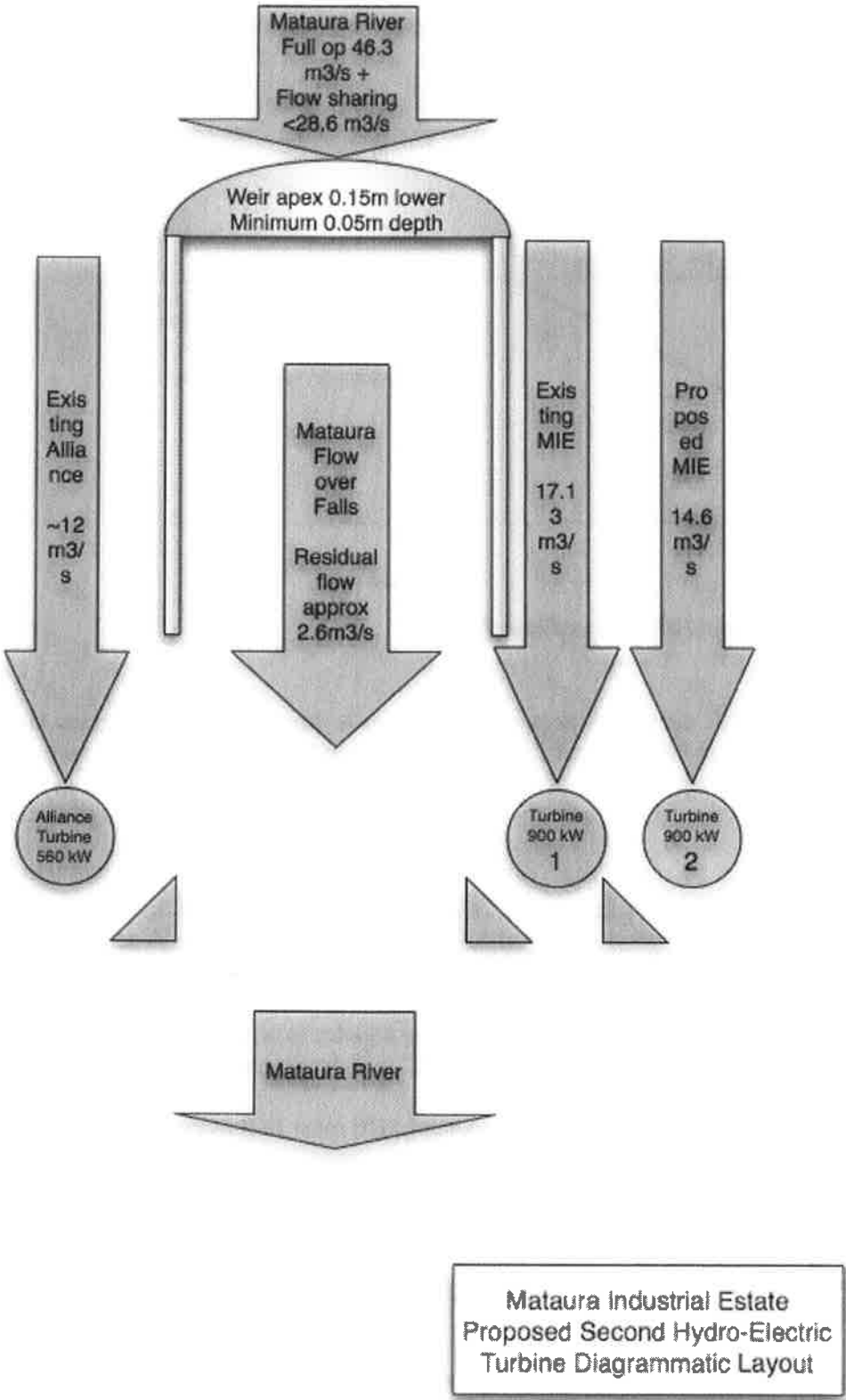


Figure 5: Diagram of layout

The following Table 1 schedules the main consent conditions for the main takes.

Item	MIE	MIE	Alliance Group Ltd	Alliance Group Ltd
Consent No	94335	95431	98031	
Purpose	dam, divert, discharge for HEP, dampen eel pass	take & discharge steam turbine cooling water	dam, divert, use & discharge for HEP generation	take & use incl cooling water
Expiry	30/6/2017	30/6/2007	30/6/2017	
Max rate m ³ /day	1,480,000	20,000	820,800	35,600
Max rate = m ³ /s	17.1296	0.2315	9.5000	0.4120
Min water depth over weir	0.05m		0.05m	
Flow equivalent to min depth m ³ /s	2.6		2.6	
Maintain fish ladder	Y		Y	
Maintain eel pass	Y			
Maintain monitoring system to warn when weir overflow ceases	Y		Y	
Rule to reduce turbine flow to meet 0.05m condition	Y			
Reduction generator demand shared equally	Y		Y	
Temperature		<19°C		
Cooperate other dischargers		Y		
Investigate native fish passage			Y	

Table 1: Consent Summary

3. Proposed Second Generator

The proposal to be investigated is to assess the likely time that a second generator of similar output (800 kW to 1 MW) could generate utilising flows above the current entitlements. The paper mill (MIE) consent is for a total of 17.13 m³/s. The additional flows being sought are 14.6 m³/s. Total MIE flows would be 31.73 m³/s if the consents being sought are granted. See Figure 5.

4. River flow data

There are two good recording sites on the Mataura, now operated by Environment Southland, that are relevant to this study:

Site No.	Site Name	Catchment Area km ²	Records since
77504	Mataura at Gore Highway Bridge	3465	1960
77506	Mataura at Tuturau	4352	1982

Table 2: Hydrological site records

Environment Southland provided a file of the full record from both sites in Hilltop software format. The full plot of data obtained for both sites are shown as Figures 6A & 6B attached.

Some basic data from these two sites is summarised here in Table 3.

	77504 Gore	77506 Tukurau
Mean flow m ³ /s	65	75
Median flow m ³ /s	50.8	58.3
Low Flows m ³ /s		
Mean annual low flow (1 day)	16.84	18.67
Mean annual low flow (7 days)	17.96	19.54
10 year return period low flow	8.60	8.90
Flood Flows m ³ /s		
Mean annual flood (2.33 year return)	560	580
100 year return period flood	2791	2941

Table 3: Flow Statistics (low & flood) supplied by Environment Southland

5. Impact on flow for Alliance

Figure 8 shows the existing and proposed flow regimes for sharing of the flows arriving at the weir.

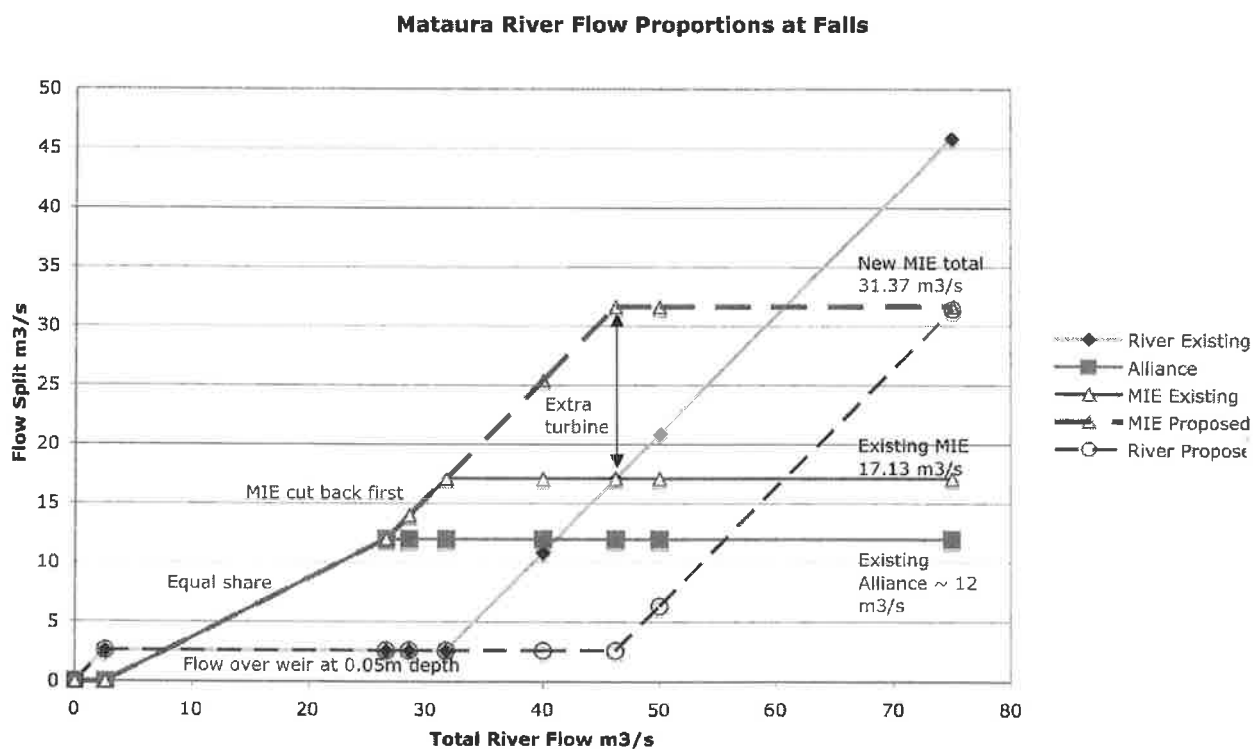


Figure 8: Proposed flow split arrangements Mataura Weir

This figure shows that no takes are allowed once the level is below 2.6 m³/s (as the assessed flow equivalent to 0.05m over the weir) and all flow should be passing over the weir. The natural river flow does not get this low (1957-2004 Mataura at Gore record minimum flow is 5.7 m³/s in 1973).

Above this nominal flow the additional flow is shared equally between Alliance and the Mataura Industrial Estate up until the capacity of the Alliance system (about 12 m³/s) is reached and the total river flow is about 26.6 m³/s.

MIE are able to take water up to their existing consent threshold of 17.13 m³/s when the total river flow is about 31.73 m³/s.

Above this level any additional flow at present will either pass over the weir and falls or side spill from the channels leading to the hydro-electric plants on both sides of the river.

No change is proposed in the operation up to the 31.73m³/s flow. The operation and flow sharing should be identical up to this flow.

Above the 31.73 m³/s the proposed additional flows for the second generator for MIE will be able to take additional flows up to the maximum additional take sought (14.6 m³/s) or up to a total river flow of 46.33 m³/s.

Above this flow all additional flows pass over the weir or side spill from the supply channels on both sides of the river rather than passing through the HEP plant.

In summary there is no impact on existing flow arrangements for the Alliance water take with the proposed increase in take for MIE.

6. River level changes

With the increased take down the left bank (MIE) channels for the increased hydro-generation there will be a small impact on the head available for supply down the right hand channel (Alliance) under some flow conditions.

In order to assess this it has been necessary to obtain level data and channel dimension information on the existing hydraulic structures and riverbed.

A physical hydraulic model was used for investigation of options for floodbank design at Mataura. This work was undertaken for the Southland Catchment Board by the Otago Catchment board at their Hydraulic Laboratory. A copy of the report on this work dated July 1982 has been obtained. In order for this model work to be undertaken the Southland Catchment Board had undertaken a detailed survey of the river and falls section of the Mataura that encompasses the area needed for assessing the current proposal. Copies of this survey have been obtained from EnviroSouth. The nature of that work means that it was geared to looking at major flood flows and levels rather than low flows conditions. The cross section and long section information has been useful. It is understood that minor work on the weir crest has been undertaken subsequently but only to ensure a consistent level.

A visit was made to Alliance on 14 February 2006 to inspect the plans that they have relating to the weir, channel and their existing hydro-generation civil works. Nigel Sadlier arranged copying of the relevant plans and also assisted with a site inspection of the channel that runs from the weir to the Alliance hydro-generation plant.

The Alliance race/flume within the building commences as a 7m wide section and reduces to 4m wide just upstream of the screens. An old race/flume section of similar dimensions

runs parallel on the landward side of the current main race/flume. Design water depth at the screens is 1.7m plus a freeboard of 0.5m making a total channel depth of 2.2m. See Figure 9.

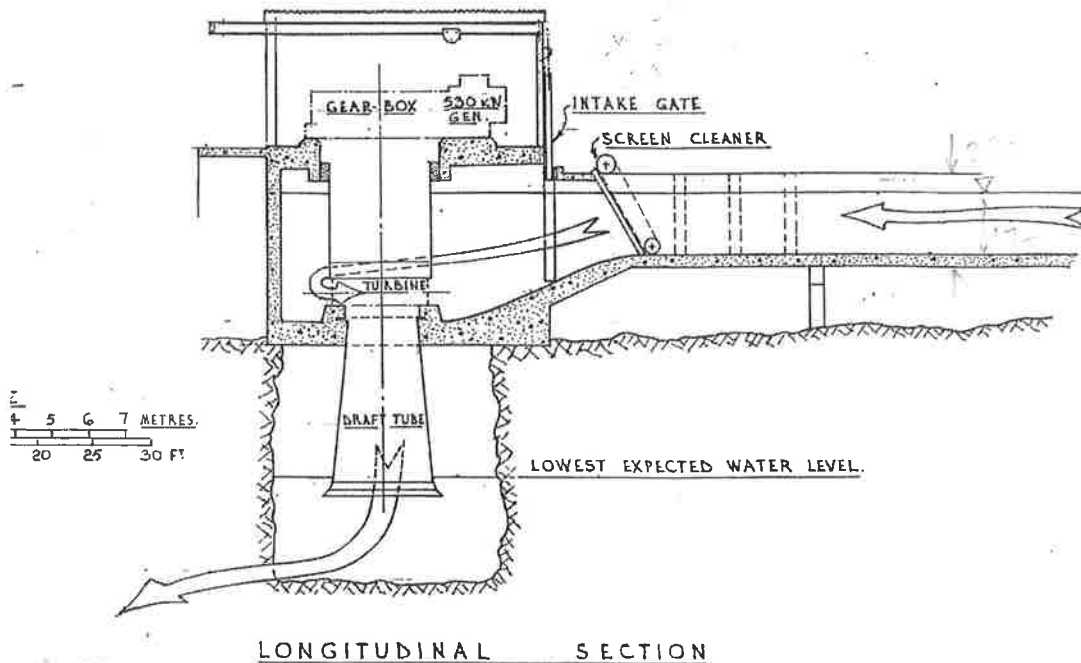


Figure 9: Alliance hydro-electric turbine longsection

From these plans it appears that the top of the concrete side walls are level (at 167.5 ft asl) and 0.15 m higher than the 71.3m of broad crested weir crest level (of 167 ft asl) referred to in the consent condition. As flows in the river increase the flow over the 71.3m crest weir will increase to about 7 m³/s and while additional flow will also pass over this area the long length of side spill weir from the supply headrace channels on both sides of the river will also come into play above this weir flow. Sluice gate structures can also be operated. For this analysis it is assumed that sluice gate structures are not operated.

See Figure 10 that shows the long length of weir crest (595m) before the channels on both sides enter the buildings as flumes.



Figure 10: Panorama showing long weir crest from Alliance looking upstream

The total length of weir crest is 595m: the 71.3m at the apex (upstream centre) that is 0.15 m lower than the rest, Alliance side 254m upstream of buildings (53m as the race/flume within building not counted), and MIE side has a crest length of ~270m upstream of the buildings.

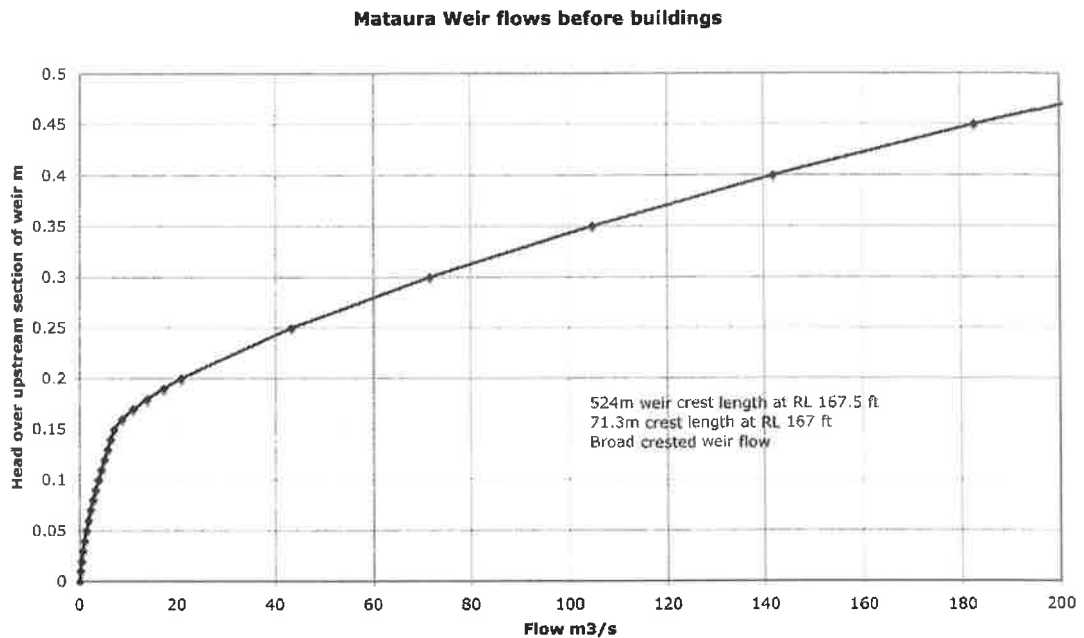


Figure 11A: Flows over weir crests above buildings assuming level conditions

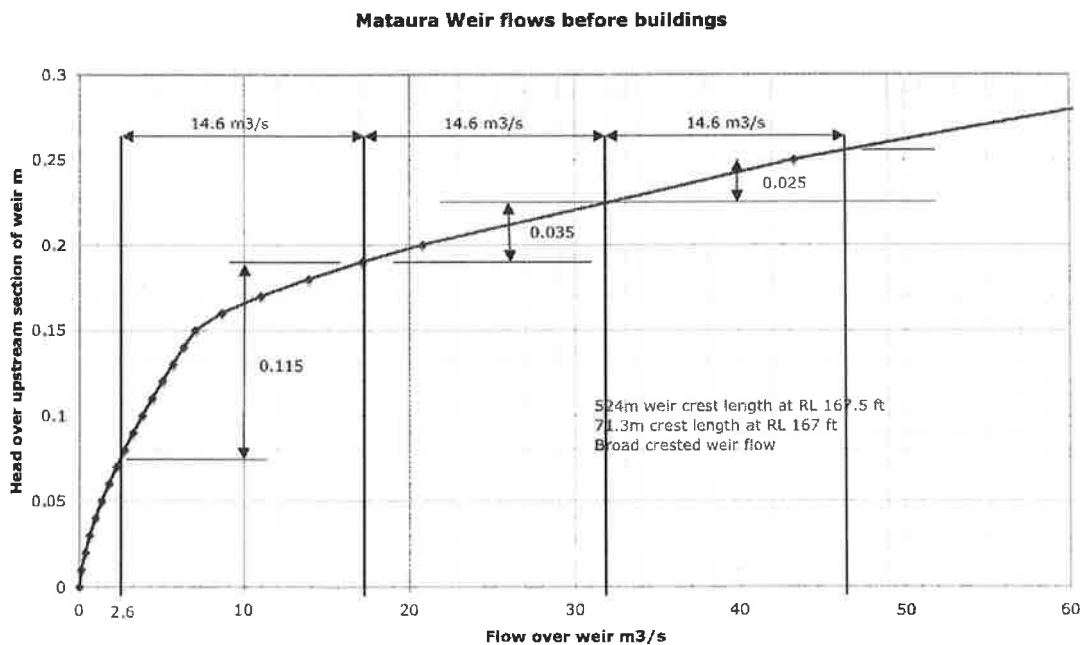


Figure 11B: A more detailed section of Graph 8A. This shows that by drawing off an extra 14.6 m³/s to the MIE second turbine the maximum impact is a reduction of 0.115m head over the weir. At higher flows the difference reduces to less than 0.04m.

Figures 11A & 11B show the head over the upstream weir for the flow that passes over the weir. Only the weir sections upstream of the buildings have been included. Using the additional overspill at the same level that is available within the buildings would reduce these impacts further.

Figure 12 shows the screen and screen cleaner at the inlet to the Alliance turbine. Note the side wall level that is same level (167.5 ft asl) as the long length of main Mataura weir crest upstream. River flows at the time of the photo are estimated at 23 m³/s and flow over the weir appeared to be complying with the 0.05m depth at the crest.

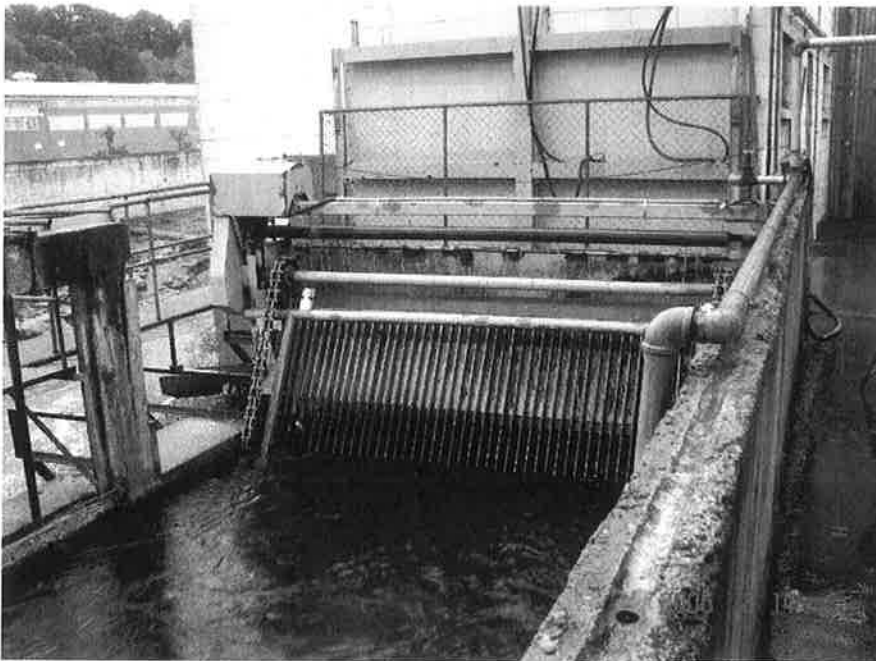


Figure 12: Alliance race and screen at inlet to HEP plant. Note level of sidewall that is at 167.5 ft asl

Figure 11B shows that the main impact would be when flows over the weir are between the minimum flow of about 2.6 m³/s and 17.2 m³/s (that is the second turbine flow plus the minimum flow). The reduction in the upstream water level is a maximum of 0.115m. This is not considered significant. This does not compromise the existing operation of the Alliance system. Full design head for the Alliance HEP turbine will still be available as will a flow of up to 12 m³/s.

Based on the main impact being as the second generator comes on stream the kick in point is going to be above 28.6 m³/s to about 43 m³/s. Inspection of the flow duration curves for Mataura at Gore (Fig.13A) and Mataura at Tuturau (Fig.13B) shows that this could be for under 20% of the time.

A simple approach to this analysis has been taken. The weir formula is based on a still pond upstream. The formula is accurate at low velocities but as the upstream velocities increase more water will pass over the weir than shown. The formula also assumes that the water approaches the weir at right angles to the weir. This is reasonably so for the

main apex section but not so for the race sections down both sides of the river to the two industrial sites. In addition there is a slight gradient for water flowing down the side channels and the head will vary gradually along the weir as a consequence.

More detailed modelling work could be undertaken that would require good cross sectional survey data of the side channels from the weir apex down both sides of the river. Given that the conservative check on figures as shown in Figures 11A & 11B have not demonstrated major changes that would impact on the ability of Alliance to continue to operate it is not considered that additional field survey work to obtain more detailed side channel cross section data is warranted.

Tailwater level

The tailwater level is controlled by the river channel cross section levels, the total flow in the channel, and the backwater effect from the downstream channel. The total flow downstream of the discharge points from the existing and proposed hydro-electric plants will be identical to that at present. The location of the second turbine is slightly downstream of the existing MIE discharge. The impact of this will be that the tailwater levels will be no higher than under current operational arrangements and may be marginally but not significantly lower than at present. Any marginal lowering of the tailwater would ensure the total power generation head remained similar to present.

7. Conclusions

The proposal to install a second hydro-electric power generation turbine in the Mataura Industrial Estate has been investigated to assess the likely impact of this on the operations of the Alliance Group Ltd at their Mataura works. The outcomes from this assessment are:

- (a) That the proposed second generator will not affect the volumetric flow available for the existing Alliance held consents.
- (b) The maximum difference in upstream levels at the Mataura weir will be 0.115m lower and occurs in the range of flows until the full weir length becomes operational. This difference will reduce at higher flows.
- (c) As the same flows are experienced in the channel downstream of the HEP discharges the expected tailwater levels will be similar yet marginally lower than the existing operations and offsetting the slight headwater difference under some flow conditions.

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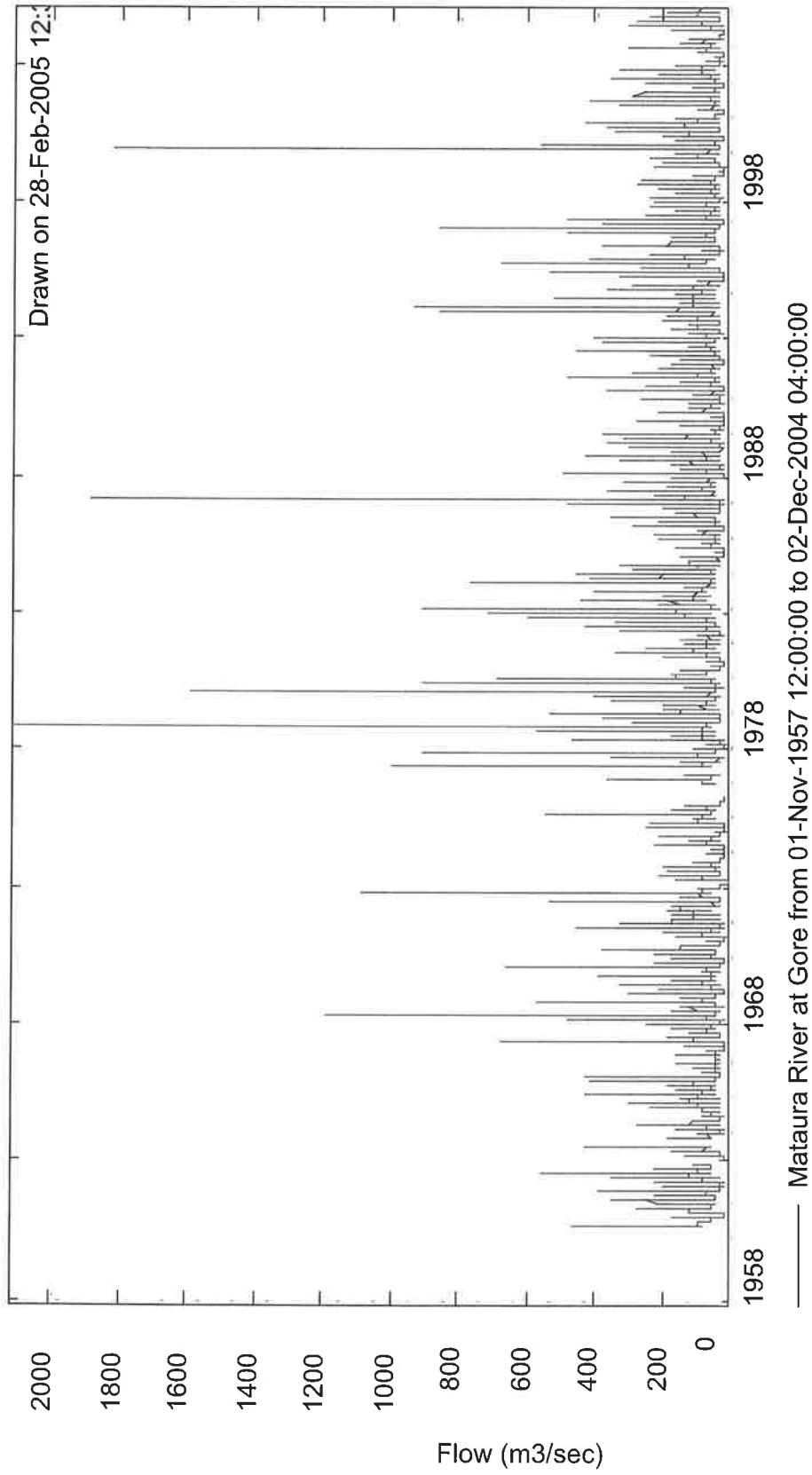
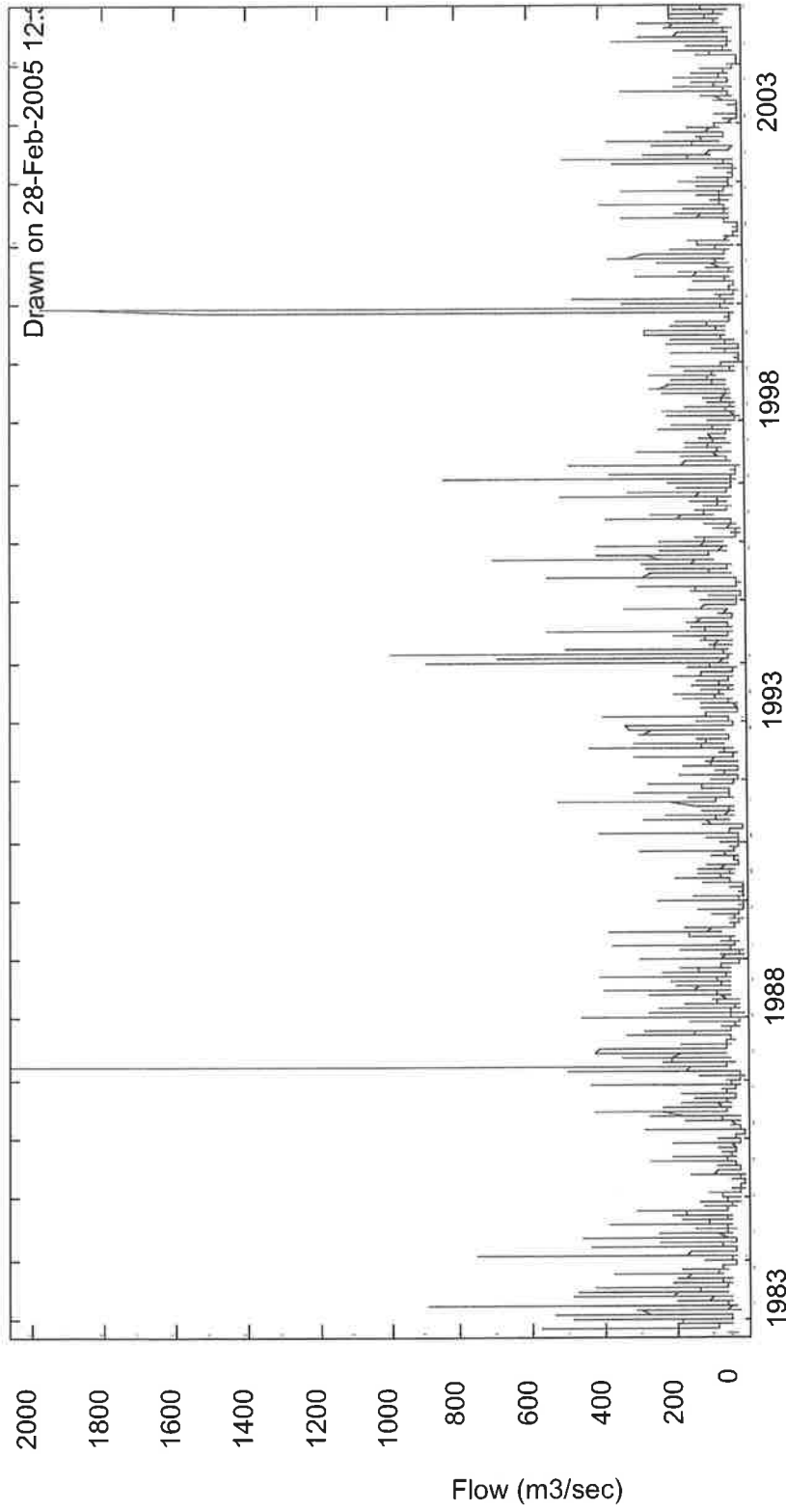


Figure 6A: Mataura River at Gore Flow Record
(data supplied by Environment Southland)



— Mataura River at Tuturau from 21-Sep-1982 16:00:00 to 02-Dec-2004 04:00:00

Figure 6B: Flow record for Mataura River at Tuturau
(data supplied by Environment Southland)

Mataura Industrial Estate 2nd Generator Alliance Impacts

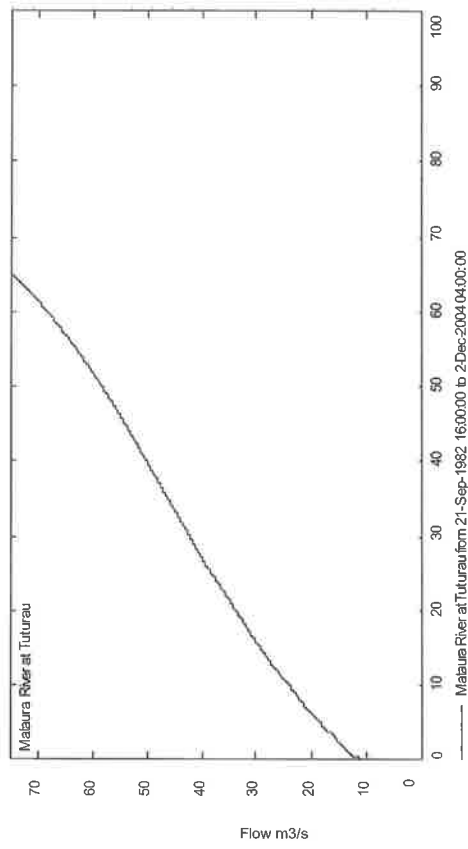
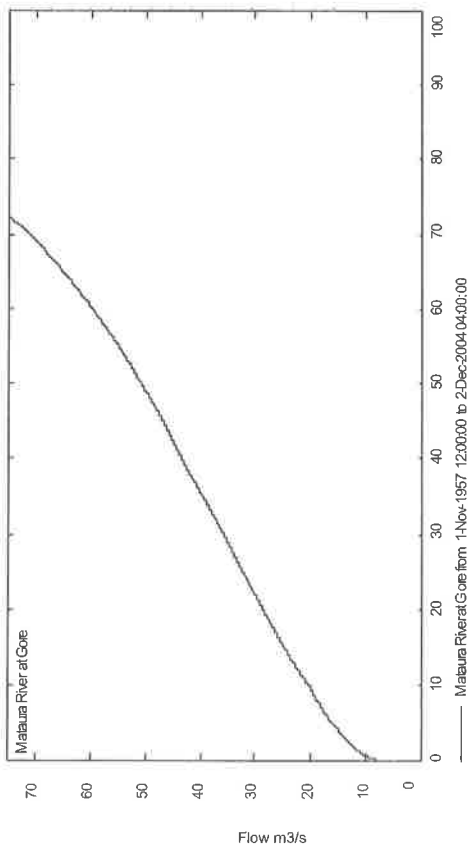
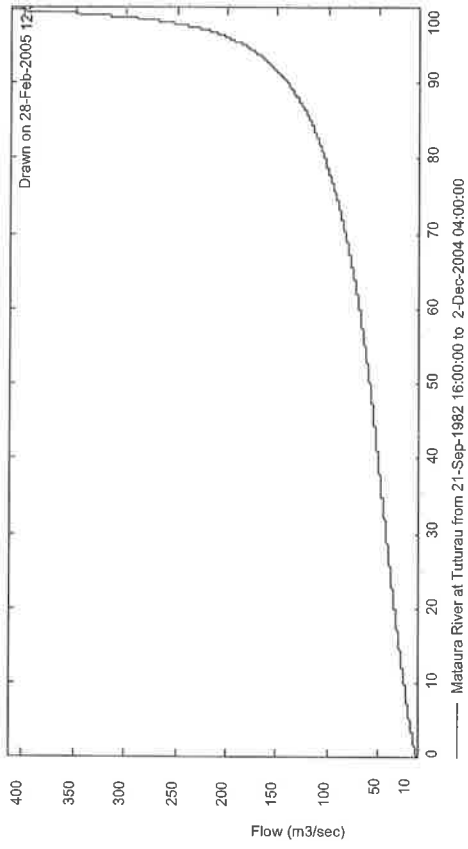
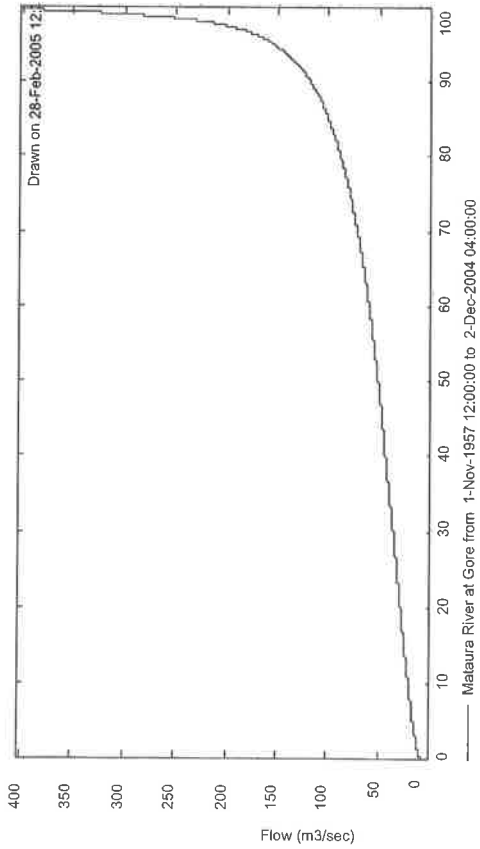


Figure 13A: Flow Duration Curve Mataura at Gore

Figure 13B: Flow Duration Curve Mataura at Tuturau



Appendix 3 – Golder Associates – Assessment of Effects Report 2007

**ASSESSMENT OF HYDRO-ELECTRIC DIVERSION
EFFECTS ON FISH PASSAGE**

NOVEMBER 2007





**ASSESSMENT OF HYDRO-ELECTRIC DIVERSION
EFFECTS ON FISH PASSAGE**

NOVEMBER 2007

on behalf of

Alliance Group Limited

prepared by

Golder Associates (NZ) Ltd

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Document Quality Assurance

This report has been prepared in accordance with Golder Associates (New Zealand) Ltd quality assurance procedures. All relevant quality control information in relation to biological and/or environmental data is identified within the document. The report has been reviewed and is approved for release as set out below.

	Name	Signature
Project Manager	Richard Allibone	
Project Reviewer	Richard Montgomerie	
Principal approval for release	Ian Boothroyd	

1. Introduction

1.1 Background

Alliance Group Limited (Alliance) operates a meat processing plant at Mataura, Southland and part of plant operations includes the diversion of water from the Mataura River into a small (1 Megawatt) on-site hydro electric generation plant.

Alliance's diversion consent (Consent Number 98031) has a schedule of conditions which set out the requirements for a specific investigation of the hydro-electric plant diversion. Condition 7 of Resource Consent 98031 requires:

7. The consent holder shall carry out an investigation into the effects of the hydro-electric power plant diversion on the Mataura River native fish passage. This investigation shall be carried out in consultation with the following parties:

*Arai Te Uru Eel Management Committee
Department of Conservation
Carter Holt Harvey*

1.2 Scope of Report

This report presents:

- a brief history of the development of the hydro-electric plant at the Alliance site;
- an assessment of the native fish fauna of the Mataura River;
- the distribution of the fish species with reference to the Mataura Falls and the diversion structure;
- and an assessment of the effect of the diversion structure on upstream fish passage;
- and notes on consultation with other parties;

in order to meet the requirements of Condition 7.

2. Background

2.1 Site Description

The Alliance plant is situated in the township of Mataura, along the true right bank of the Mataura River (Fig. 2.1). The true left bank of the river is occupied by the former Carter Holt Harvey paper mill now an industrial site managed by the Mataura Industrial Estate (MIE). The hydro-electric plant at the Alliance site diverts water from the Mataura River via a U shaped weir and raceway structure (Fig. 2.2). The diversion is upstream of the Mataura Falls water fall (Figs. 2.3 and 2.4). The natural fall in the river provides the hydraulic head for the hydro-electric turbine.

The diversion operates under consent conditions that require a minimum water depth of 0.05 m be maintained over the weir at all times. At the edges of the diversion as the diverted water is channelled along the hydrorace the water flow over the weir top decreases to nil (Figs. 1.2 and 1.5). This leads to the weir being over topped by water at least 0.05 m of water in the centre of the river to no overflow at the side of the diversion structure providing a range of water depths for fish to utilise when moving upstream over the weir.

2.2 Hydro-electric Plant History

The Mātaura Paper Mill and the Southland Frozen Meat and Produce Export Company first established the hydro-electric plants on the Mātaura River in the earlier 1890s. The Southland Frozen Meat and Produce Export Company was granted consent to take water from the Mātaura River in 1890 (Pickering 1949) for hydro-electricity generation. In 1893 the Mātaura Paper Mill also began operating a hydro-electric plant. In 1905, after the generation plant had been upgraded, the hydro-electric plant supplied electricity to the processing plant and the town of Gore; and this was extended to supply electricity to Mātaura in 1913. The hydro plant continued to supply power to Gore and Mātaura until 1924 when the Southland Electric Power Board began supplying electricity to Gore and Mātaura from its Monowai Power Station (Pickering 1949). The meat processing plant became completely electrified in 1932. Just when the diversion structure was completed during this development period is unclear; however it is evident that the hydro-electric generation plants at the Alliance site and the paper mill site in Mātaura have now been operating for approximately 115-120 years. Diversion structures and the intake canal system are likely to have been in place either prior or put in place during the last plant upgrades in the 1920 or 1930s.



Fig. 2.1: The present day Alliance meat processing plant (left side of picture) and the Mātaura River with the Mātaura Falls and the upstream U-shaped diversion weir.

2.3 Mātaura Water Conservation Order

The Mātaura River is subject to a Water Conservation Order (WCO) that was applied for by Fish & Game New Zealand and that was granted in 1997. The WCO lists as *protected waters* the Mātaura River from its source to the sea and it also protects many of the tributary streams and the Waikaia River. The

outstanding features that the WCO recognised were the outstanding fisheries and angling amenity. The outstanding fisheries are not defined further in the WCO but given the reputation of the Matura River as highly significant brown trout angling river this is likely to be the fisheries of particular interest. Clause six of the WCO prohibits damming of the Matura River and Waikaia River. This clause in subclause 3 does recognise the existing diversion weir at Matura and specifically allows for its continued operation subject to the consent being granted with similar conditions to that of former water permits.



Fig. 2.2: The hydro-electric diversion weir and top end of the Alliance diversion raceway, note the shallow water over topping the hydro race along the side of race diversion wall.

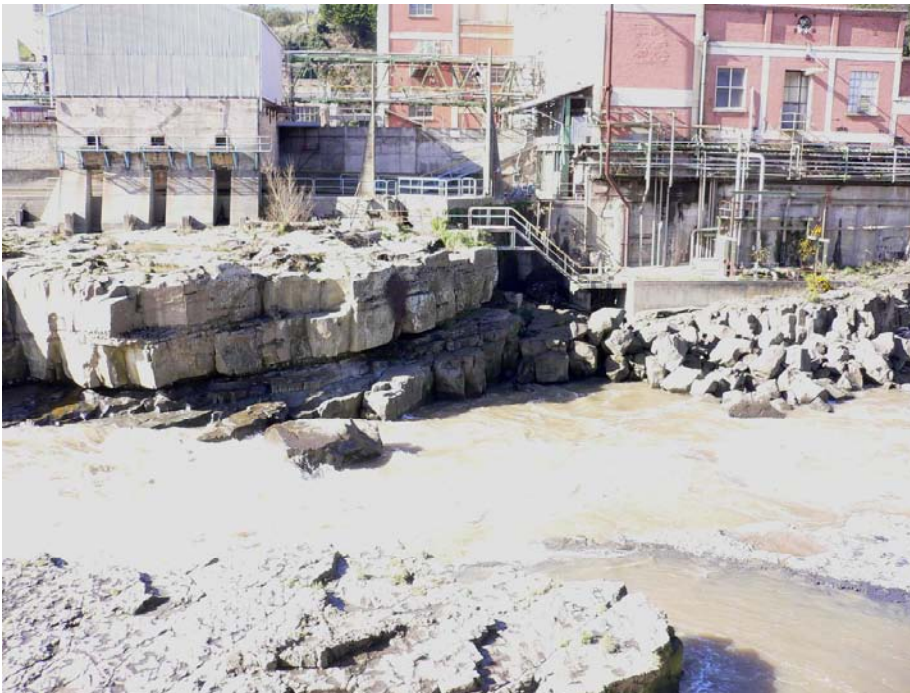


Fig. 2.3: Turbulent water in the lower section of the Matura Falls and the steep rock banks on the riparian margin.



Fig. 2.4: The main waterfall of the Mataura Falls.

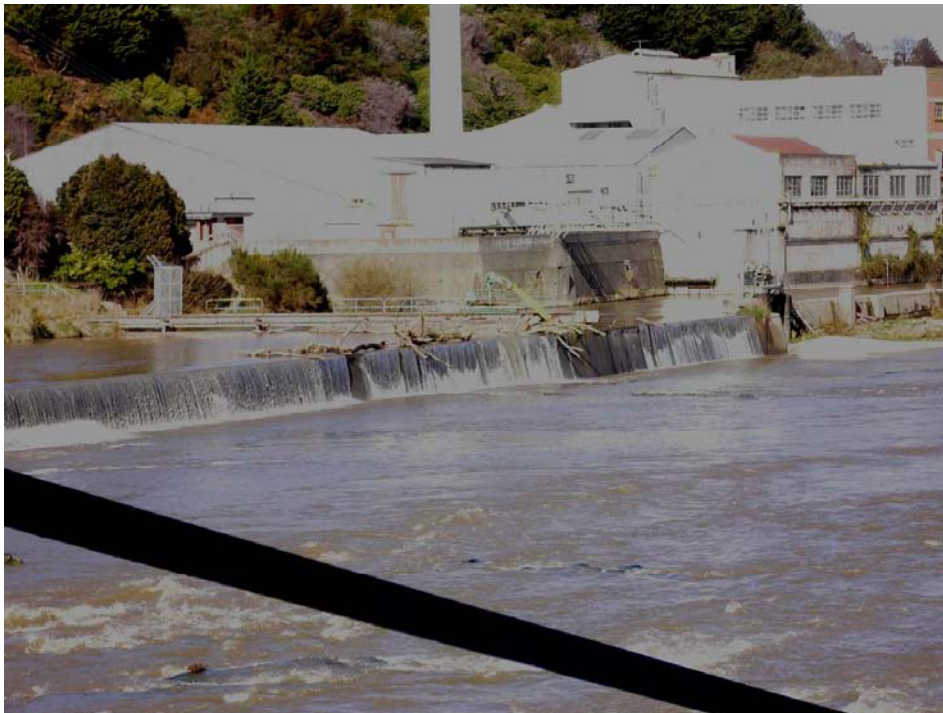


Fig. 2.5: The diversion wall on the Mataura Industrial Estate plant with varying water flows over the weir.

3. Fish Species of Mataura River

3.1 Background

The New Zealand Freshwater Fish Database (NZFFD) records thirteen native fish present in the Mataura River and its tributaries (Table 3.1). Distribution, species present and taxonomic status of the NZFFD records have also been checked with Fish & Game Southland; and the University of Otago, Department of Zoology, to determine if all their records have been submitted to the NZFFD. Additional species occurrence data was provided by Vic Thompson (eel fisherman, manager of Mossburn Enterprises) and non-migratory galaxiid taxonomic and distributional data confirmed with Bob McDowall (NIWA).

The native fish present in the Mataura River catchment can be divided into a number of broad groups using their distribution within the Mataura River catchment:

- Lowland native species
- Widespread native species
- Restricted distribution native species
- Data deficient native species

Table 3.1: Native fish species in the Mataura River.

Scientific name	Common name	NZFFD Records
Diadromous¹ species		
<i>Anguilla dieffenbachii</i>	Longfin eel	50
<i>Anguilla australis</i>	Shortfin eel	6
<i>Cheimarrichthys fosteri</i>	Torrentfish	4
<i>Galaxias argenteus</i>	Giant kokopu	6
<i>Galaxias maculatus</i>	Inanga	4
<i>Geotria australis</i>	Lamprey	4
<i>Gobiomorphus cotidianus</i>	Common bully	14
<i>Gobiomorphus huttoni</i>	Redfin bully	1
<i>Retropinna retropinna</i>	Common smelt	1
Non-diadromous species		
<i>Galaxias gollumoides</i>	Gollum galaxias	30
<i>Galaxias paucispondylus</i>	Alpine galaxias	1
<i>Galaxias sp</i>	Southern flathead	6
<i>Gobiomorphus breviceps</i>	Upland bully	43

Note: ¹Diadromous fish are species that carry out migrations to and from the sea as part of their life cycle.

3.2 Lowland Native Species

This group comprises species with limited migratory ability that have their ranges restricted to the lower reaches and main-stems of the river. The five species that form this group are, inanga, torrentfish, common bully, redfin bully and common smelt. In the Mataura River catchment these five species do not progress upstream past the Mataura Falls at Mataura due to their inability to climb or swim upstream over the falls. This upstream limitation means that fish passage for these species is not going to be affected by the hydro-electric diversion.

3.3 Widespread Native Species

A suite of six native fish (shortfin eel, longfin eel, lamprey, giant kokopu, Gollum galaxias, upland bully) are more widespread in the Mataura catchment. Shortfin eel is not abundant but is present in wetlands and ponds throughout the catchment. Longfin eel is by far the most abundant eel and is present in the main rivers and tributaries throughout the Mataura river catchment (NZFFD). Lamprey is known to range through much of the Mataura River catchment and in particular migrate into the Waikaia River catchment (Jellyman et al. 2002, Jellyman & Glova 2002). Giant kokopu occur in Mataura River tributaries in the lower river downstream of Mataura Falls, and an isolated landlocked population exists at Freshford in the Waikaia River (Rasmussen 1990). It is possible that this fish exists upstream of the Mataura Falls in other areas, either as landlocked populations or migratory individuals. Hanchet (1990) noted that giant kokopu can climb waterfalls and recorded fish up to 120 km inland in the Waikato River system. Therefore the possibility exists that migratory giant kokopu penetrate inland as far as the waterfall at Mataura and may ascend this fall. Gollum galaxias and upland bully are widespread non-migratory fish that occur in many of the Mataura River tributaries throughout the catchment. However, movement between the tributaries is believed to be uncommon and neither upland bully nor Gollum galaxias (R. Allibone pers. obs.) are known for their climbing ability and as such the Mataura Falls is likely to represent a significant barrier to upstream movement for these two species of fish.

3.4 Restricted Distribution Native Species

Two native fish species are more restricted in the Mataura River catchment; the southern flathead (an undescribed non-migratory galaxiid species; McDowall 2006) and alpine galaxias only occur in headwater tributaries of the river. These fish are not known to occur in the lower reaches or tributary systems associated with the lower reaches of the Mataura River. It is therefore highly unlikely that these require passage over the Mataura Falls or the hydro-electric diversion weir.

3.5 Data Deficient Native Species

Koaro (*Galaxias brevipinnis*) and black flounder (*Rhombosolea retiaris*), while not recorded in the NZFFD for the Mataura catchment, are present at the Mataura Falls (Vic Thompson pers. obs.). Koaro is known to be an able climber and is capable of ascending very high waterfalls on the wetted edges (McDowall 2000). It is not clear at present if this fish occurs regularly at the Mataura Falls and for some reason is unable to ascend the Mataura Falls or whether it occurs intermittently depending on the size of the whitebait run. The lack of records in the NZFFD for koaro either upstream or downstream of the Mataura Falls would indicate the fish is not common in the catchment. Black flounder is unable to climb or swim up waterfalls of the size of the Mataura Falls and therefore its upstream range is limited by the Falls and it is not affected by the hydro-electric diversion weir.

4. Effects of the Hydro-Electric Diversion

4.1 Species of Interest with Respect to Fish Passage

From the distribution and life histories five native fish species are of interest with respect to the fish passage at the hydro-electric diversion. These fish are all migratory (or diadromous) species that are expected to be capable of ascending waterfalls; shortfin eel, longfin eel, lamprey, giant kokopu and koaro. An assessment of the effects of the diversion for each species has been made using available distribution data, published information, observations by Alliance Group staff and other parties at the Mataura site.

4.2 Fish Passage at the Mataura Falls

Prior to completing the assessment of fish passage it is worth noting features of the Mataura Falls that will make upstream fish passage difficult. The bedrock has been eroded by the Mataura River and while the majority of the falls are steep or vertical slopes they are potentially climbable by the fish of interest. A short section of the waterfall face presents a significant barrier. Part way up the vertical rise (Fig. 4.1) a shelf has been eroded into the rock face that appears to extend horizontally around much of the rock face. Fish climbing the waterfall will encounter this ledge and will be unlikely to negotiate the rock overhang above the ledge. Therefore fish passage up and over the Mataura Falls is highly likely to only be possible in areas where the overhang above the ledge has been eroded away or when high flows submerge the ledge. It is likely that the ledge is absent in the highly eroded areas of the main waterfall (Fig. 2.4) but the turbulent high velocity water is also likely to limit successful fish passage. One or two wetted surfaces are present on the outer edge of the waterfall where the ledge and overhang appear eroded and fish passage may be possible. It is also important to note that the waterfall and areas immediately upstream are all bedrock. Little fish cover is available in this section of the river so resting habitat for fish is rare in the main channel. The small side flows present provide better resting areas but also make the fish vulnerable to bird predators if they rest in shallow water.



Fig. 4.1: The edge of Mataura Falls showing the eroded ledge and overhanging rock across the possible fish climbing routes. Note the one wetted area on the extreme right of the picture that provides a potential climbing route.

4.3 Lamprey

Adult lampreys make annual upstream migrations to spawning habitat. Individual adults only make this migration once, and are presumed to die after spawning (Todd 1990). The duration of the freshwater life of adult lamprey is not fully known but individuals in laboratory experiments have lived for 17 months without feeding (McDowall 1990). Anecdotal stories associated with lamprey migrations indicate the fish is capable of climbing steep faces and also of leaving the water and ascending slopes on the riparian margin during rainy nights (Jellyman 1984, Tweed 1987). The long duration of their freshwater life means that lamprey that cannot surmount an obstacle to their migration could remain downstream of the barrier for one or two years.

An abundant lamprey migration is observed at the Mataura Falls most years as the adult lamprey migrate upstream for spawning. Todd (1979) noted that a lamprey fishery existed at the Mataura Falls where fish were taken from just below the Falls. The lamprey migration at the Mataura Falls has been the subject of recent NIWA studies. Jellyman et al. (2002) investigated adult lamprey movements upstream of Gore, well upstream from the Mataura Falls and diversion weir. His study notes that the adult fish elected to move upstream into the Waikaia River rather than the Mataura River at the confluence of these two rivers. The authors commented that adult fish are attracted to odours released by juvenile lamprey upstream as they migrate and implied that the Waikaia River was still likely to contain resident juvenile lamprey. Jellyman & Glova (2002) carried out an assessment of juvenile lamprey (ammocoetes) habitat use in the Mataura River and collected juveniles at numerous sites upstream of the Alliance diversion weir. The juveniles were most abundant at sites in the Mataura River around Gore. This survey shows adult lampreys are climbing both the Mataura Falls and the diversion weir and are continuing upstream to spawn.

Observations at the Alliance plant also suggest that the lamprey migrations are proceeding upstream past the diversion weir. Accumulations of lamprey occur at the Mataura Falls and around the Alliance hydro-electric plant (Fig. 4.2). These lampreys are observed climbing the vertical surfaces including concrete channel walls and getting over into the hydrorace (Fig. 4.2). Observers at the Alliance plant have also noted that the accumulations of lamprey can disappear overnight. This is interpreted as strong evidence that the lampreys are ascending the race and diversion walls and have continued to migrate upstream. A lack of large numbers of lamprey remaining for months downstream of the diversion supports that conclusion that lamprey adults climb both the Mataura Falls and the hydro-electric diversion weir.



Fig. 4.2: Lamprey (left) congregating in a wetted area of the Alliance hydro-electric diversion and (right) a lamprey ascending the diversion wall.

From the information on upstream fisheries, the abundant presence of juvenile lampreys around Gore and the observations of lampreys at the Alliance plant it is concluded that the diversion weir is not preventing upstream fish passage for adult lampreys.

4.4 Shortfin Eel

The shortfin eel is the rarer of the two eel species in the Mataura Catchment and has been rarely recorded upstream of the Mataura Falls. The rarity of shortfin eels is accepted as a natural phenomenon for the Southland area where the eel stocks are predominately longfin eels. Commercial eel catch sampling in the last 20 years has shown that the catches in the Mataura (and other Southland catchments) is dominated by longfin eels (e.g., Beentjes & Chisnall 1997, Beentjes 2005) generally with greater than 90% of the catch being longfin eels.

Observations of the upstream elver migrations have also found that smaller elvers are more capable of climbing water falls, dam spillways and other potential barriers (Fig. 4.2). This is due to the smaller lighter elvers maintaining better adhesion to the surface being climbed via surface tension than larger elvers. This phenomenon is primarily due to the weight of large elvers reducing the adhesion via surface tension. Therefore the expectation is that the smaller shortfin elvers will ascend higher or steeper vertical surfaces than larger longfin elvers.

Currently shortfin eels are not noted as occurring upstream of the Mataura Falls and the diversion weir. In fact the only stream in the Mataura River catchment known to have substantial numbers of shortfin eels is Low Burn, a tributary downstream of Mataura (Beentjes 2005), although this is based on limited sampling of the commercial catch and NZFFD records. However the expected low abundance of this species upstream of the hydro-electric diversion weir, means that despite the climbing ability of small shortfin elvers it is unlikely that the weir represents a significant barrier.

4.1 Longfin Eel

Longfin eels are present throughout the Mataura River catchment and are the main stay of the commercial fishery. The longfin elvers migrate upstream reaching the Mataura Falls in January or February over a period of approximately two weeks (Vic Thompson pers. obs.). These longfin elvers are generally larger than shortfin elvers and can weigh several grams. The larger size of the longfin elvers means their ability to climb the Mataura Falls and the hydro-electric diversion weir is less than the shortfin elvers. Weight data collected at the fish pass and trap at Mataura Falls found the longfin elvers weighed around 3 gm (Vic Thompson unpub. data). For such large elvers the ability to climb the steep faces of the Mataura Falls is likely to be limited and it is possible that only the smaller individual longfin elvers climb the waterfall easily. It is apparent from the experimental trap results that longfin elvers are having difficulty ascending the Mataura Falls. It is also likely that high water flows may provide better passage for elvers as the raised water level may increase the water level over the height of the ledge and overhanging rock on the waterfall. If this occurs at the river edge where flows are less turbulent and at night when elvers are most active, then this may provide the opportunity for a significant number of elvers to ascend the waterfall. However this requires high flow events in January and/or February in the two week period when elvers reach the Mataura Falls (Vic Thompson pers. com.) a combination of events that may occur only occasionally.

The ascent of the diversion weir is likely to be easier than the Falls as the height and nature of the diversion weir present less difficulties to the climbing elvers than the waterfall. The relatively rough concrete surface of the weir (without ledges and overhangs) means that the ascent will be unimpeded by surface obstacles. The only difficulty expected to reduce the success of the elvers ascending the weir is the weir shape. Elvers have very limited ability to bend dorso-ventrally and this leads to them having difficulty climbing around a 90° degree turn from vertical to horizontal (R. Allibone pers. obs.; Vic Thompson pers. obs.) as is required around most of the top of the diversion weir. Elver passage is likely at points on the diversion weir where the water flows over the weir as low velocity shallow trickles, but in high velocity areas elvers would be dislodged. At the edge of the diversion weir shallow water sections

are present and some of the variations in weir construction are also likely to provide areas where the water flows are suitable for passage. Rounding off parts of the top of weir to remove the 90° angle is also a potential option to eliminate the problem.

Analyses of the commercial eel fishery have been undertaken for the Mataura River and these analyses have split the catch upstream and downstream of the Mataura Falls (e.g., Beentjes & Chisnall 1997, Beentjes 2005). These analyses found that longfin eels in terms of length and weight have remained relatively stable and small eels of 45 cm are still being caught upstream of the Falls indicating successful elver passage is still occurring. Commercial fishers, however, believe the longfin eel fishery upstream of the Mataura Falls is declining (Vic Thompson pers. com.). From the data available it is not possible to confirm this, especially as the fishery is generally declining around New Zealand, or whether there is a local effect in the Mataura River upstream of the Falls (e.g., land use change). It is also possible the decline is related to fish passage difficulties at the waterfall. As noted above it may require the combination of a moderate flood flow at Mataura Falls during the elver migration to provide fish passage. If this combination is infrequent then recruitment will be periodic and significant declines in the fishery may be experienced between recruitment events. It is also likely that if this is true the commercial fishery upstream of Mataura Falls cannot support the same Catch Per Unit Effort as downstream due to the lower periodic recruitment and if similar levels of fishing effort are being applied up and downstream of the Mataura Falls then a decline upstream would be more noticeable.

In conclusion fish passage for longfin elvers at the Mataura Falls is likely to be restricted at times due to the nature of the waterfall, size of the elvers and volume of water in the river. Elvers that successfully climb the Falls may also have difficulty negotiating the diversion weir where the vertical side meets the horizontal upper surface, although the weir does not represent such a substantial barrier as the waterfall. The continuing commercial fishery data does also indicate that longfin elvers continue to recruit into the upper river,

4.2 Giant Kokopu

Giant kokopu are known from the lower Mataura River Catchment (NZFFD) and the landlocked population at Freshford in the Waikaia (Rassmusen 1990). There are no observations of this fish at Mataura Falls and it is unknown whether all the upstream migrating whitebait disperse into tributaries downstream of the Falls or not.

The climbing ability of giant kokopu is not considered to be as good as that of koaro or banded kokopu and elvers. On occasions giant kokopu individuals have been recorded upstream of significant waterfalls (Hanchet 1990), but they are commonly considered to be the inhabitants of lowland rivers and their tributaries (e.g., Chadderton 1990, Chadderton & Allibone 2000, Bonnett et al. 2002, David & Closs 2001). A factor that counts against the presence of anything but landlocked populations upstream of the Mataura Falls is the migrations of adult fish on freshes and floods at spawning time. It is assumed from movement data that adult giant kokopu undertake downstream spawning migrations. David & Closs (2002) found that adult giant kokopu undertook long distance downstream movements followed by an upstream movement back to their original territories. Downstream migration of this sort that takes adult giant kokopu over the hydro-electric diversion and the Mataura Falls, will lead to the fish being stranded downstream of the Falls as adult giant kokopu would be unable to climb the Falls. Therefore any populations apart from landlocked ones upstream of the Mataura Falls are likely to consist of juvenile giant kokopu that have not undertaken a downstream spawning migration. This being the case the important populations of migratory giant kokopu are those below the Mataura Falls. The diversion weir will therefore not effect the migration of giant kokopu whitebait and adults from these populations (nor the landlocked population further upstream).

4.3 Koaro

Information on koaro migration and occurrence in the Mataura River is sparse. No adult koaro have been recorded in the NZFFD and no references to this species were found in the published papers reviewed. As such it is not possible to determine the distribution of this fish in the catchment.

Upstream migrating koaro whitebait or post-whitebait stage juveniles have been reported at the Mataura Falls during the operation of an experimental fish pass and trap in the early 2000's (Vic Thompson pers. com.). Koaro are known for their ability to climb very high waterfalls (McDowall 1990), vertical concrete weirs (Allibone pers. obs.) and penetrate far inland (NZFFD). It is expected that the koaro juveniles that successfully ascend the Mataura Falls will be capable of climbing the diversion weir. The range of water depths over the weir and the relatively short height of the diversion will provide wetted surfaces that koaro can easily climb. Further assessment of koaro is not possible given the lack of data with respect to occurrence in the Mataura catchment.

5. Consultation with Other Parties

5.1 Arai Te Uru Eel Management Committee

A phone conversation with Mr Vic Thompson of Mossburn Enterprises as a representative of Arai Te Uru Eel Management Committee was carried out on the 19 October 2007.

This conversation focused on fish passage for longfin eels at Mataura Falls and the diversion weir. Mr Thompson noted the following details:

- Mr Thompson and others ran a trial fish pass at the Mataura Falls on the MIE side of the river in the early part of this decade.
- During the fish pass trials they were able to make a number of observations about the elvers and other fish arriving at the Falls.
- Longfin elvers have an average weight of 3 grams when they arrive at the Mataura Falls.
- Longfin elvers arrive over a two week period, some time in January or February, but the arrival could not be predicted more accurately from there observations at the time.
- Most of the elver run waits until dark to attempt to ascend the Falls.
- On occasions up Mr Thompson believed up to 15% of the elver run would attempt day time ascent of the Falls, this could cause significant mortality due to temperature effects on the elvers in shallow water.
- Shortfin elvers were very uncommon in the run.
- Koaro whitebait was present at the Falls and in the trap on occasions.
- Lamprey was not really an issue of concern.
- Mr Thompson was willing to see physical modifications undertaken to the waterfall to improve passage, however he recognised this may reduce the success of the customary lamprey fishery and may not be acceptable to everyone.
- Mr Thompson was concerned about the ability of elvers to negotiate sharp turns that require dorso-ventral bending as elvers cannot bend their bodies that way.
- Mr Thompson wished to see higher flows coming over the waterfall during the elver migration as he felt this would improve the elver passage around the margins of the river.

5.2 Department of Conservation

Ms Emily Atkinson, the Technical Services Officer – Freshwater for Southland Conservancy was contacted by phone on the 19 October 2007 and the 23 October 2007.

On the 23 October Ms Atkinson was initially briefed regarding the position of Mataura Falls and the hydro-electric diversion weir as she had not visited the site. This discussion included a description of the Fall, the riparian area around the Falls and flows at the site. The discussion then proceeded to determine which species were of concern regarding fish passage at the hydro-electric diversion taking into account that fish had to first ascend the Mataura Falls. It was agreed that all bullies species, torrentfish, black flounder, inanga, and Gollum galaxias were all species that would not negotiate the Mataura Falls and as such were not necessary to include in the fish passage assessment. Lamprey, shortfin eel, longfin eel, giant kokopu and koaro were the fish species that were agreed should be considered. Ms Atkinson was also emailed an aerial photo of the Alliance plant, the Mataura Falls and the hydro-electric diversion so she could make an additional visual assessment of the area of concern and we agreed that if she had further concerns regarding fish passage and the species to be assessed she contact the Golder staff by the 26 October. No subsequent contact has been made by phone or email.

6. Summary

The diversion weir has been operation in some form since the 1890's. The weir's location upstream of the Mataura Falls means it only has the potential to present fish passage difficulties for fish species that have already negotiated the Mataura Falls. Five native fish species (lamprey, shortfin eel, longfin eel, giant kokopu and koaro) were identified as species that may encounter the weir during upstream migrations. For lamprey it is concluded that the diversion weir does not present a barrier. For giant kokopu, koaro and shortfin eels the low numbers of these species and low density of populations downstream coupled with their good climbing ability as juveniles lead to the conclusion that the diversion weir also does not represent a concern with regard to fish passage.

Longfin eel fish passage at the Mataura Falls is certainly difficult and large numbers of elvers may be prevented from attaining upstream passage at the waterfall. However the population of longfin eels upstream of the waterfall and diversion weir does indicate that both the waterfall and the diversion weir are being climbed at times. Intermittent recruitment of longfin elvers is a possibility into the upper catchment and a lack of successful recruitment in recent time maybe giving rise to an observed decline in the commercial fishery. The diversion weir may present a physical obstacle to longfin elvers (and any shortfin elvers present) as they attempt to progress from the vertical climb to the horizontal upper surface. Rounding of the lip of diversion weir top to remove the 90 degree angle could significantly reduce this issue.

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Appendix 4 – Trap and Transfer Recommendations – Holloway Environmental Services

Elver passage at the Mataura Industrial Estate



Holloway Environmental Services Ltd

May 2016

Summary

Holloway Environmental Services (HES) were engaged in December 2014 to investigate elver access requirements to comply with resource consents issued to the Mataura Industrial Estate (MIE). HES gained the required permits, undertook site inspections, and carried out elver transfer on site.

Due to a number of factors trapping was not satisfactory in 2015. However 100 small eels and 8.5 kg of elvers (approx. 3000) were hand captured and transferred to above the weir.

In 2016, the site was monitored and when elvers were located at the areas they accumulated at in 2015, a trap was installed. During the migration period, visible elver numbers were low compared to the previous year. No substantial accumulations of elvers occurred in any location. Despite this, approximately 8.5 kg of elvers and a small number of galaxid were trapped and transferred.

In 2015, elver numbers significantly reduced following a small fresh (elevation of river flow) which resulted in water spillage over the rock faces other than the main falls on the Alliance Group side of the river. In 2016, following equipment failure, Alliance Group was unable to operate their hydro, and as a result there were substantial discharges from the headrace. I hypothesise that there is a flow dependant barrier on the Alliance Group side of the river. Elvers were able to bypass the falls at flows and locations wetted by the 2015 fresh and 2016 headrace spillage.

The Mataura Industrial Estate wishes to continue to provide a "good corporate citizen" approach to elver movement. It is recommended that from January 15th each year, elver accumulation areas are checked one night a week. If elvers are observed to be accumulating, the trap should be installed and operated until the trap ceases to catch elvers. If elvers do not accumulate in any particular season the trap does not need to be installed.

Location

The Mataura Falls are located on the Mataura River within the town of Mataura. The area has been industrialised with the Alliance Group freezing works on the true right bank and the Mataura Industrial Estate occupying the former Carter Holt Harvey paper mill site on the true left bank. Both industries operate small hydro-generation sites and, to provide additional head, a weir was constructed across the full width of the river immediately above the falls. This weir also forms the river side of the hydro head races on each side of the falls. There is a minimum flow requirement at the weir and as this is approached both industries are required to reduce their take to maintain the flow. At the minimum flow, no generation can occur. The headrace has a near-vertical downstream face and slightly overhanging cap stone along the MIE headrace. The centre of the weir provides the minimum flow requirements.

The falls themselves are the result of a layer of hard rock (cap rock) overlying softer material. The softer material has been eroded resulting in an overhang of the harder rock.

The falls have always disrupted fish passage. As a result of the accumulation of fish, especially lamprey, below the falls, the site was an important food gathering location to Maori. It has generally been considered that the changes made to the river as a result of industrialisation, and particularly the weir, further reduced fish passage. However Allibone (2007) considered that the weir was passable under some flow conditions.



Figure1 Vicinity of Mataura Falls

Both sites have a number of discharges into the river, in addition to the hydro outfalls, at a number of locations up both banks. These are a mix of natural run-off from the sites and surrounding area, and discharges of water taken from the river.

At the trap site, there is a vertical cap rock face of 2.5 to 3 metre high falling to a shelf of rock. There is a discharge down the face of the cap rock (Figure 2) originating from leakage from the headrace wall. Approximately 5 metres to the true left of this discharge is a sluice gate from the headrace, which also exits onto the rock shelf. The sluice gate is imperfectly sealed and has variable leakage. The rock shelf has a number of depressions and fissures which contain water sourced from both the sluice gate and the discharge down the cap rock. The shelf also receives the debris from a screen-cleaner in the headrace. This debris accumulates in a pool of water until removed by sufficiently high flows and provides a daytime refuge for eels and unfortunately rats. There are two main and a number of small flows off the rock shelf onto a gently sloping rock face forming the true left riverbank.

Consent and Permit Requirements

Consents were issued by Environment Southland to Carter Holt Harvey Limited (CHH) for the operation of the hydro plant and ancillary takes. These consents have been transferred to MIE. They contain the following requirements:

Consent 203311 enables the operation of the hydro electric generation facility in the former paper mill. The consent requires that:

9. By 1 August 2008 the consent holder shall have constructed an adequate passage for native fish species, particularly elver and lamprey.

Consent 94335 requires that:

5. The consent holder shall maintain an eel pass to enable elver passage above the weir or hydro race.

Over the years since the issue of the original consent, a number of solutions have been considered. None of these attempts were particularly successful and were stymied by the closure of the paper mill. G.J. Patterson as MIE purchased the former mill site, and has initiated consideration of the elver passage requirements as required by consent.

Resource consents only set a requirement for fish passage / transfer. They do not authorise capture or transfer of fish. MIE did not hold special permits under the Fisheries Act from the Ministry of Primary Industries (MPI) or approvals under the Conservation Act for the capture, handling or transfer of native fish. HES applied for these on behalf of G.J. Patterson as MIE, and these were granted on 11 February 2015.

To enable activities prior to granting the special permits, the Hokonui Runaka provided a Customary Authorisation to undertake an enhancement programme within the Maitai Maitai Reserve, which encompasses this site.

The Allibone (2007) report was presented to Environment Southland (ES). As a consequence of that report, ES agreed to a cessation of fish passage related activity by Alliance Group in December 2008. While MIE could rely on the same report to cease fish passage related activities, they wish to ensure that they contribute to the maintenance of a viable eel population above the falls.

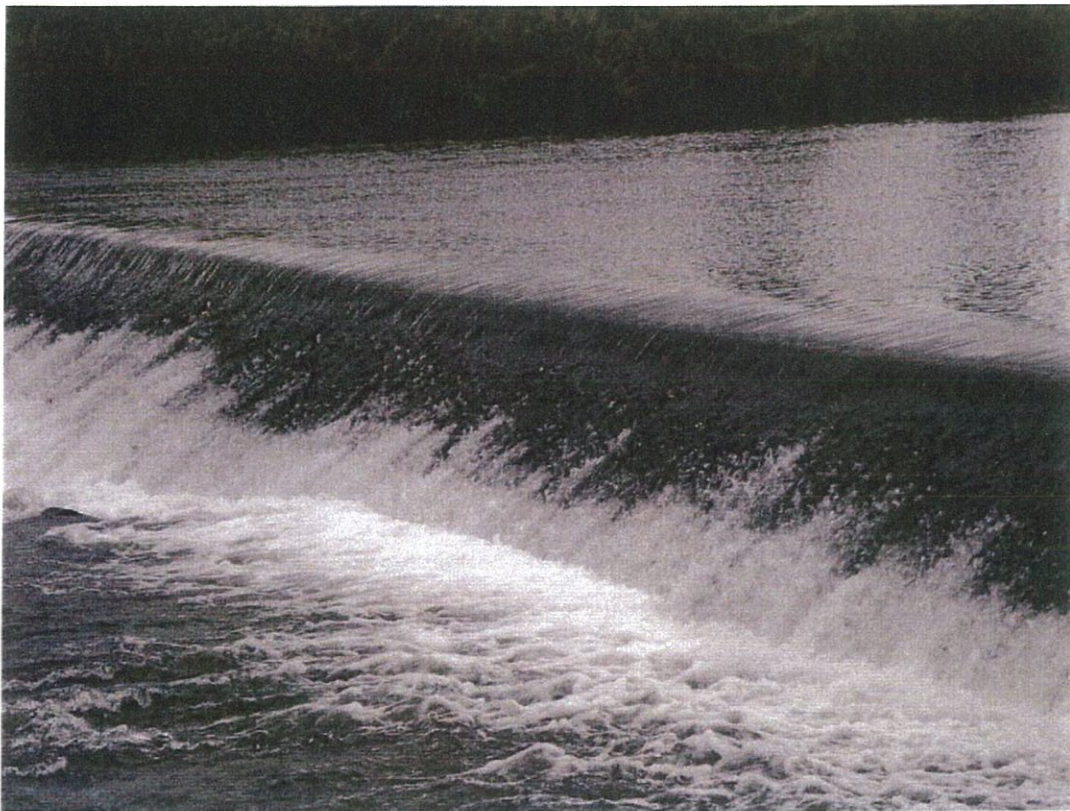


Figure 2. The weir showing laminar flow over the cap and turbulent flow in the lower slope

Previous works

There is a small flow over the cap rock face adjacent to MIE. This flow largely originates from a fissure in the wall of the head race. Adjacent to this fissure CHH built a concrete ramp up the headrace wall. This was not effective as very few elvers were able to climb the cap rock face and those which did and climbed the concrete ramp did not go over the edge of the headrace wall. Water supply to the concrete ramp was dependant on a pumped supply which is no longer available.

In previous seasons some spat ropes have been hung down a small flow over the edge of the cap rock in an attempt to encourage more elvers on top of the cap. The spat ropes cover a vertical fall of approximately 3 metres. Information on spat rope does indicate success in providing access through culverts which form a velocity barrier. They have also been successful in enhancing access into culverts where there is a small drop into a plunge pool from the culvert exit. There do not appear to be any records of the successful use of spat rope to provide access up a significant vertical drop, as has been attempted in this location. During the 2015 migration period a small number of elvers climbed the wetted rock face. Inspection on a number of occasions did not find elvers climbing in the spat rope, but 2 dead elvers were located in the rope. By 2016 the ropes had substantial algal and rooted plant covering. Few elvers were observed accumulating at the base of the rope and none located above it.



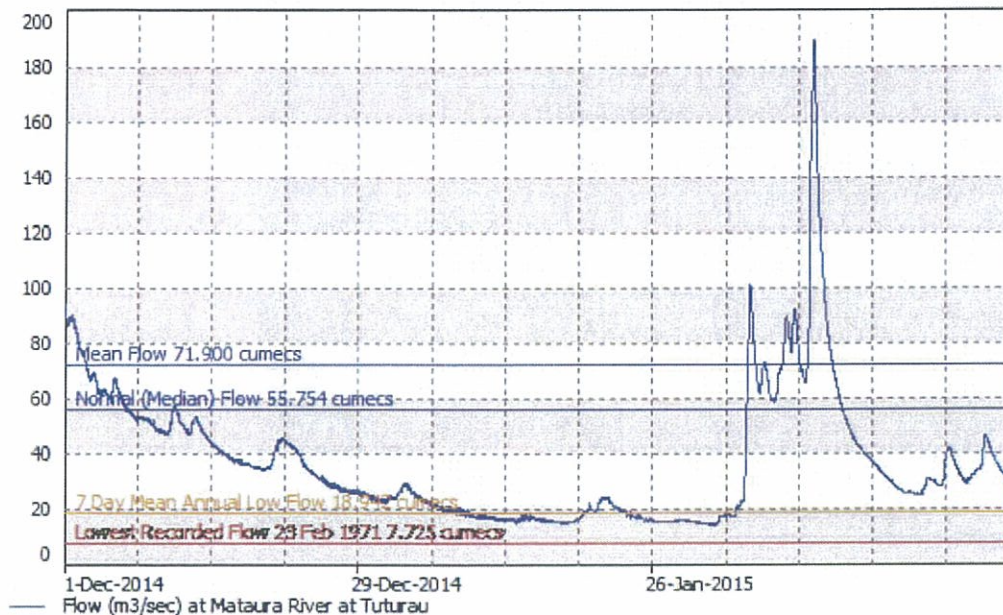
Figure 3. View of the cap rock and small discharge from the headrace. The hose supplied water to the trap, and the spat ropes are visible on the left hand side of the photo.

Hydrology

The closest water level recording site on the Mataura River is at Tuturau, approximately 7.5 km downstream. There are no significant tributaries entering between the MIE and the water recorder site. Thus, the Tuturau water recorder site adequately represents the hydrology at MIE.

In the 2015 season, the river was above the mean flow in early December 2014 (Figure 4) and then steadily receded until the end of January 2015. Between 2nd February and 12th February a series of rain events resulted in elevated flows, peaking at 190 cumecs.

Flows above 75 cumecs result in water flowing over the cap rock, making access over the cap rock to the falls, difficult during the day. I determined that safe access in the dark was not possible at these flows.



Source: Environment Southland Website

Figure 4. 2015 Mataura river flow at the Tuturau flow recorder site.

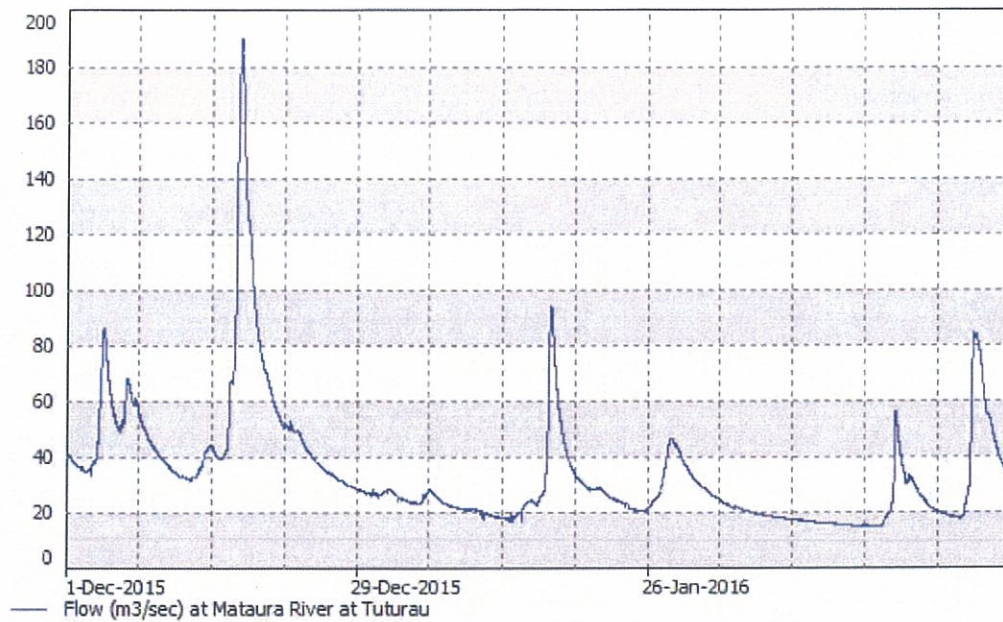


Figure 5. 2016 Matura river flow at the Tuturau flow recorder site.

The 2016 season started with an elevated December flow, but a number of minor freshes occurred throughout the season, the trap was removed for 2 nights (26th & 27th) during the February 80 plus cumec flow.

In late 2015, Alliance Group suffered a failure of their hydro plant. The need to source replacement parts from overseas meant that for the duration of the 2016 elver migration period Alliance Group was spilling water at a number of locations from the headrace to the cap rock on their side of the river. Consequently there were a number of flows over the cap rock and downstream shelves, which would not normally occur at low flows (Figures 6 & 7).

There was no change to the hydrology on the MIE side of the river.



Figure 6. Alliance Matura showing flows from the headrace through sluice gates and overflows



Figure 7. Alliance Matura downstream of the falls showing flows across the rock shelves as a result of the hydro race discharges

Night inspection

The site was inspected at night from late December in both seasons.

In 2015, one adult lamprey was observed as well as a number of elvers and small eels. By mid January, there were substantial accumulations of small eels and elvers in the discharge flows and pools on the shelf below the cap rock. Following the high flows of late January 2015, the small eels disappeared and only elvers were located in the flows and pools at the trap site.

All discharge points from the headrace and side of the weir were regularly inspected. No elvers or eels were located at any discharge point other than the leak feeding the discharge over the cap rock containing the spat rope. All the discharges further upstream from this leak, discharged into the river between the falls and weir.

Few elvers were seen to climb the discharge over the cap rock using either the spat rope or the adjacent damp moss. On 2nd February 2015 I watched the small pool at the top of the spat ropes for a period of 45 minutes. During this time six elvers were seen to successfully climb the face. On the 24th of February 2015, a number of elvers were noted in the pool on top of the cap rock. On this occasion no elvers were seen leaving the river and the number in the pools on the rock shelf at the bottom of the sluice gate was greatly diminished. Sampling these noted a number of shortfin elvers.

In 2016, small numbers of elvers were located in all the 2015 accumulation points below the cap rock. However numbers were small and I estimated less than 10% of the 2015 numbers. Only 1 small eel was located at any time unlike the 2015 season where 90 were captured in one night.

The weir - headrace walls were also accessed on a number of occasions in 2016 when the river was low. Two elvers were located one night at the junction of the headrace wall and the weir. Adult eels were also observed both in the top of the headrace and immediately below the weir. There was also no evidence of elvers accumulating below the weir.



Figure 8. Elvers climbing on and adjacent to the spat rope up the discharge down the cap rock. A number of elvers climbed to a small niche just visible at the top of the photo. Few appeared to go past here on the spat rope but a number were seen climbing in the moss mats.

Trapping

MIE had operated a small trap adjacent to the sluice gate discharge. This consisted of a small box receiving water via a hose from the headrace. A short section of tube containing a section of spat rope provided both an entry for elvers and the discharge point for the water from the box. During inspections a small number of elver were seen to enter the box. However as the discharge tube regulated the water level in the box, elvers were able to enter and leave without hindrance. During inspection on the 31st December 2014 an elver was found entangled and dead in the spat rope leading into the trap. Use of this trap was discontinued once the new trap was available as the water supply was transferred to the new trap.

The MIE engineer constructed a new trap for the site. However, due to the late start to the programme, and holiday periods, the initial prototype was not available until the start of February 2015, when it had to be promptly removed due to elevated flows. Trapping recommenced on 13th February 2015. No elvers were located in the trap over the following 3 days. Consequently 20 elvers were captured and placed in the trap. The following day only 4 were still present requiring modification to the trap. The trap ramp was made from treated ply and Boubee (pers. com.) noted that treated wood ramps are not attractive or effective for elver movement. Hence my request to source a brush ramp covering. The brush required for the trap finally arrived once the elvers had ceased accumulation.

Prior to the 2016 season HES constructed a trap utilising polyethylene brushes with two bristle densities. These are similar to the brushes used at other location in NZ for elver trapping. The trap was installed on 3 February 2016 and was operated until early March 2016 (cover photo). The trap was removed for the 26th and 27th of February due to elevated flows which put the trap site at risk.

Hand capture

Given the accumulations of elvers below the sluice gate leakage and the discharge over the cap rock in 2015, elvers were captured in a hand net (200 x 120 mm opening). The net was generally placed in the flow below eel /elver accumulations and the accumulated elvers disturbed resulted in them collecting in the net. Captured eel / elvers were held in a bucket of fresh water during capture process.

At the cessation of capture, small eels were removed from the catch, counted and weighed. The elvers were weighed and a subsample of just over 20 taken for analysis. Elvers and small eels were then released (generally 01:00 to 02:30 am) at varying locations along a beach on the True Right Bank (TRB) above Alliance Matura from the access point to the Tannery site. No location was used twice.

There were no accumulations of elvers sufficient to warrant attempt at hand capture in the 2016 season.



Figure 9. Elvers accumulating at the right hand side of the sluice gate in 2015. Note the strand of spat rope which was not used by the elvers

Analysis

When the catch was sufficiently large to enable sub sampling (visual assessment but approximately 400 g total catch) a random subsample of 20 – 25 elvers was taken. The sub sample of elvers was sedated with a lethal dose of clove oil. Individual elvers were randomly removed from the container and individually weighed, measured, and the species determined. Once 20 elvers had been sampled, a total weight of the 20 sampled elvers was taken. All sub sampled elvers were then frozen for delivery to NIWA in compliance with the transfer permit requirements.

Results

In 2015 hand netting resulted in the capture and transfer of 104 small eel with an average weight of 76 g. There were 9.1 kg of elvers captured and transferred. This was approximately 3200 elver at an average weight of 2.85 grams. Shortfin elvers were captured later in the season, and by cessation of capture these shortfins represented 4.4 percent of the total captured.

There were substantial numbers of small eels accumulating at the base of the trapping area discharges in late January. However following the elevated flows of early February, very few were located. There are two potential explanations for this.

Trapping in the Waiau River has also noted a substantial pulse of small eels which is much shorter in duration than the elver migration. This pulse may have occurred in late January in the Mataura River and coincidentally finished at the same time as the elevated flows. Alternatively the small eels were accumulating in the area due to an inability to continue to move upstream. The elevated flows may have enabled the small eels to overcome the barrier to migration and move up river while the elvers were unable to move upstream. This is suggestive of a size discriminatory barrier such as an elevated velocity barrier where no eels can reach it at low flows but only larger eels are able to cross it once access is enabled by higher flows.

Trapping in 2015 was not successful due to the very late start in developing the trap and very late supply of some required components.

Only one lamprey was noted in the area at the commencement of night inspections. No other fish species were caught or seen in the area during the inspections. Downstream of where the trap site discharges enter the river is a group of rocks. These were home to a number of large longfin adults. None of these were observed to come up river to the area where the elvers and small eels exited the river.

One rat was noted on one night. This was in a small alcove located between the sluice gate and discharge down the rock face. It is possible that the rat could have taken elver along the margins of the wetted areas in this location, but this hopefully would be insignificant predation.

In 2016, in contrast to the previous year, all elvers were trapped and no hand capture undertaken due to low elver accumulations. The trap captured approximately 8.5 kg representing 3480 elvers. The average size was smaller (129.3 mm) compared to the elvers captured in 2015 (138.4 mm). The average elver weight was also lower in 2016 (2.58g) compared to the 2.85 g in 2015. A number of Galaxids were also captured in the trap, and these were transferred with the elvers.

Only one small eel was captured in 2016. The large eels remained in the rocks below the capture site and again were not seen outside this location in 2016. Again a rat was seen on 3 occasions in locations where it could potentially take elvers.

The lack of elver accumulation, smaller average size and absence of small eels reinforces the view that there is a flow –dependant barrier at the falls. This is negated by elevated flows, probably in the vicinity of 60 – 80 cumecs, or release of water from the Alliance Mataura headrace as occurred this year.

Conclusions

The trapping and monitoring programme has shown that at certain flows the Mataura Falls, and the weir are not a barrier to elver and small eel migration. This agrees with the Allibone report, and hence Mataura Industrial Estate could also rely on this report to cease any further activity in relation to native fish movement.

However, MIE wishes to ensure that a viable eel population is maintained in the river and consequently wish to ensure that migratory movements are not limited in years of low flow. I therefore recommend that monitoring occurs during the elver migration period and, if accumulations are located, trapping in undertaken.

Recommendations.

To ensure that elver movement is not restricted during low flow conditions I recommend that MIE implement an annual monitoring programme.

- 1 From 15th January annually, a weekly night inspection is undertaken after 11:30 pm. The areas where elver accumulations have been located previously are closely inspected by spotlight. Once elvers are located (30 – 50) in the area inspections should occur twice weekly.

- 2 If twice weekly inspections locate substantial accumulations of elvers (hand netting can capture >200 g in an hour), then the trap is installed. If no accumulation of elvers occurs, then inspections continue until elvers numbers fall away.

- 3 Once elver accumulations occur the trap is installed and operated until there is 7 days capturing less than 20 elvers per night. Small catches of elvers can be released in the upper headrace if suitable sites remain each year. Larger catches (>1kg) should be released at night along the beach below the tannery site on the TRB.

Construction of access to above falls

Mataura Industrial Estate held a consent to enable cutting into the overhang to form a ramp. This will improve the ability of elvers and possibly, depending on slope, other species to reach the top of the cap rock which forms the falls. However access to this area still results in the fish being downstream of the weir. Therefore any construction of access up the cap rock then requires further construction of access to the headrace. The nearest location in the headrace is immediately upstream of the hydro intake. It is my opinion that elvers that are released or exit into the head race immediately above the turbine, while in full operation, are at risk of being swept back through the turbine. Thus elvers should not be transferred to the headrace in the immediate vicinity of the hydro intake when it is operating as the water velocity is likely to exceed the elver swimming ability.

However upstream of the access bridge is a trash rack. By 2016 this had accumulated substantial amounts of debris to the extent that water flow was restricted to less than 50% of the channel width. This provided an area of low flow, sediment and debris accumulation. Small numbers of elvers were released here and rapidly buried themselves in the sediment. Upstream the reduced water velocities also resulted in sediment accumulation against the headrace walls and this also provided a suitable release location. Thus this area is potentially suitable for a second mechanism to enable elver movement from the section of river above the falls and below the weir.

While this is a potential area for consideration any elvers which climbed the cap rock, then have to be conveyed or attracted a considerable distance upstream and try to locate the mechanism to get them into the headrace a considerable distance upstream. Fluctuation water levels as a result of the hydro operation and river level variation make the successful development of a mechanism to elevate elvers to the headrace unlikely. Hence I do not see any value in attempting to cut a ramp into the cap rock.

Required works.

To enable improved operation of the trap the current water take discharge pipe needs to be replaced with a 35mm hose connection. The sandbags used again this year have suffered from weathering and will need to be replaced.

References

Allibone R, 2007. Assessment of hydroelectric diversion effects on fish passage. Report for Alliance Group by Golder Associates (NZ) Ltd.

Appendix 1

Location of the release beach in relation to the capture location

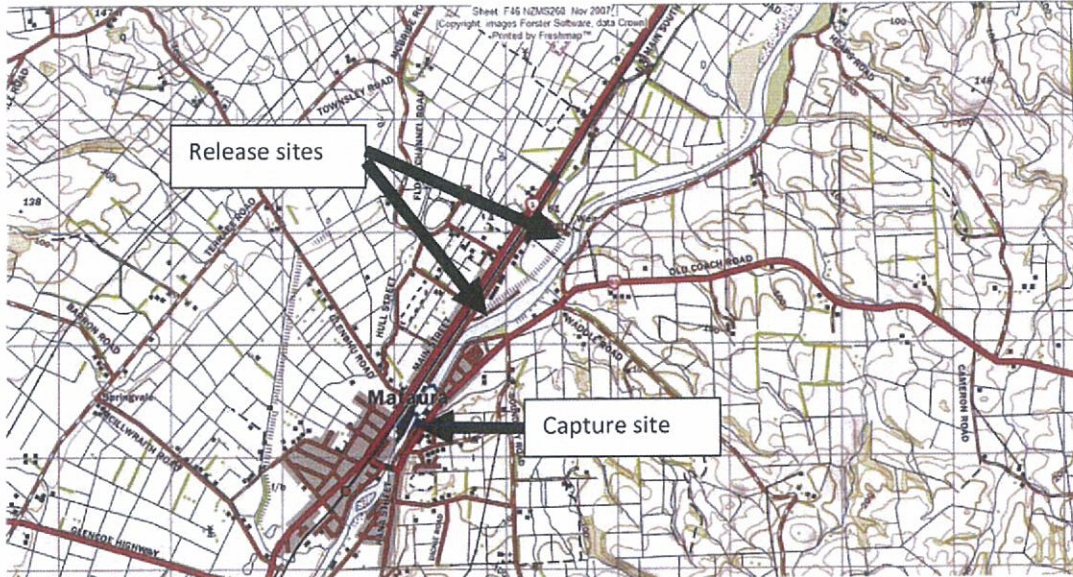


Fig Capture site and release sites in the beach between the two arrows.



Appendix 5 – Environment Southland Decision Report APP 20171566

ENVIRONMENT SOUTHLAND

<p>Report and Decision of Independent Hearings Commissioner Hearing held in the Council Chambers, Environment Southland, Invercargill on 3 December 2018</p>

Independent Hearings Commissioner Dr Rob Lieffering was appointed by Environment Southland to hear and determine an application by the Alliance Group Limited for resource consents associated with a hydro-electricity generation scheme at Maitai. The application, made in accordance with the Resource Management Act 1991, is referenced as Application No. APP-20171566.

Representations and Appearances

Applicant:

Mr S. Christensen, Counsel

Mr D. Richardson, Group Environmental Manager, Alliance Group Limited

Mr J. Kyle, Planner, Mitchell Daysh

Dr M. James, Ecologist, Aquatic Environmental Sciences

Submitters:

Department of Conservation

- **Ms P. Williams**, Counsel
- **Ms E. Funnell**, Ecologist

Fish and Game Southland

- **Mr J. Smyth**, Counsel
- **Mr Z. Moss**, Ecologist
- **Mr T. Hawker**, Ecologist

Te Ao Marama Incorporated

- **Ms L. MacKenzie**, Planner
- **Ms S. Blair**, Cultural

Section 42A RMA reporting officer:

Mr S. West, Principal Consents Officer

BACKGROUND AND PROCEDURAL MATTERS

1. This is the report and decision of Independent Hearings Commissioner Dr Rob Lieffering. I was appointed by Environment Southland (**ES** or **the Council** or **the Consent Authority**) to hear and decide the application lodged by the Alliance Group Limited (**Alliance** or **the Applicant**), pursuant to the Resource Management Act 1991 (**RMA**), for resource consents associated with the operation of a hydro-electricity generation scheme (**the hydro scheme**) at Maitara.
2. The hearing of these applications commenced at 9:00 am on Monday 3 December 2018 in the Council Chambers, Invercargill. Evidence was presented over the course of the day and the hearing was adjourned at 4:30 pm.
3. Prior to the hearing, a report was produced pursuant to section 42A of the RMA (**the Staff Report** or **section 42A report**) by the Council's Reporting Officer, Mr Stephen West, a Principal Consents Officer.
4. The Staff Report provided an analysis of the relevant matters requiring consideration under the RMA and recommended the application should be granted. A suite of recommended consent conditions was appended to the Staff Report for my consideration.
5. Prior to the hearing, I issued a Minute addressing procedural matters and making directions to ensure a smooth hearing process. Minute #1 directed that conferencing between the ecologist/fish experts take place and conferencing between the expert planners. The purpose of this conferencing was to clearly outline the matters the experts agreed on and those they did not, including reasons for any disagreement. I received two joint statements of the experts prior to the hearing.
6. The Staff Report, Applicant's evidence and submitters' expert evidence was pre-circulated prior to the hearing in accordance with section 103B of the RMA. Additional time for such evidence to be circulated was provided due to the expert conferencing that was to take place. I pre-read the application documentation, submissions, Staff Report, and pre-circulated evidence. These documents were 'taken as read' at the start of the hearing¹.
7. I undertook a site visit on Tuesday 4 December 2018. I was accompanied by Ms Renee Murrell (Alliance Maitara Environmental Manager), Mr Dave Glover (Alliance Maitara Health and Safety Manager), and Ms Lacey Bragg (Environment Southland Consent Administrator). Neither Ms Murrell nor Mr Glover were involved with the hearing and I confirm that neither of them proffered any opinion on any matter related to the application

¹ As provided for by section 41C(1)(b) of the RMA.

² Alliance Group Limited, Maitara Plant – Hydro Electric Generation Plant, Resource Consent Applications and Assessment of Environmental Effects prepared by Mitchell Daysh dated 22 December 2016.

³ Email from C Hunter (Mitchell Daysh) to S West (Environment Southland).

⁴ The submission states that the submitter is collectively referred to as Ngāi Tahu in its submission and I have accordingly used the same reference for the purposes of this decision.

during my visit. I was shown the various components of the hydro scheme including the weir, diversion channel, trash screen, turbine, and outlet channel. The Mataura River was in high flow during my visit and the turbine was not operational.

8. I issued Minute #2 on 4 December 2018 which outlined the timeframes in respect of circulation of the Applicant's revised set of proffered conditions, suggested changes to those conditions from submitters and the reporting officer, and provision of the Applicant's Right of Reply. These timeframes were discussed and agreed to by the parties towards the end of the formal part of the hearing.
9. The Applicant circulated a set of revised conditions to the submitters and Mr West for their comment and I received those comments on 17 December 2018.
10. Counsel for the Applicant provided a final written Right of Reply and a final revised set of proposed conditions on behalf of the Applicant on 21 December 2018.
11. I issued Minute #3 on 21 December 2018 requesting further information from the Applicant and received its response on 1 February 2019 – this related to cumulative effects on downstream migrating eels and costs of monitoring. Having read the response, I considered further information was necessary and requested this by way of Minute #4 (issued on 3 February 2019) – this related to the thresholds/triggers proposed by the Applicant in its conditions and whether they adequately dealt with cumulative effects.
12. I received a response to Minute #4 from the Applicant on 8 February 2019. There were some matters in the Applicant's response that were not clear to me so I asked for clarification on those matters (via email through Ms Bragg) on 8 February 2019 and received the Applicant's response to that email on 11 February 2019.
13. I formally closed the hearing on 13 February 2019. In reviewing the Applicant's final set of proffered conditions there appeared to be an inconsistency in respect of the proposed process of developing the Mitigation Plan and I sought clarification (again via email through Ms Bragg) on 15 February 2019 and received a response from the Applicant on 19 February 2019.
14. I record that the two requests for further information following the formal part of the hearing by way of Minutes and the emails seeking clarifications were all necessary as they dealt with critical matters not fully traversed and tested at the hearing. These matters arose as a result of information provided by the Applicant in its Right of Reply (including supporting information from its experts). Whilst I had the option to reconvene the hearing, I considered requesting the information by way of Minute(s) and email clarification was more efficient and appropriate in this case. The responses I received from the Applicant clearly showed appreciation for the opportunity to either clarify matters or make corrections to the information provided.

15. I acknowledge all the parties' willingness to participate in the expert conferencing and in providing the information I requested during these proceedings. I thank all the parties for their contributions in this regard. I also thank Ms Lacey Bragg, the Council's Hearings Administrator, for the excellent assistance she provided throughout the hearing process. I wish to thank those parties who attended the hearing and presented evidence.

THE APPLICATION

16. The background to the application is outlined in the application documentation² and the Staff Report – there is no need for me to repeat that material here. The Staff Report stated that the purpose of the application is to enable electricity to be generated by the Applicant via an existing hydro scheme located on the true right bank of the Mataura River. The activities and the application are summarised as follows:
- (i) Alliance operates a meat processing plant at Mataura;
 - (ii) An existing concrete U-shaped weir is in the Mataura River upstream of the Mataura Falls. This weir is believed to have been constructed in the 1920s or 1930s;
 - (iii) Water is diverted by the weir along the true right bank of the river into a diversion channel where it is directed through a turbine system which generates around 72,000 kW per week, supplying around 25% of the meat processing plant's electricity needs – a water permit is being sought for this activity;
 - (iv) Water from the turbines is returned to the Mataura River downstream of the Mataura Falls – a discharge permit is being sought for this activity;
 - (v) The weir also diverts water along the true left bank where it is also used to generate electricity via a hydro scheme operated by Mataura Industrial Estate (**MIE**) under a separate set of resource consents – this was formerly the site of the Carter Holt Harvey mill; and
 - (vi) The existing consents (the Applicant's and MIE's) require the hydro schemes be operated in such a way as to ensure they do not result in the depth of water over the weir falling to below 0.05 m.
17. The application, as lodged, included a proposal to shut off the hydro scheme during the months of March and April each year between the hours of 7 pm and 6 am under certain flow conditions. This was proposed to minimise potential effects on downstream eel

² Alliance Group Limited, Mataura Plant – Hydro Electric Generation Plant, Resource Consent Applications and Assessment of Environmental Effects prepared by Mitchell Daysh dated 22 December 2016.

migration. However, the Applicant advised the Council on 14 November 2017³ that it no longer proposed this shut down regime but instead proposed a monitoring programme to better inform what, if any, mitigation is needed in terms of downstream eel migration.

18. The proposed activities and resource consents sought were summarised in the Staff Report as follows:

APP-20171566-01 Water Permit: To dam, divert, and use water for hydro-electric power generation.

APP-20171566-02 Discharge Permit: To discharge water from a hydro-electric system to the Mataura River.

19. A consent duration of 25 years is being sought by the Applicant for both resource consents.

REGIONAL PLAN RULES AFFECTED

20. The relevant operative plan for these activities is the Regional Water Plan for Southland (**RWP**). In June 2016 the Council notified the Proposed Water and Land Plan (**PWLP**) and, while there are appeals relating to various provisions of this plan, the rules had immediate legal effect and are therefore also applicable in this case.

21. There were differences between the Applicant and the Reporting Officer on how the activities complied, or otherwise, with the relevant rules. In addition, upon reading the Staff Report I noted it appeared that a section 13 RMA land use consent may have been needed for the weir, but this consent type had not been applied for. This was a matter I directed the expert Planners canvass during the expert conferencing. The joint statement confirms that the following rules are applicable and the corresponding activity statuses apply under the RWP and PWLP:

Consent Type	For	RWP	PWLP
Water Permit	▪ Damming of water	▪ Discretionary activity under Rule 19(b)	▪ Discretionary activity under Rule 4
Water Permit	▪ Diversion and use of water	▪ Restricted discretionary activity under Rule 18(d)(iii)	▪ Discretionary activity under Rule 49(c)
Discharge Permit	▪ Discharge of water to water	▪ Controlled activity under Rule 3A	▪ Controlled activity under Rule 8

³ Email from C Hunter (Mitchell Daysh) to S West (Environment Southland).

Consent Type	For	RWP	PWLP
Land Use Consent	<ul style="list-style-type: none"> ▪ Use of a weir structure on the bed of the Mataura River 	<ul style="list-style-type: none"> ▪ See discussion in paragraphs below ▪ Mr West and Ms MacKenzie consider it is a controlled activity under Rule 29(e) ▪ Mr Kyle considers it is permitted under Rule 29(d) 	<ul style="list-style-type: none"> ▪ Permitted activity under Rule 60(ab)

22. Mr Kyle also presented an analysis of the status of the activities following recent decisions on the proposed PWLP. I asked Mr Kyle whether any new activity status as a result of these decisions was relevant as section 88A of the RMA essentially 'locks in' the status of an activity to that which applied at the time of lodgement and the application is to be assessed under that status irrespective of any activity status changes that may occur following lodgement. Mr Kyle was unsure whether that applied to regional activities, so I asked Mr Christensen to address this in his Right of Reply. The Right of Reply confirmed that the activity status remains as that applicable at the time of lodgement.
23. All the Planners agreed with the above statuses and that all the activities are sufficiently inter-linked to warrant the consents to be 'bundled' with the most restrictive activity status applying to the bundle. In this case the most restrictive activity status is **discretionary** and all the activities must be considered as such under sections 104 and 104B of the RMA.
24. As noted in the above table, there was a difference of opinion between Mr Kyle and the two other Planners (Mr West and Ms MacKenzie) as to whether the weir required a section 13 RMA land use consent. Mr Kyle was of the opinion it was permitted under Rule 29 of the RWP, however Mr West and Ms MacKenzie considered it did not meet all the requirements of this permitted activity rule. During the hearing I asked Mr Kyle and Mr West questions regarding this matter. Both witnesses agreed that the matter may need to be resolved at a later date and, in the event it is found that a land use consent is needed for the weir, it could (and would) be applied for separately. The Applicant has not applied for a land use consent for the weir and therefore I cannot grant such a consent. Despite this, one of the key issues identified in the evidence of various witnesses related to upstream fish passage over the weir structure.

SITE DESCRIPTION AND EXISTING ENVIRONMENT

25. The site is described in detail in the application documents and summarised in the Staff Report. The following are the key elements of the existing environment:
- (i) The U-shaped weir is located approximately in the middle of the Mataura River upstream of the Mataura Falls, the falls being a natural rock ledge. The weir is thought to have been constructed in the 1920s or 1930s;
 - (ii) The Mataura River is a Statutory Acknowledgement Area under the Ngāi Tahu Claims Settlement Act 1998 and section 42 of that Act notes "*The Mataura was an important mahinga kai, noted for its indigenous fishery. The Mataura Falls were particularly associated with the taking of kanakana (lamprey)*";
 - (iii) The Mataura River Mātaitai Reserve exists along approximately 10 km of the Mataura River, including the application site, and came into force in 2005 as the area is noted for its native fish populations, in particular lamprey, shortfin and longfin eels;
 - (iv) The Mataura River is subject to the Mataura Water Conservation Order (**WCO**) which came into force in 1997. The outstanding features of the river that the WCO seeks to protect are the outstanding fisheries and angling amenity;
 - (v) Land uses adjacent to the application site are dominated by industrial uses and the wider surrounding area is made up of a mix of residential, commercial, and community support uses;
 - (vi) MIE holds consents to divert water for its hydro scheme using the same weir the Applicant uses, however on the opposite side of the river;
 - (vii) Eleven species of diadromous native fish have been recorded within the Mataura River and the Mataura Falls form a natural barrier for six of these species that are poor to moderate climbers but unable to migrate past the falls; and
 - (viii) The Mataura River generally has degraded water quality, being in the worst 25% and 50% of all lowland sites in New Zealand for total ammoniacal nitrogen and dissolved reactive phosphorus, respectively.

NOTIFICATION AND SUBMISSIONS

26. The application was processed on a limited notified basis with notice being served on 27 October 2017.
27. Three submissions were received, all in opposition, and all wishing to be heard. Two of the submissions, namely from the Southland Fish & Game Council (**Fish & Game**) and Hokonui Rūnaka and Te Rūnanga o Ngāi Tahu (collectively referred to as **Ngāi Tahu**⁴) oppose the application and seek that the consents be declined – both submissions stated that, should the consents be granted, they should be issued for a period of no more than five years. The third submission, from the Department of Conservation (**DoC**), opposes the application in part and seeks that the consents be granted for a term of no longer than five years subject to appropriate conditions to address adverse effects on fish passage for long fin eel or lamprey.
28. The Staff Report presents a summary of the submissions. The key concerns raised in the submissions are:
 - (a) Effects on cultural values;
 - (b) Lack of information on sportfish and the effects on them;
 - (c) Effect on fish passage, both upstream and downstream, including effects of turbine strike and adequacy of fish screen;
 - (d) Adequacy of the 'trap and transfer' system for elvers;
 - (e) Monitoring, including of migrating fish species;
 - (f) Consistency with objectives and policies of the relevant plans; and
 - (g) Duration of consent.
29. I was provided with, and have read copies of, the three submissions received and consider these were accurately summarised in the Staff Report. I therefore adopt that summary for the purposes of my decision as provided for by section 113(3)(b) of the RMA.
30. The Staff Report records that two pre-hearing meetings were held (30 January and 16 August 2018) and that further reports were prepared both by the Applicant and submitters on the effects associated with fish passage. These meetings failed to resolve the issues and hence the requirement for a formal hearing to be held. I have read the report that Mr West prepared under section 99(5) of the RMA on the pre-hearing meetings.

⁴ The submission states that the submitter is collectively referred to as Ngāi Tahu in its submission and I have accordingly used the same reference for the purposes of this decision.

ASSESSMENT

31. In assessing the application and making my decision I have considered the application, the assessment of environmental effects (**AEE**), the Staff Report, the three submissions, the joint witness statements, and the evidence provided during, and following, the formal hearing process.
32. In addition to the material listed in the preceding paragraph, during the hearing I requested copies of the MIE consents and supporting decision, and the report required by Condition 12 of that consent which required MIE to carry out an investigation into appropriate passage for eels migrating downstream. Mr West tabled these documents at the hearing.
33. I record that the findings I have made and the decision I have arrived at are based on all the evidence before me and my consideration of that material within the context of the statutory framework.

Statutory Considerations

34. Section 104(1) of the RMA states that, when considering an application for resource consent and any submissions received, I must, subject to Part 2 of the RMA (which contains the RMA's purpose and principles), have regard to-
 - (a) *Any actual and potential effects on the environment of allowing the activity;*
 - (ab) *Any measure proposed or agreed to by the Applicant for the purpose of ensuring positive effects on the environment offset or compensate for any adverse effects on the environment that will or may result from allowing the activity;*
 - (b) *Any relevant provisions of a national environmental standard, other regulations, a national policy statement, a New Zealand coastal policy statement, a regional policy statement or a proposed regional policy statement, a plan or proposed plan; and*
 - (c) *Any other matters the consent authority considers relevant and reasonably necessary to determine the application.*
35. Section 104(2) of the RMA states that, when forming an opinion for the purposes of section 104(1)(a), I *may* disregard an adverse effect of the activity on the environment if a national environmental standard or the plan permits an activity with that effect. This is referred to as the application of the 'permitted baseline'. I heard no evidence as to whether there was any permitted baseline applicable in this case and as such I assume not.
36. Section 104(2A) requires me to take into account the Applicant's value of investment as this is an application for replacement consent. I discuss this matter later in this decision.
37. Section 104(3)(a)(ii) states that I must not have regard to the effect on any person who has given written approval to the application. No written approvals were provided by the Applicant so this section is not relevant to my consideration.

38. Section 104B of the RMA states that I may grant or refuse the application sought and, if granted, I may impose conditions under section 108 of the RMA.
39. Sections 105 and 107 of the RMA are also relevant for me to consider for the discharge permit being sought.
40. My assessment considers each of these sections of the RMA below.

RMA SECTION 104(1)(a) – ACTUAL AND POTENTIAL EFFECTS ON THE ENVIRONMENT

41. The activities will result in various actual and potential effects on the environment – these effects include both positive and adverse effects. The more significant of the adverse effects formed the basis of most of the submissions that were received by the Council and the evidence presented during these proceedings. There were, however, some effects in respect of which I received evidence which was not contested. I briefly cover those in the following paragraphs before addressing the matters that were the focus of the hearing (i.e. the matters in contention) under separate effects headings.
42. I accept that any adverse effects on natural character and water quality will not be significant. Accordingly, I adopt the assessment in the Staff Report for the purposes of my decision as provided for by section 113(3)(b) of the RMA.
43. In terms of positive effects, I received evidence to show the hydro scheme provides \$35,000 per month worth of savings for the Applicant which is a significant sum of money. The ability to generate electricity on-site is efficient and avoids the need for this energy to be generated elsewhere. A further positive effect is that the generation is from a renewable resource.
44. On the basis of the evidence before me, I have focussed my assessment on the following potential and actual environmental effects which formed the basis of much of the evidence presented during the hearing:
 - Fish passage:
 - Upstream migration and proposed mitigation measures
 - Downstream migration, including fish screen, turbine strike, and cumulative effects of the Applicant's hydro scheme and that operated by MIE on the other side of the Mataura River
 - Cultural effects
45. I consider each of these separately below.

Fish Passage

Introduction

46. All parties agreed that providing for upstream and downstream migration (sometimes referred to as passage) for certain fish species were key issues associated with this application. The experts agreed that the relevant fish species to be considered in respect of fish passage were longfin and shortfin eel, lamprey, koaro, and brown trout.
47. Longfin eel, shortfin eel, and koaro are all diadromous species, meaning that part of their life-cycle involves migrating from freshwater to the sea. Eels migrate downstream as adults and spawn in coastal waters (thought to be north of New Zealand near Tonga). Young eels (elvers) return to freshwater where they migrate up rivers. Koaro spawn in estuarine waters and their young form part of the 'whitebait' species which migrate upstream. Lamprey spend some of their life cycle in freshwater and some in the sea.
48. Brown trout are not diadromous, however some trout do spend time in estuarine environments and are referred to as 'sea-run trout'. Brown trout can, and do, migrate up and down rivers in search of food but they do not have an obligate marine phase to their life cycle.

Upstream Fish Migration

49. The Mataura Falls form a natural barrier for upstream fish migration and the weir, located a short distance upstream of the falls, forms an additional man-made barrier for fish migration. Dr James stated the falls and the weir do not pose a significant barrier for eels, koaro, lamprey, and possibly brown trout. He stated that the 'trap and transfer' system that is proposed is 'best practice' and commonly used in other parts of New Zealand. While he considered that the trap and transfer scheme was not 'essential' in this case, its use would definitely enhance upstream fish migration.
50. Dr James stated that brown trout are found throughout the Mataura River catchment but generally form resident populations as long as they have access to spawning streams. He stated a fish ladder was in place over the weir to aid upstream migrations for those brown trout that get past the falls and are migrating upstream to suitable spawning areas. Dr James stated that there are suitable spawning areas downstream and upstream of the subject site and he considered they do not rely on migration to sustain their population.
51. Ms Funnell stated that while the trap and transfer system is an accepted method to provide for upstream fish passage, the Applicant's proposal would not provide for upstream

migration of lamprey as they migrate at a different time of the year to eels – eels being the target species for the Applicant's trap and transfer scheme.

52. Ms Funnell also raised concerns regarding the risk of lamprey predation by birds such as shags at the base of the weir. She acknowledged that lamprey congregate at the base of the falls and are therefore subject to potential predation by birds in that area, but the presence of the weir creates an additional congregation point for lamprey, thereby increasing the risk of predation effects. She was not aware of any evidence to suggest that the lamprey population was in decline.
53. Mr Moss stated that brown trout are known to congregate 'in their hundreds' at the base of the falls but that trout must be able to traverse the falls and the weir as the population is being sustained. Mr Moss identified that the weir has a fish ladder to specifically provide for upstream brown trout fish passage.

Findings – Upstream Migration

54. I find that the falls form a natural barrier for upstream fish migration and the weir creates an additional (artificial) barrier. I agree that the fish species which need to be considered in respect of upstream migration are those that would naturally be able to climb over the falls, these being eels, lamprey, koaro, and brown trout.
55. Provided the fish ladder is adequately maintained and provided the Applicant's proposed trap and transfer scheme is successfully implemented, I find the effects on upstream fish migration are adequately mitigated. I agree with Dr James that the trap and transfer scheme 'enhances' the upstream migration of fish.

Downstream Fish Migration

56. Downstream migration (or passage) of fish was considered to be a key issue because of the potential for fish to pass through the turbine, potentially resulting in death of the fish – the larger the fish the greater the likelihood of death. However, there were differences of opinion as to which fish species should be the focus for consideration.
57. Dr James stated that focus should only be on longfin eels rather than other fish because:
- They dominate the eel population above the Mataura Falls and are classified as 'At risk – declining';
 - They are obligate migrants and their survival as a species is dependent on migrant adults being able to access the open sea – he stated that migrants from the Mataura River play an important part in the overall sustainability of the species;

- While lamprey is also a threatened species (classified as 'nationally vulnerable'), those that may pass through the turbines are likely to be juveniles and tend to be small (~100 mm) and most will pass through with little or no mortality;
 - Other populations of native fish are self-sustaining and either resident in the upper or lower Mataura River or not reliant on migration past the Falls;
 - While the Mataura River is a nationally important and internationally recognised trout fishery, brown trout are not reliant on migration through the Falls area – he stated that it seemed unlikely there are significant downstream migrations of brown trout or loss through the turbine; and
 - The weir and hydro scheme have been in existence for some 100 years and through that time the trout fishery has developed into a strong, high quality brown trout fishery – he considered this to mean that the fishery has not been significantly impacted by the operation of the hydro scheme.
58. Mr Moss agreed with Dr James that brown trout do not have an obligate marine phase to their life cycle, however he disagreed with Dr James's opinion that it seemed unlikely there is significant downstream migration of brown trout or loss through the turbine. Mr Moss stated that the Applicant has undertaken no monitoring to determine the effects of the hydro scheme on fish populations and, in particular, what proportion of fish (including brown trout) are being diverted from the mainstem into the hydro race and then through the turbine.
59. Mr Moss stated that, due to the patterns of spawning and migration of brown trout in the Mataura River, both adults and small fish can be encountered and downstream migration of juvenile and adult brown trout do occur during different times of the year (October to April and March to September, respectively).
60. Mr Hawker stated that the Applicant's hydro scheme does not incorporate an effective fish screen for the protection of native fish and brown trout, including juveniles, nor is one proposed. He stated that hydro schemes can cause significant loss and/or mortality of fish, particularly large fish moving downstream. In his opinion an effective fish screen is required and a condition should be imposed requiring such a screen to be installed because without such a screen there will be significant mortality of both indigenous and sports fish when they pass through the turbine. In the absence of a requirement for a screen Mr Hawker stated that a comprehensive monitoring programme should be required which monitors the effects of the hydro scheme on all potential fish species that may pass through the trash screen and through the turbine.
61. Mr Hawker stated that reducing the bar spacings of the trash screen as proposed by the Applicant did not constitute an effective fish screen. He described the principles of an

effective fish screen and he presented a set of recommended criteria for such a screen for sports fish. In answers to questions he confirmed that his recommended criteria would be equally effective for native fish and that such a screen could cost in the order of \$1.5-2.0 million to design and install.

62. Mr Smyth stated that fish screening guidelines had been incorporated into the Canterbury Land and Water Plan and these had been applied by Environment Canterbury in relation to consenting hydro schemes in Canterbury. He stated that fish screen guidelines had been incorporated into the PSWLP by way of Appendix R, however he stated these were subject to an appeal by one party, being the Applicant. The fish screen guidelines in Appendix R were the same as those recommended by Mr Hawker.
63. Ms Funnell stated there were 15 indigenous and two introduced fish species recorded within the Mataura River catchment. She stated that adult eels (both longfin and shortfin) and juvenile lamprey migrate downstream as part of their life cycle and are reliant on safe passage past the weir and Mataura Falls and there is potential for these species to be entrained into the hydro race and from there into the turbine.
64. Ms Funnell stated that some juvenile lamprey ('macrophthalmia' being 80-100 mm in length) mortality could be expected and could be in the order of 4-14%. She also noted that there was a risk that upstream migrating adult lamprey may enter the hydro race after they have scaled the weir and these fish would then potentially enter the turbine.
65. Ms Funnell stated that larger eels, lamprey, and trout will suffer mortality from impingement on the intake screen. Mr Hawker and Mr Moss also considered the modifications to the intake screen will result in high mortality rates for impinged and captured brown trout.
66. Ms Funnell stated that the native fish species of greatest concern and most at risk are the larger downstream migrating longfin and shortfin eels. She stated that the numbers of migrant eels that move downstream within the Mataura River are unknown but could be in the order of several hundred eels. Ms Funnell stated that high mortality rates of migrant eels are expected as evidenced by various studies around New Zealand.
67. Ms Funnell considered that the most effective mitigation would be the installation of a fish screen that prevents entry into the hydro race and a fish bypass that returns fish to the mainstem of the river.
68. Mr Christensen stated there was relatively poor knowledge on the extent to which downstream migrating eels are being impacted by the hydro scheme. As such, the Applicant is proposing a monitoring programme focussed on eels to better understand how the hydro scheme is impacting them, noting that the monitoring would also collect information on impacts on other fish, including brown trout.

69. Dr James provided details of the proposed monitoring which would involve a five-year survey of the number of adult eels entrapped within the hydro race or impinged on the trash screen – the screen would be modified to have narrower spacings between the bars. The results of this monitoring would be used to decide what, if any, mitigation or offsetting are required.
70. Mr Christensen stated that to undertake this monitoring so as to reach a defensible conclusion as to the effect of the hydro scheme and then to design and implement effective mitigation, or undertake suitable compensatory actions, is dependent on a 25-year consent term being granted. I asked Mr Christensen whether the proposed monitoring should have been undertaken prior to applying for these consents to fulfil the requirements of Schedule 4 of the RMA (which requires an application to be supported with an AEE). He answered by stating in an ideal world the information would have been collected and presented in the AEE but it is proposed to be collected through the proposed conditions.
71. Mr Christensen stated that if some type of screening and by-pass were found to be needed, these could be difficult and expensive to construct and may require ongoing maintenance.
72. The exact nature of the mitigation measures that would be implemented was not specified but could include one or more of the following (from the Applicant's proposed Condition 22):
- Permanent alterations to the fish screening system or hydro race (including the area around intake) to avoid, as far as can practicably be achieved, the entrapment of eels in the hydro race;
 - The closure of the hydro plant during flood flows between 1st February and 15th May (or similar timeframe determined as a result of monitoring); and/or
 - Eel habitat enhancement in other parts of the Mataura River to offset the effects of eels being entrapped in the hydro race and entering the turbine
73. The proposed conditions would require the mitigation measures to be outlined in a Downstream Eel Mitigation Plan (the Mitigation Plan) which would need to be certified by the consent authority before being implemented.
74. In answers to questions, Dr James stated that, in his professional opinion and based on available information, some form of mitigation measures are likely to be required following the monitoring programme.
75. When I asked Dr James if the monitoring programme was '*just delaying the inevitable?*' he stated that, because the scale of effect is unknown, the scale of required mitigation is, likewise, currently unknown.

76. Mr Smyth and the tabled Lane Neave legal memorandum (from Ngāi Tahu) noted that the Applicant's experts had referred to the proposed monitoring and, if required, mitigation, as '*adaptive management*'. Both presented extensive legal submissions on the concept. Mr Smyth concluded that the Applicant's proposed environmental performance objectives do not provide enough certainty, clarity, or robustness on which to form the foundation of an appropriate adaptive management approach. Mr Christensen, in his Right of Reply, stated that, while the Applicant's experts have used the term '*adaptive management*', what is proposed is not an adaptive management proposal in the sense described in the leading cases on the subject.
77. Mr Smyth stated the proposed conditions in terms the Mitigation Plan retained a large level of discretion to the Applicant and that:
- Reference to permanent alterations to the fish screening system or hydro race (including the area around intake) would not necessarily require an effective fish screen to be installed (and maintained) in accordance with all the seven criteria set out in the NIWA 2007 fish screening guidelines – these being those outlined in Mr Hawker's evidence and those contained in Appendix R of the PLWP (albeit these are under appeal);
 - The potential for offsetting of the effects on downstream migrating adult eels by eel habitat enhancement would only be appropriate if there was strong evidence that adult eel population is habitat limited as opposed to recruitment limited – that is, offsetting may not adequately mitigate the adverse effect on downstream migrant adult eel passage.
78. Ngāi Tahu expressed similar concerns regarding the level of discretion provided to the Applicant in the proposed conditions. It noted that offsetting should only be used if there is no net loss. Ngāi Tahu was also concerned that the monitoring focusses only on one fish species.
79. I asked Mr Kyle and Mr West whether the MIE hydro scheme formed part the 'existing environment' as its consents are current and do not expire until 2026. Both witnesses confirmed that the effects of the MIE hydro scheme do form part of the existing environment and therefore form the baseline against which the Applicant's effects are to be assessed.
80. Mr Kyle confirmed that the proposed conditions (attached to his Evidence in Chief) did not specifically incorporate a requirement to consider the cumulative effects of the MIE consents but it was his expectation that the Downstream Eel Migration Monitoring Programme would take all relevant factors into account – he agreed that the wording of the conditions should be amended to specify that cumulative effects would need to be

considered – the revised proposed conditions included with the Applicant’s Right of Reply included changes to ensure cumulative effects were to be assessed ‘*if needed*’.

81. Mr West confirmed that he had not properly considered cumulative effects in his section 42A report. He considered the monitoring of downstream eel passage effects should take into account the effects of the MIE hydro scheme and the conditions should be amended to make this clear.
82. Dr James stated that the proposed downstream monitoring programme did not include a cumulative effects assessment of the MIE hydro scheme. I asked Dr James how a decision would be made on whether a Mitigation Plan was needed if the cumulative effects of the Applicant’s hydro scheme were unknown. He stated that an assessment could be undertaken by the scaling of flows – that is, the number of eels likely to be entering the MIE hydro scheme could be calculated by taking the results obtained by the Applicant’s monitoring and multiplying them by a factor to account for MIE’s increased flow diversion.
83. Dr James stated that an assessment could then be made as to the significance of the Applicant’s cumulative effect. In answers to questions Dr James stated that the decision on whether the effects are significant enough to warrant mitigation measures was subjective but would be based on expert opinion as the proposed condition wording (those being current at the time of the hearing) did not include any hard-coded numeric thresholds.
84. Thresholds which would trigger either additional monitoring or preparation of the Mitigation Plan were not initially proposed in the Applicant’s proposed conditions. In the set of conditions attached to Mr Kyle’s evidence the trigger for mitigation was if there were ‘...*significant adverse effects on downstream eel passage*’. This wording was then changed (in Mr Kyle’s Statement of Rebuttal Evidence) to if ‘...~~significant~~ *adverse effects on downstream adult eel migration passage*...’.
85. In its Right of Reply the Applicant provided a revised set of proposed conditions and a supplementary statement of evidence from Dr James on cumulative effects and proposed numeric thresholds/triggers for various actions to be taken. This was the first time numeric thresholds were proposed. I requested further information from the Applicant (via Minutes #3 and #4) regarding the proposed thresholds/triggers and whether the cumulative effects have been properly considered in setting the thresholds/triggers.
86. I received comments on the Applicant’s revised conditions from the submitters and Mr West, including a supplementary statement of evidence from Ms Funnell regarding the proposed thresholds/triggers.
87. The Applicant’s final set of proposed conditions included three thresholds which either trigger further monitoring or mitigation as follows:

- (a) If 10 or more adult migrant female eels are impinged/caught in any one monitoring season then the Applicant would be required to either undertake PIT monitoring or, if it chooses, implement mitigation measures (i.e. develop and implement a Mitigation Plan).
 - (b) If 100 or more adult migrant female eels are impinged/caught in any one season then the Applicant would be required to implement mitigation measures (i.e. develop and implement a Mitigation Plan).
 - (c) In the event that PIT monitoring is undertaken (using non-threatened shortfin eels, not longfin eels), then if the relative proportion of migrant eels (both male and female) either entrapped in the race or impinged on the screen is 5% or more during the preceding downstream migration season then mitigation measures would be implemented.
88. Dr James noted that estimating eel stocks is very difficult but the best available information was the work of Graynoth *et al* (2008) which estimated the eel biomass in the Mataura River as being 243 tonnes. Using this data Dr James estimated that around 29,000 large female longfin eels may be present with 4 to 8% of these migrating each year (i.e. 1,160 to 2,300 female eels). He considered the proposed 10 adult female eel threshold (to undertake additional instream monitoring) was sufficiently conservative and took adequate account of cumulative effects of the MIE hydro scheme. He stated that the 100 adult female eel trigger does not need to take into account a cumulative effect as the Mitigation Plan would need to be developed and implemented above this trigger and the instream monitoring between 10 and 100 adult female eels took into account cumulative effects. However, he stated that the 5% threshold (in the event that PIT monitoring is undertaken) does not take into account the cumulative effects of both hydro schemes and that this threshold is *'...more of a practical consideration as being able to detect differences less than this for the Alliance side (which is the only part of the system that this consent can have compliance conditions) is unlikely because of issues around variability, the low numbers involved and errors in detection'*.
89. I sought clarification on Dr James's proposed thresholds on three occasions following the close of the formal hearing (following receipt of his two memorandums). His first memorandum (dated 1 February 2019) addressed cumulative effects of the Applicant's hydro scheme and the MIE scheme and used flow scaling to estimate the likely number of eels affected by the MIE hydro scheme. It was not clear how the various eel thresholds proposed related to the cumulative effects of the MIE hydro scheme and Dr James's calculations had been not been based on the MIE consented rate of taking (which is more than double its current rate, the latter being the rate used by Dr James in his first memorandum). Dr James's second memorandum (dated 8 February 2019) presented

revised figures on cumulative effects and further clarification on the various thresholds. A further email from Mr Christensen provided further clarifications and corrections to Dr James's second memorandum.

90. Ms Funnell (for the Department of Conservation) agreed with Dr James's assessment regarding the number of large female migrant eels that potentially migrate down the Mataura River. She noted that Dr James has suggested a 5% threshold for migrating eels entering the Applicant's intake and this has been used to calculate the 100-eel threshold. She considered the thresholds suggested by Dr James do not consider the ecological significance of the magnitude of effect nor the duration of the effect (i.e. the effect could be enduring over the term of the consent).
91. Ms Funnell stated that defining the significance of effect and relative thresholds relied on expert judgement and has been a source of debate among practitioners. She noted the proposed monitoring was biased towards larger fish and would miss important information on smaller eels that were able to pass through the modified trash screen.
92. Ms Funnell stated that the relevance of a 100 migrant adult female eel threshold from an ecological perspective is difficult to assess and she considered a lower threshold of 50 eels to be more appropriate.
93. Fish & Game considered that the proposed monitoring should be undertaken, and the results used during the re-consenting process. That way the actual effects of the Applicant's hydro scheme will be known and a decision can then be made as to whether an effective fish screen is needed.
94. All three submitters and Mr West consider that a common expiry date with the MIE consents would better enable cumulative effects of the Applicant's and MIE's hydro schemes to be considered.

Findings – Downstream Fish Migration

95. I find that potential effects on downstream fish migration is the key issue associated with this application. The Applicant has not assessed the actual effects of its hydro scheme on fish that rely on downstream migration as part of their life-cycles and non-obligate species that move up and down the river looking for food (e.g. brown trout).
96. By its own admission, the Applicant has a relatively poor knowledge on the extent to which downstream migrating eels are being impacted by the hydro scheme and it is proposing a monitoring programme to better understand how the hydro scheme is impacting them, noting that the monitoring would also collect information on impacts on other fish, including brown trout. The results of this monitoring would be used to reach a defensible conclusion

as to the effect of the hydro scheme and then to design and implement, if required, effective mitigation or compensatory actions.

97. I find that the Applicant could (and should) have undertaken its proposed monitoring well in advance of the expiry of the current consents and the results of that monitoring would then have been available as part of the current proceedings to provide an evidential basis on what the scale of adverse effect was and what mitigation measures, if any, should be implemented to avoid or mitigate adverse effects on downstream migration of fish. The lack of actual monitoring results means there is currently insufficient information on the effects of the hydro scheme on downstream fish migration/passage.
98. The Applicant is proposing to collect the missing information by undertaking a comprehensive monitoring programme over a five-year period. I find that the proposed monitoring programme and the way it will be developed (in consultation with the three submitters) is generally appropriate, however I consider that its focus should not only be on longfin eel but also other fish that may be affected by the hydro scheme. Whilst longfin eel is a very important species to consider given their threatened status, I agree with the three submitters that the monitoring programme should equally focus on other native fish as well as salmonids – this position is supported by various provisions of the statutory documents.
99. I find that the proposed thresholds which would trigger either further monitoring or development and implementation of the Mitigation Plan, whilst having been established based on the best available information, are somewhat arbitrary and it is unclear whether they adequately take into account cumulative effects or the ecological significance of the magnitude of effects.
100. As discussed earlier, proposed numeric thresholds were introduced relatively late in the proceedings as part of the Applicant's Right of Reply, however no evidence was included in the Reply on whether the thresholds adequately took into account cumulative effects of the MIE hydro scheme. It was only in response to my first further information request that evidence was provided to suggest the threshold took into account cumulative effects, however that information assumed the MIE hydro scheme had only half the rate of take that its consents allowed. I asked further questions on this and was provided with more calculations which suggested the thresholds accounted for the consented MIE rate of taking. Finally, there was confusion on whether the 5% threshold was based on female eels or total number of eels – this was a matter clarified/corrected very late in the proceedings by Mr Christensen.
101. The 5% threshold, which originates in the Vaiphuhi (2018) report, does not appear to have any ecological basis and, as Dr James confirmed in his second memorandum dated 7 February 2019, this threshold does not take into account the cumulative effects of the

Applicant's hydro scheme over and above those effects that may be occurring at the MIE hydro scheme.

102. The way in which the proposed thresholds were developed and justified during these proceedings, including following the close of the formal part of the hearing, leads me to have insufficient confidence in them being environmentally defensible thresholds to be imposed as conditions of consent. Further work needs to be done to determine not only the magnitude and significance of the effects of the Applicant's hydro scheme but, more importantly, the cumulative effects of the Applicant's and MIE's hydro schemes. Collecting the right monitoring data to assess these effects is, in my view, best done between now and 2026, being when the MIE consents expire. I note the Applicant's proposed monitoring would take place over a five-year period, which would mean results were available in 2024 or 2025 (depending on what year it commences), this being very close to the expiry date of the MIE consents. The period between the completion of the monitoring and the need to apply for new consents would then be able to be used to determine what the appropriate mitigation measures are (should such measures be required). I agree with the submitters and Mr West that a common expiry with the MIE consents is appropriate in this case to enable the effects of both hydro schemes to be considered together given they both use the weir to divert water into their respective hydro schemes.
103. I also note it is likely that the appeals to the PSLWP will also have been determined, including the applicability of the fish screen design requirements specified in Appendix R.
104. I find that the proposed conditions as they relate to the potential mitigation measures that might be implemented retain too much discretion to the Applicant and they would leave the Consent Authority in a position of being an approver (arbiter) rather than a certifier when the Mitigation Plan is submitted for 'certification'. Conditions that leave a decision to a subjective discretion are ultra-vires and cannot be imposed. Conditions must provide clear performance or environmental standards that are to be certified – no such standards are included in the Applicant's proposed conditions. Further, critical actual or potential adverse effects need to be identified, appropriately avoided, remedied or mitigated with conditions before a decision to grant is made and not left to be addressed via a future plan. Plans should be limited to non-critical operational processes that lie behind a performance or operational standard – in this case a Mitigation Plan would contain critical information which should be properly evaluated and 'approved' and therefore I do not consider the Applicant's approach in this regard to be appropriate. This is very different to the certification of the Elver Trap and Transfer Plan and Downstream Fish Migration Monitoring Programme because: 1) these documents outline operational details; and 2) draft versions of these were included with the application so details of what they will contain are already available.

105. To understand the cumulative effects of the Applicant's hydro scheme and the MIE hydro scheme will require not only the Applicant to undertake monitoring but also MIE. I therefore encourage the Applicant to begin discussions with MIE to develop a suitable monitoring programme which will be able to assess the cumulative effects. The Consent Authority should also encourage MIE to participate in the monitoring programme because cumulative effects will be the critical consideration when the MIE consents (and the Applicant's) come up for renewal in 2026.
106. Ms Funnell, Mr Hawker, and Mr West all expressed the view that installation of an effective fish screen would be the most effective mitigation measure and such a screen would adequately avoid and/or minimise effects on downstream fish migration. Ms Blair (for Ngāi Tahu) stated that it could only support a 25-year duration where the environmental effects are fully mitigated and/or minor and that fish passage is unimpeded. It is clear to me that, had the Applicant proposed (volunteered) such a screen in its application, then it would probably have satisfied the concerns of all three submitters. However, the Applicant is not proposing such a screen (although it may have been recommended in its Mitigation Plan) and I have insufficient information on the magnitude of effects on downstream fish migration to 'require' the installation of such a screen, especially given its likely significant costs.
107. I heard evidence that the level of investment required to design, install, and maintain such a screen would be significant (in the order of \$1.5-\$2 million). I understand and accept the Applicant's position that it does not wish to make such a significant investment until the monitoring has been undertaken to determine the magnitude of any adverse effect.

Cultural Effects

108. Ms Blair and Ms MacKenzie appeared on behalf of Ngāi Tahu and tabled a memorandum from its legal counsel Mr Joshua Leckie and Ms Kate Tarawhiti who did not appear in person due to other commitments.
109. Ms Blair outlined the cultural significance of the Mataura River to Hokonui Rūnanga⁵. I adopt her assessment for the purposes of this decision, however the key features are summarised as follows:
- the subject site is an important place for the collection of mahinga kai including taonga species;
 - the catchment is tribally renowned for its abundance of tuna and kanakana (eels and lamprey);

⁵ Ms Blair used the term 'Hokonui Rūnanga' throughout her evidence, being an alternative spelling of 'Hokonui Rūnaka'.

- the river was a key travel route for Ngāi Tahu ki Murihiku;
 - the river has provided ongoing cultural use and Ngāi Tahu ki Murihiku continue to have a relationship with the river that reflects early matauranga that has been passed down through the generations;
 - the subject site is located within a gazetted freshwater mātaimai under the Fisheries Act 1996. This provides recognition of the responsibility that Hokonui Rūnanga has to uphold the kaitiakitanga and rangatiratanga over the river; and
 - Ngāi Tahu values of wai, ki uta ki tai, mauri, mahinga kai, kaitiakitanga, whanaungatanga, and manakitanga all intertwine and express the significance and connection that Hokonui Rūnanga have with the river.
110. Section 5.1.5 of the AEE outlines the Applicant's assessment of the effects on cultural values. This section confirms the importance of the river to Ngāi Tahu and in terms of the effects on cultural values and states "*Alliance has engaged with Te Ao Marama and the key issue identified relates to the potential effects on fish passage of native species*". The various mitigation measures are then outlined (trap and transfer, closing the plant during optimal downstream adult eel migration periods) and concludes that "*Alliance has discussed these proposals with Te Ao Marama and they indicate that it appears to be an acceptable method of managing potential effects*". I note that no cultural impact assessment (CIA) was commissioned or included with the AEE.
111. Mr Kyle stated that various elements of Part 2 of the RMA are identified in Section 10 of the AEE, however I note that cultural matters are not referred to at all in that section despite RMA sections 6(e)⁶ and 7(a)⁷ specifically relate to cultural matters.
112. Mr Kyle stated that customary rights of iwi and the cultural significance of the Maitai River had been recognised by the Applicant. He stated that consultation with Te Ao Marama and Hokonui Rūnanga occurred early and was ongoing, with the conditions proffered recognising the important kaitiaki role of the Rūnanga in the development and implementation of the monitoring and mitigation programmes.
113. Ms Blair stated that the Applicant's hydro scheme should be considered together with the MIE hydro scheme to ensure the remaining mauri of the river is upheld with consistency and fairness. While Ngāi Tahu's submission sought that a five-year duration be imposed, Ms Blair confirmed that the submitter now considers the consent should have a common expiry with the MIE consent.

⁶ the relationship of Māori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga

⁷ kaitiakitanga

114. Ms Blair stated that for Hokonui Rūnanga to be effective kaitiaki of their mātaimai and of their taonga species they need to be “*heavily involved with any monitoring completed within the Mataitai*”.
115. The Ngāi Tahu legal memorandum noted significant and protected cultural values of the Maitara River had been specifically recognised through various planning, policy, and legislative documents, namely:
- Statutory acknowledgement for Maitara River (Schedule 42 of the Ngāi Tahu Claims Settlement Act 1998);
 - Te Tangi a Taura (Ngāi Tahu ki Murihiku Iwi Management Plan 2008);
 - Fisheries (Declaration of Mātaimai Reserve at Maitara River and Appointment of Tangata Tiaki/Kaitiaki) Notice 2005;
 - Ngāi Tahu Freshwater Policy Statement 2002; and
 - Water Conservation (Maitara River) Order 1997
116. The Ngāi Tahu legal memorandum asserted the Council and the Applicant had failed to consider the effects of the application, in particular the impacts on fish passage and impacts on the cultural values of the Maitara River. The memorandum stated the application was inconsistent with the relevant planning framework and:
- “...merely mentioning cultural values or Ngāi Tahu specific planning documents without providing an actual assessment of the impact on those values is insufficient. While the latest version of the conditions by the Applicant have gone some way to addressing Ngāi Tahu’s concerns, it is insufficient to refer to pre-application meetings between the applicant and Ngāi Tahu as somehow inferring that the effects on cultural values have been considered when all the recommendations from Ngāi Tahu have not been accepted by the Applicant in the conditions of the consent sought.”*
117. Mr West did not consider cultural effects in Section 3.3 (Actual and potential effects) of his section 42A report but his report noted the subject site is within a statutory acknowledgement area and mātaimai reserve. Further, his analysis of the relevant statutory planning documents included discussion on provisions that relate to cultural values. He also presented what he considered to be the relevant provisions of Te Tangi a Taura, but he did not provide any commentary on those. In answers to questions Mr West stated that he normally did not provide commentary on iwi management plan provisions and left that to iwi to do.
118. Ms MacKenzie presented planning evidence on behalf of Ngāi Tahu. She agreed that Mr West had identified the key objectives and policies from the RWP. However, in terms of

the PWLP she considered that, in addition to those provisions identified by Mr West, Objectives 3 and 14 were also relevant. In terms of the RPS she considered Objectives TW.2, TW.4, BIO.2 and BIO.3 and Policies BIO.2, BIO.4, and BIO.8 were also relevant.

119. Ms MacKenzie agreed with Mr West that Te Tangi a Tauria⁸ was relevant but she considered four additional policies within that plan to be relevant. In answers to questions Ms MacKenzie stated the provisions of Te Tangi a Tauria should be given equal weight to those in the RWP and PLWP because both those plans have policies which require any assessment to take into account any relevant iwi management plan.
120. Ms Blair acknowledged that the hydro scheme was important infrastructure for the Applicant but Hokonui Rūnanga had concerns about fish passage and the consent duration.
121. In its comments on the Applicant's final set of proposed conditions Ngāi Tahu requested a new condition be included requiring payment of experts to undertake the trap and transfer and monitoring programmes. Ngāi Tahu stated the Ruanaka has experience in such programmes and are cultural experts. It considered it fair and reasonable that a consent holder should pay for this expertise just as they would pay for any other expert or qualified person.
122. Mr Christensen, in his Right of Reply, stated Alliance did not agree with the condition suggested by Ngāi Tahu because matters of payment should be dealt with outside of the consent process, noting there is no equivalent condition of consent in relation to payments to other experts who are referred to in the conditions.

Findings – Cultural Effects

123. I find that the cultural effects associated with the hydro scheme are intricately linked to its effects on fish passage, in particular of tuna and kanakana (eels and lamprey), both of which are a taonga species for Māori.
124. My findings on fish passage (both upstream and downstream) in the previous sections of this decision are therefore directly relevant to my findings on cultural effects. To this end, I find that the Applicant is adequately providing for upstream fish passage through the fish ladder over the weir and its trap and transfer programme. However, I consider there to be insufficient information on effects of the hydro scheme on the downstream fish passage. I consider that the Applicant should undertake its proposed downstream fish monitoring and then, as part of a re consenting process (at the same time as the MIE consent is going

⁸ Referred to in her evidence as Te Tangai [sic] a Tauria.

through its consenting process), a decision made on what mitigation measures, if any, need to be implemented to avoid or mitigate the measured adverse effects.

125. The proposed monitoring needs to focus not only on longfin eels but also other fish that migrate up and down the Mataura River at the subject site. Other native fish species are equally important to local iwi.
126. I find that the Applicant's proposed conditions adequately recognise the important kaitiaki role of Hokonui Rūnaka through its involvement in the development and implementation of the monitoring programme. I agree with Mr Christensen that the request for a condition requiring payment is a matter that should be dealt with outside of the consent process.

Overall Summary of Environmental Effects

127. I am required to assess the potential and actual environmental effects of the activities on an evidential basis. I have considered the expert evidence and the experience and observations of submitters, within the context of the relationship and values of tangata whenua and the statutory framework.
128. I am satisfied that the adverse effects on upstream fish migration are adequately mitigated, however, on the basis of the evidence presented, I consider there to be insufficient information on the potential and actual adverse effects of the hydro scheme on downstream fish passage. Significant questions remain as to the extent of adverse effects of the Applicant's hydro scheme, on its own and cumulatively with the MIE hydro scheme, on downstream fish migration.
129. The information gaps are proposed to be filled through implementation of the Applicant's proposed five-year monitoring programme, the results of which will inform the decision on what mitigation is required (if any) to avoid and or mitigate any adverse effects that are found. I find that this monitoring programme is generally appropriate but that it should not only focus on longfin eels but also other native fish, which are a taonga for local iwi, and salmonids.
130. The way in which the proposed thresholds were developed and justified during these proceedings, including following the close of the formal part of the hearing, leads me to have insufficient confidence in them being environmentally defensible thresholds to be imposed as conditions of consent. Further work needs to be done to determine not only the magnitude and significance of the effects of the Applicant's hydro scheme on downstream fish migration but, more importantly, the cumulative effects of both the Applicant's and MIE's hydro schemes.

131. I find that the proposed conditions as they relate to the potential mitigation measures which may need to be implemented retain too much discretion to the Applicant and they would leave the Consent Authority in a position of being an approver (arbiter) rather than a certifier when the Mitigation Plan is submitted for 'certification'. The Mitigation Plan would contain critical matters which should be properly evaluated and approved before being implemented. That approval cannot be undertaken by the Consent Authority as part of the certification process.
132. I conclude that the effect of the Applicant's hydro scheme on cultural values are intricately linked to its effects on fish passage, in particular for tuna and kanakana (eels and lamprey), both of which are a taonga species. I consider the Applicant's proposed conditions adequately recognise and provide for the important kaitiaki role Hokonui Rūnaka has for the area – this being provided for through its involvement in the development and implementation of the monitoring programme.

RMA SECTION 104(1)(ab) - ENVIRONMENTAL OFFSETS AND COMPENSATION

133. Section 104(1)(ab) of the RMA requires me to have regard to any measure proposed or agreed to by the Applicant for the purpose of ensuring positive effects on the environment to offset or compensate for any adverse effects on the environment that will or may result from allowing the activity.
134. No offsetting or compensation is being proposed, however the Applicant included offsetting as a potential mitigation measure in its proposed Mitigation Plan. No details of the proposed offsetting have been provided and both Fish & Game and Ngāi Tahu expressed concerns regarding the appropriateness of such offsetting in respect of this application. I discussed those concerns earlier in this decision.

RMA SECTION 104(1)(b) OF THE RMA - RELEVANT PLANNING PROVISIONS

135. I am required to have regard to the relevant objectives and policies of relevant specified statutory planning documents, which in this case are the:
- Southland Regional Policy Statement (RPS);
 - RWP;
 - PLWP;

- National Environmental Standard for Sources of Human Drinking Water Regulations 2007 (NES Drinking Water)
 - Resource Management (Measurement and Reporting of Water Takes) Regulations 2010;
 - Freshwater Fisheries Regulations 1983;
 - National Policy Statement for Freshwater Management 2014 (Freshwater NPS); and
 - National Policy Statement for Renewable Electricity Generation 2011 (NPSREG).
136. An analysis of the relevant planning provisions was provided in Section 6 of the AEE, and by Messrs West and Kyle and Ms MacKenzie. I note that Ms MacKenzie identified several provisions, in addition to those identified by Mr West, of the PWLP and the RPS which she considered relevant. I have had regard to all of the provisions outlined in evidence and do not propose to repeat them here.
137. There are various provisions in the planning documents which provide support to the hydro scheme, including because it involves an existing lawfully established structure and the use of a renewable energy resource.
138. The provisions include directions for me to consider various specified matters and values in deciding whether to grant the consents or not, including provisions which seek to maintain and/or enhance such values. These include cultural and ecological values.
139. As discussed earlier in this decision, I consider there to be insufficient information to conclude what the magnitude of the adverse effects of the hydro scheme are on downstream fish migration. This means I am unable to conclude whether the activity is entirely consistent with those policies relating to ecological values or whether the activity would fully achieve the objectives relating to such values.
140. There are provisions in the RWP and PLWP that require consideration of iwi management plans, in this case the relevant iwi management plan is Te Tangi a Tauira and I discuss that elsewhere in this decision.

RMA SECTION 104(1)(c) - OTHER RELEVANT MATTERS

141. Section 104(1)(c) requires me to have regard to any other matters that are relevant and reasonably necessary to determine the application. For this application these include:
- Water Conservation (Mataura River) Order 1997;
 - Te Tangi a Tauira;

- Fisheries (Declaration of Mātaitai Reserve at Matura River and Appointment of Tangata Tiaki/Kaitiaki) Notice 2005
 - Ngāi Tahu Freshwater Policy Statement; and
 - Southland Murihiku Conservation Management Strategy
142. The Water Conservation (Matura River) Order 1997 prohibits the damming of water but provides a specific exception for the weir provided its water permits are granted or renewed subject to similar terms and conditions to which the former permits were subject. That is the case here.
143. The Te Tangi a Tauria, being an iwi management plan, is of relevance to my consideration. Mr West provided a summary of (but no discussion on) the relevant provisions of this plan and Ms MacKenzie listed six additional policies from that plan which she considers relevant. I do not repeat the provisions here but record that I have had regard to them in making my decision.
144. I discuss the Matura River Mātaitai Reserve earlier in this decision and do not repeat it here.
145. Ms MacKenzie considered the Ngāi Tahu Freshwater Policy Statement to be relevant and Ms Blair stated this Policy Statement sets out the Ngāi Tahu policies in respect of freshwater. The Policy Statement includes objectives and policies related to mauri, mahinga kai, and kaitiakitanga. I have had regard to these provisions in making my decision.
146. Ms Williams stated the Southland Murihiku Conservation Management Strategy was relevant to consider and contained policies which require DoC to work Ngāi Tahu and others to protect indigenous tuna and their habitats. Ms Williams concluded that the provisions in the Southland Murihiku Conservation Management Strategy mostly provide guidance for DoC rather than being another matter for me to consider under section 104(1)(c). I agree and have therefore placed very little weight on the contents of the Strategy in making my decision.

RMA SECTION 104(2A) – VALUE OF INVESTMENT OF EXISTING CONSENT HOLDER

147. Section 104(2A) requires me to have regard to the value of investment of consent holder as this application relates to existing consents and section 124 of the RMA is applicable.

148. The Applicant has stated that the weir and hydro scheme have a capital value of approximately \$4 million. This is a significant investment and I have had regard to this in deciding to grant the consents.

RMA SECTION 104(6) – INADEQUATE INFORMATION TO DETERMINE APPLICATION

149. Section 104(6) allows me to decline an application for a resource consent on the grounds that I have inadequate information to determine the application.

150. While I have found that there is ‘insufficient’ information on the effects of the hydro scheme on downstream fish migration, the correct threshold of effect to trigger mitigation measures to be implemented, and certainty on what the mitigation measures (if required) will be, this does not, in my view, mean the information is ‘inadequate’ for me to determine the application.

151. ‘Insufficient’ and ‘inadequate’ have different meanings (but are often incorrectly used interchangeably). ‘Insufficiency’ relates to quantity whereas ‘inadequacy’ relates to quality. I have no evidence to suggest the information in front of me is not of a sufficient quality – it has been prepared and presented by experts – however there is not enough information/evidence on the actual effects.

152. In any case, section 104(6) of the RMA uses the words “*may decline*”, thereby making the use of this provision discretionary. Even if my interpretation of the meanings of insufficient and inadequate in the paragraph above are incorrect, I do not consider that the application should be declined on the grounds provided for by section 104(6) of the RMA.

RMA SECTIONS 105 AND 107

153. Section 105 of the RMA states that, when considering section 15 RMA matters (discharges), I must, in addition to section 104(1), have regard to-

- (a) *The nature of the discharge and the sensitivity of the receiving environment to adverse effects; and*
- (b) *The Applicant’s reason for the proposed choice; and*
- (c) *Any possible alternative methods of discharge, including discharge to any other receiving environment.*

154. Section 107(1) of the RMA states that I am prevented from granting consent allowing any discharge into a receiving environment which would, after reasonable mixing, give rise to all or any of the following effects, unless the exceptions specified in section 107(2) apply⁹:
- (c) *The production of any conspicuous oil or grease films, scums or foams, or floatable or suspended material:*
 - (d) *Any conspicuous change in the colour or visual clarity:*
 - (e) *Any emission of objectionable odour:*
 - (f) *The rendering of fresh water unsuitable for consumption by farm animals:*
 - (g) *Any significant adverse effects on aquatic life.*
155. Mr West covers both sections 105 and 107 of the RMA in his section 42A report and I adopt that assessment for the purposes of this decision.
156. I have had regard to the considerations outlined in section 105 of the RMA and am satisfied that none of the effects listed in section 107 of the RMA will occur after reasonable mixing as a result of the discharge of water to water from the hydro scheme.

RMA PART 2

157. The matters specified in section 104(1) that must be considered are ‘*subject to Part 2*’ of the RMA. These words, and how they apply to the consideration of resource consent applications, has been the subject of a number of cases heard in the Environment Court, High Court, and more recently the Court of Appeal.
158. The recently released Court of Appeal decision¹⁰ on RJ Davidson Family Trust v Marlborough District Council (**the Davidson decision**) provides the latest, and most authoritative, position on this matter. In summary, the Davidson decision directs that where the New Zealand Coastal Policy Statement (NZCPS) is relevant to an application and it is clear from the relevant NZCPS policies whether consent should be granted or refused, then there is no need for a decision maker to refer back to Part 2 RMA matters as it would not add anything to the required evaluative exercise – that is, separate recourse to Part 2 RMA matters is not required as those matters are already reflected in the NZCPS objectives and policies. As the Court of Appeal stated¹¹:

⁹ The exceptions being:

- (a) that exceptional circumstances justify the granting of the permit; or
- (b) that the discharge is of a temporary nature; or
- (c) that the discharge is associated with necessary maintenance work—and that it is consistent with the purpose of this Act to do so

¹⁰ CA97/2017 [2018] NZCA 316

¹¹ At para [71]

“Putting it another way, even if the consent authority considered pt 2, it would be unlikely to get any guidance for its decision not already provided by the NZCPS. But more than that, resort to pt 2 for the purpose of subverting a clearly relevant restriction in the NZCPS adverse to the applicant would be contrary to King Salmon and expose the consent authority to being overturned on appeal”.

159. The Davidson decision also provides guidance on whether Part 2 RMA matters need to be considered where the NZCPS provisions do not provide clear guidance on whether consent should be granted or refused, and situations for applications where the NZCPS is not relevant – the latter being the case for the current application as the NZCPS is not relevant. In both situations the decision maker needs to determine whether the relevant plan has been ‘competently prepared’ under the RMA – that is, whether it contains a coherent set of policies designed to achieve clear environmental outcomes. If the relevant plan meets these criteria then there is no need to consider Part 2 RMA matters, and if the relevant plan does not meet these criteria then the decision maker should consider Part 2 RMA matters and determine whether they provide assistance in making a decision on the application.
160. I heard no evidence to suggest the relevant plan(s) has not been competently prepared under the RMA. As such, according to directions provided by the Court in the Davidson decision, there is no need for me to consider Part 2 RMA matters for this application.

CONCLUSION AND OVERALL DETERMINATION

161. On the basis of the evidence that was put in front of me by the Applicant, submitters, and Mr West, I consider it is not presently possible to conclusively state one way or the other whether the activities are resulting in acceptable environmental effects in respect of downstream fish migration. The Applicant has not undertaken any monitoring to assess these effects even though the hydro scheme has been operating for many years. The Applicant acknowledges that further investigation is required to quantify the effect and it is proposing to fill the information gaps through a five-year monitoring programme, the results of which will inform a decision on what mitigation is required (if any) to avoid and or mitigate any adverse effects that are found. This monitoring programme is considered to be generally appropriate but it should not only focus on longfin eels (as proposed by the Applicant) but should include other native fish, which are a taonga for local iwi, and salmonids.
162. I have insufficient confidence on the proposed numeric thresholds and do not consider them to be environmentally defensible and inappropriate to be imposed as conditions of consent. Further work needs to be done to determine not only the magnitude and

significance of the effects of the Applicant's hydro scheme on downstream fish migration but, more importantly, the cumulative effects of both the Applicant's and MIE's hydro schemes.

163. I find that the proposed conditions as they relate to the potential mitigation measures that might be implemented retain too much discretion to the Applicant and they would leave the Consent Authority in a position of being an approver (arbiter) rather than a certifier when the Mitigation Plan is submitted for 'certification'. The Mitigation Plan would contain critical matters which should be properly evaluated and approved before being implemented. That approval cannot be undertaken by the Consent Authority as part of the certification process.
164. Whilst the adverse effects on upstream migration are also unquantified, the Applicant's trap and transfer programme and fish ladder over the weir are appropriate mitigation measures and I therefore conclude the effects on upstream migration of fish to be acceptable.
165. I conclude that the effects on cultural values is intricately linked to the effects on fish, in particular tuna and kanakana (eels and lamprey) which are taonga species. Provided the effects on these species are found to be avoided and/or appropriately mitigated then I consider effects on cultural values would also be appropriate. However, as the effects on downstream fish migration are currently unknown, I cannot determine whether cultural effects are acceptable. Despite this, I find that the Applicant's proposed conditions adequately recognise and provide for the important kaitiaki role of Hokonui Rūnaka through its involvement in the development and implementation of the monitoring programme.
166. The cumulative effects of the Applicant's hydro scheme and that operated by MIE on downstream fish migration are also currently unknown and unquantified. Cumulative effects need to be determined and both schemes should be considered together so that these effects can be appropriately considered and a decision can then be made on what appropriate mitigation measures, if any, should be implemented. This should be done following the five-year monitoring programme proposed by the Applicant, which is very close to the time the MIE consents are due to expire. For these reasons I conclude the consents for the Applicant should have a common expiry with that of the MIE consents. Common expiry dates are not just used for the purposes of equitable allocation of resources (e.g. water) or for 'administrative convenience' as Mr Christensen suggested, but are also used so that cumulative effects can be considered – that is particularly relevant in this case.
167. The evidence I heard clearly suggests that installation of an effective fish screen would have satisfied the concerns of the three submitters and Mr West. An effective fish screen would appropriately avoid and/or mitigate potential effects on downstream fish migration. However, the design, installation, and maintenance of an effective fish screen would be a

significant investment and I have insufficient evidence in front of me to 'require' the installation of such a screen. I understand and accept the Applicant's position that it wants to gather information on the magnitude of adverse effect before having to spend significant money on mitigation measures.

Conditions

168. There have been several iterations of conditions over the course of the hearing process. Mr West presented a recommended set in his section 42A report and the Applicant has put forward several versions. I have given the submitters and Mr West the opportunity to comment on the Applicant's final set of conditions and I have considered all the comments provided.
169. I have used the Applicant's final set of proposed conditions as a starting point for the conditions I have imposed. However, as discussed in this decision, I have determined that the consents should be granted for a shorter period and that the downstream fish monitoring should be undertaken to fill the information gap. As such, no thresholds or triggers for the Mitigation Plan to be implemented have been included. The decision on mitigation (if necessary) would occur when the new consents are applied for, this being at the same time as the MIE consents are applied for.
170. One condition that I have made more significant changes to is Condition 3 relating to the inspection of the fish ladder. I consider that the independent fisheries biologist should inspect the ladder and prepare a report (the Fish Ladder Review Report) on the findings of this inspection, including recommendations, if any, of any amendments needed to the fish ladder to ensure it is able to function properly. If the Fish Ladder Review Report contains any recommendations for amendments to the fish ladder, then these will need to be implemented within three months of the report being submitted to the Consent Authority. Once the amendments are made the Consent Holder would need to arrange for the independent fisheries biologist to reinspect the fish ladder to confirm that the recommended amendments have been appropriately made.
171. The other substantive change I have made relates to the Downstream Eel Migration Monitoring Programme. This monitoring needs to include other native fish and salmonids for the reasons I discuss earlier in this decision. I have renamed this the 'Downstream Fish Migration Monitoring Programme' and have included an advice note to encourage the Consent Holder to develop and implement the Monitoring Programme in collaboration with the holder of consents 203311 (currently being MIE) so that the cumulative effects of both hydro schemes are properly assessed by the monitoring.

172. I do not consider that a Mitigation Plan has to be developed and submitted to the Consent Authority as a consent condition on these consents. The Applicant will need to identify what mitigation measures it considers are necessary at the conclusion of the monitoring programme – those mitigation measures would then be described/outlined in the application for replacement consents and a decision on the appropriateness of those measures would then be assessed (and the supporting evidence tested) as part of that consent process.
173. I have changed the conditions which outline the ‘certification’ process for the Elver Trap and Transfer Plan and the Downstream Fish Monitoring Programme.
174. The section 128 RMA condition has been changed and now provides the Consent Authority with the opportunity to review the conditions of consent should the annual Monitoring Report identify that significant adverse effects on downstream fish migration are occurring. The Monitoring Report needs to identify the magnitude of the potential or actual adverse effects of the hydro scheme on downstream fish migration and this information would be able to be used by the Consent Authority to instigate such a review.
175. I have made a number of typographical corrections and changes to improve the clarity and readability of conditions without changing their intent.
176. The conditions I have imposed relate to the actual and potential effects of the proposed activities, and are enforceable, reasonable and appropriate. I record that the conclusions reached on adverse effects, and my subsequent decision to grant the application, rely heavily on the Applicant fully complying with these conditions.

Duration

177. The Applicant has sought a 25-year duration for the resource consents.
178. Mr West recommended an eight-year duration¹² so that the expiry coincides with the expiry of the MIE consents.
179. All three written submissions considered a five-year duration to be appropriate so that the appropriate monitoring is undertaken, and solutions found for the upstream and downstream migration of fish. However, at the hearing all three submitters stated their preference was that the consents have a common expiry with the MIE consents.

¹² I understand Mr West's recommended eight-year term to apply to the expiry date of the Applicant's existing consents (being 30 June 2017), not eight years from the granting of any new consents. I have assumed this same logic applies to the three submitters who changed their position from a five-year term to an eight year term. In any case, Mr West and the submitters made it clear that they supported a common expiry date with the MIE consents.

180. During the hearing I asked various witnesses whether a longer-term consent as applied for by the Applicant together with a condition enabling the Consent Authority to review the conditions of consent under section 128 of the RMA at the time of the MIE consents being replaced was an option worth considering.
181. The Applicant's final set of proposed conditions included a new condition which would allow the Consent Authority to instigate a review under section 128 of the RMA "*Within three months of any consents being issued which replace existing consent 203311*" (consent 203311 being the MIE consents).
182. Mr Smyth stated that section 128 RMA reviews are difficult and cannot be triggered by third parties such as Fish & Game.
183. Ms Williams stated that the proposed wording would mean the Applicant's consent would only be able to be reviewed following the completion of the MIE consent renewal process. She said this does not meet the intention of Policy 14A(i) in the operative RWP which requires consideration to be given to applying a common expiry date for water permits when determining the term of a water permit. Ms Williams stated DoC continues to oppose the use of section 128 of the RMA.
184. Ngāi Tahu states that linking the Applicant's consent with the MIE consents by way of a section 128 RMA does not address a range of matters such as:
- The uncertainty of the effects on fish passage and cultural values;
 - The conditions are limited to the effects on downstream migrating female tuna and not other fish species;
 - The review is at the Consent Authority's discretion; and
 - The review process is limited to the Consent Authority and the Consent Holder, none of the submitters would be able to participate.
185. Having considered all the comments provided, the Applicant's proposed section 128 review condition, and the reasons why a common expiry date with the MIE consents is appropriate, I do not consider a longer-term duration with a such a section 128 RMA condition to be appropriate.
186. Policy 14A of the RWP and Policy 40 of the PLWP deal with matters to be considered when setting consent durations. Those considerations include:
- The degree of certainty of adverse effects – shorter durations where there is uncertainty on such effects
 - Relevant tangata whenua values

- Duration sought by the applicant (including reasons)
 - Permanence and economic life of the activity
 - Capital investment in the activity
 - Monitoring and review requirements in conditions
 - Desirability of applying a common expiry date for permits that allocate water from the same resource
187. In addition, Mr West, in his 'Key matters' statement tabled during the hearing, noted that he had not specifically discussed item 6 of Policy 40 of the PWLP which requires me to consider '*...the applicant's adoption, particularly voluntarily, of good management practices*'. He stated that there had been very little monitoring or mitigation over the time the activity has occurred.
188. I have had regard to the matters set out in Policy 14A of the RWP and Policy 40 of the PLWP in setting the duration of the consents.
189. In summary, a common expiry date with the MIE consents (i.e. 7 November 2026) is appropriate in this case to enable the Applicant to undertake its monitoring programme to assess the effects of its hydro scheme on downstream fish migration, including cumulative effects.

DECISION

For the above reasons, it is my decision on behalf of Environment Southland, pursuant to sections 104, 104B, and 108, and subject to Part 2 of the Resource Management Act 1991, to **GRANT** the following resource consents to Alliance Group Limited, subject to terms and conditions set out in Appendix 1, attached to this decision:

- AUT.20171566-01 To dam, divert, and use water for hydro-electric power generation; and
AUT.20171566-02 To discharge water from a hydro-electric scheme into the Mataura River.

Dated this 28th day of February 2019



Dr Rob Lieffering
Independent Hearing Commissioner

APPENDIX 1 – Conditions

- 1 This consent shall expire on 7 November 2026.
- 2 The water diversion authorised by this consent shall not cause the flow at the centre of the existing weir on the Mataura River to fall below a depth of 0.05 metres.
- 3 The Consent Holder shall maintain a monitoring system to provide immediate warning to its staff that the flow at the centre of the existing weir on the Mataura River is approaching a depth of 0.05 metres so that the rate of diversion of water is reduced or ceased to ensure the requirement of condition 2 is always met.
- 4 No alteration to the existing weir or diversion channel shall be carried out by the Consent Holder without the written approval of the Consent Authority.
- 5 When a reduction or cessation in the rate of diversion of water is necessary to comply with condition 2, the Consent Holder shall notify the Consent Authority (email: escompliance@es.govt.nz) of the reduced rate or cessation immediately.

Advice Note: The required reduction in rate of diversion to achieve compliance with condition 2 may be achieved by a combination of reduced rate by the Consent Holder and a similar level of reduction in the rate of diversion undertaken by the holder of consent 203311. This arrangement cannot be imposed as a consent condition on either of the two consents and it is recommended that this be formalised between the two consent holders by way of a side agreement.

Fish Ladder

- 6 (a) The Consent Holder shall maintain a fish ladder across the weir structure at all times.
(b) Within twelve months of the date of commencement of this consent the fish ladder shall be inspected by a suitably qualified, independent and experienced freshwater fisheries biologist (the Biologist) to assess whether it adequately provides for the upstream passage of salmonids that would normally migrate past this point in the river. A report (the Fish Ladder Review Report) prepared by the Biologist on the findings of this inspection, including recommendations, if any, of any amendments needed to the fish ladder to ensure its ability to function adequately, shall be prepared and provided to the Consent Authority, Attention: RMA Compliance and Enforcement Manager (or their equivalent) within one month of the inspection.
(c) If the Fish Ladder Review Report contains any recommendations for amendments to the fish ladder, then these shall be implemented within three months of the report being submitted to the Consent Authority. Once the amendments are made the Consent Holder shall arrange for the Biologist to reinspect the fish ladder to confirm that the

recommended amendments have been appropriately made. A letter/report from the Biologist shall be provided to the Consent Authority within one month of the reinspection confirming that the recommended amendments have been appropriately made to the fish ladder.

(d) A Fish Ladder Operation and Maintenance Plan shall be provided to the Consent Authority, Attention: RMA Compliance and Enforcement Manager (or their equivalent) within three months of either the Fish Ladder Review Report or the reinspection letter/report (if one was needed) having been provided to the Consent Authority. The Consent Holder shall implement the Fish Ladder Operation and Maintenance Plan once it has been provided to the Consent Authority .

Elver Trap and Transfer Plan

- 7 Within six months of the date of commencement of this consent the Consent Holder shall submit an Elver Trap and Transfer Plan ('the Plan') to the Consent Authority, Attention: RMA Compliance and Enforcement Manager (or their equivalent) for certification.

The Plan shall be prepared by a suitably qualified, independent and experienced freshwater fisheries biologist and shall be in general accordance with the draft Elver Trap and Transfer Plan for Mataura Falls attached as part of the section 42A report, dated 3 November 2018 (prepared by Vaipuhi Consulting: V3.0 March 2018). Hokonui Rūnaka shall be invited to enter into a partnership with the Consent Holder to contribute to the preparation of the Plan. This invitation shall be extended to Hokonui Rūnaka at the commencement of this consent in order to allow sufficient time to be available to meet the requirements of this condition.

The objective of the Plan shall be to facilitate a trap and transfer system to maintain and enhance the upstream passage of elvers over the Mataura Falls and the weir structure and their transfer back into the mainstem of the river during those times of the year that elvers are most likely to migrate upstream.

The Plan shall include details relating to:

- (a) The design specifications of the trap and transfer system. This shall be prepared in accordance with the Best Practice Guidelines for the Passage of Fish at Hydroelectric Dams. Part 1: Upstream Migrants (Paterson and Boubee 2010) or any revisions of these guidelines;
- (b) When inspections of the base of the Mataura Falls (both sides) will commence and the frequency of such inspections necessary to identify elver accumulation;

- (c) The triggers that determine when the trap will be installed. This shall be determined based on the quantum of elvers identified at the base of the Mataura Falls;
 - (d) The frequency of necessary inspections of the trap system during its operation and transfer requirements;
 - (e) The triggers that will allow for the trap to be removed at the end of the migration season;
 - (f) Annual reporting requirements;
 - (g) Details of maintenance requirements;
 - (h) Review requirements; and
 - (i) Predator management.
- 8 The Consent Holder shall submit a draft of the Elver Trap and Transfer Plan ('Draft Plan') to the Department of Conservation Attn: Operation Manager Murihiku (or equivalent), Hokonui Rūnaka Attn: The Chair, Te Ao Marama Inc Attn: Kaupapa Kaiao Manager (or equivalent), and the Southland Fish and Game Council Attn: Manager Southland Fish and Game (or equivalent) for comment prior to submitting the Final Trap and Transfer Plan to the Council for certification. The Draft Plan shall be provided to these organisations at least 40 working days prior to its submission for certification to the Consent Authority.
- 9 Upon receipt of the Draft Plan required by condition 8, the organisations listed in that condition shall be provided with the opportunity to participate in a collaborative workshop with the Consent Holder to discuss and review the Draft Plan. The Consent Holder shall circulate a record of the discussion to those organisations within 5 working days of the completion of the workshop. Those organisations shall be given the opportunity to provide oral feedback at the workshop and written feedback to the Consent Holder on the Draft Plan within 15 working days of the completion of the workshop. If no feedback is received by that deadline the Consent Holder can consider that the organisation which has not responded has no further comments on the Draft Plan.
- 10 The Consent Holder shall provide any feedback received from the organisations listed in condition 8 on the Draft Plan to the Consent Authority at the time it is submitted for certification, along with a clear explanation of where any comment has or has not been incorporated into the Plan and the reasons why.
- 11 The Consent Holder shall be required to implement the requirements of the certified Elver Trap and Transfer Plan prepared in accordance with condition 7 on an annual basis. Trap and transfer work shall be undertaken by a suitably qualified and licensed person

with a special permit from the Ministry of Primary Industries (MPI) to take, transfer and release fish under the Fisheries Act 1996, and a transfer and release permit from MPI under the Conservation Act 1987.

If river flow conditions require the trap to be removed, the trap shall be reinstated as soon as it is practical to do so, but no longer than 24 hours after river conditions improve and it is considered safe to reinstall the trap.

The Elver Trap and Transfer Plan shall be reviewed annually and, if amendments are required, a revised Plan shall be submitted to the organisations listed in condition 8 and the Consent Authority at least 40 working days prior to the intended start of the next trap and transfer programme. If a revised Plan is prepared the collaborative process specified under condition 9 shall be offered to the organisations listed in condition 8 afresh.

- 12 The Consent Holder shall invite Hokonui Rūnaka to work in partnership with it to observe the trap and transfer programme and, if requested, to assist with the implementation the Plan.
- 13 Following implementation of the Elver Trap and Transfer Plan the Consent Holder shall ensure that a report is prepared and provided to the organisations listed in condition 8 and to the Consent Authority by the 30th April each year. This report shall contain the following details:
 - (a) The date inspections started;
 - (b) Date the trap was installed and removed, including during the migration season;
 - (c) Relevant environmental variables including daily river flow, water temperature, and rainfall during trapping;
 - (d) Weight of elvers transferred;
 - (e) Details of any by-catch caught, including species, size, condition, injuries/death and release locations of live by-catch;
 - (f) Transfer location(s) of elvers and other fish species;
 - (g) Any amendments identified as being necessary to the Trap and Transfer Plan for the following season; and
 - (h) Any matters raised by Hokonui Rūnaka that would assist with the implementation of the Trap and Transfer Plan in subsequent seasons.

Downstream Fish Migration Monitoring Programme

- 14 Within six months of the date of commencement of this consent the Consent Holder shall submit a Downstream Fish Migration Monitoring Programme ('Monitoring Programme') to

the Consent Authority, Attention: RMA Compliance and Enforcement Manager (or their equivalent) for certification.

The Monitoring Programme shall be prepared by a suitably qualified, independent and experienced freshwater fisheries biologist and shall be in general accordance with the draft 'Downstream Eel Monitoring Programme for Mataura Falls' attached as part of the section 42A report, dated 3 November 2018 (prepared by Vaipuhi Consulting: V3.0 March 2018). Hokonui Rūnaka shall be invited to enter into a partnership with the Consent Holder to contribute to the preparation of this plan. This invitation shall be extended to Hokonui Rūnaka at the commencement of this consent in order to allow sufficient time to be available to meet the requirements of this condition.

The primary objective of the Monitoring Programme shall be to set out how monitoring of the effects of the hydro scheme on the downstream migration of fish should be undertaken.

The primary purpose of the Monitoring Programme shall be to identify if fish are entering the turbine and, if so, how many, their size, and species are entering the turbine during the eel migration period. This monitoring information shall be used to determine what, if any, adverse effects the hydro scheme is having on downstream fish migration and the magnitude of any such effects, including on a cumulative basis, taking into account the likely corresponding effects created by the diversion authorised by consent 203311. The timing of eel movement to the turbine within the migration period shall also be investigated. To assist with the implementation of this Monitoring Programme the trash screen bar size shall be modified and maintained at all times so that the spacing between the bars does not exceed 20 millimetres.

The Monitoring Programme shall include details relating to:

- (a) Modifications required to the race, trash screen, screen cleaner and trash sluice to assist the inspection process;
- (b) Monitoring dates which are targeted at ensuring that the eel migration season is properly covered by the investigations;
- (c) Screen inspection frequencies, including the need to increase frequencies during elevated flow events;
- (d) Methods for determining:
 - (i) The numbers of fish diverted from the mainstem of the Mataura River into the diversion channel;

- (ii) The number and condition of fish entrapped in the race and protocols for the handling, captive holding, transportation and release of these fish back to flowing water in the mainstem of the river downstream of the Mataura Falls; and
 - (iii) The numbers of fish, including injury and mortality rates, passing through the trash screen and into the turbine.
- (e) Protocols for inspecting the screen and the sluice for impinged fish and methods to be employed to maximise their survival as far as is practicable, including minimising the risk of injury to fish from impingement on the screen and/or mechanical cleaning of the screen;
 - (f) The recording and reporting obligations associated with monitoring undertaken;
 - (g) Review of the programme and procedure for modifications particularly if mortality and injuries rates to fish increase;
 - (h) Any predator management required;
 - (i) Provision for Hokonui Rūnaka to work in partnership with the Consent Holder and to participate in the Monitoring Programme, including observation of the monitoring of the trash screen and holding chute and the fish collection and monitoring process;
 - (j) Protocols for the storage of eel carcasses and their subsequent provision to Hokonui Rūnaka; and
 - (k) Protocols for removing eel otoliths and their issuance to NIWA or a suitable alternative entity for analysis. The results of this analysis shall be provided to Hokonui Rūnaka 30 days after it is received by the Consent Holder.

Advice Note: *The Consent Holder is encouraged to develop and implement the Monitoring Programme in collaboration with the holder of consents 203311 which associated with the operation of the hydro scheme on the opposite side of the Mataura River so that the cumulative effects of both hydro schemes are properly assessed by the monitoring.*

- 15 The Consent Holder shall provide copies of a Draft Downstream Fish Migration Monitoring Programme ('Draft Monitoring Programme') to the Department of Conservation Attn: Operation Manager Murihiku (or equivalent), Hokonui Rūnaka Attn: The Chair, Te Ao Marama Inc Attn: Kaupapa Kaiao Manager (or equivalent), and the Southland Fish and Game Council Attn: Manager Southland Fish and Game (or equivalent) for comment prior to submitting the Final Monitoring Programme to the Consent Authority for certification. The Draft Monitoring Programme shall be provided to

- these organisations at least 40 working days prior to its submission for certification to the Consent Authority.
- 16 Upon receipt of the Draft Monitoring Programme required by condition 15, the organisations listed in that condition shall be provided with the opportunity to participate in a collaborative workshop with the Consent Holder to discuss and review the Draft Monitoring Programme. The Consent Holder shall circulate a record of the discussion to those organisations within 5 working days of the completion of the workshop. Those organisations shall be given the opportunity to provide oral feedback at the workshop and written feedback to the Consent Holder on the Draft Plan within 15 working days of the completion of the workshop. If no feedback is received by that deadline the Consent Holder can consider that the organisation which has not responded has no further comments on the Draft Monitoring Programme.
- 17 The Consent Holder shall provide any feedback received on the Draft Monitoring Programme to the Consent Authority at the time it is submitted for certification, along with a clear explanation of where any comment has or has not been incorporated into the draft Monitoring Programme and the reasons why.
- 18 The Consent Holder shall implement the certified Downstream Fish Migration Monitoring Programme on an annual basis for the first five years following date of commencement of this consent. The person undertaking the monitoring shall be either a suitability qualified and experienced person or a person who has been trained in the handling and measuring of fish for scientific studies by a suitably qualified and experienced person.
- The Downstream Fish Migration Monitoring Programme may be reviewed annually by the Consent Holder and if amendments are required a revised Monitoring Programme shall be submitted to the organisations listed in condition 15 and the Consent Authority at least 40 working days prior to the intended start of the next monitoring period. If a revised Monitoring Programme is prepared the collaborative process available under condition 16 shall be offered to the organisations listed in condition 15 afresh.
- 19 Following each annual monitoring campaign carried out to meet the requirements of the Downstream Fish Monitoring Programme, the Consent Holder shall engage a suitably qualified, independent and experienced freshwater fisheries biologist to prepare a report ('the Monitoring Report') that: 1) summarises the results of the monitoring; 2) assesses the actual propensity for entrapment of fish within the intake channel and for entrapped fish to enter the turbine; and 3) provides a recommendation as to whether it is necessary to design and implement different option(s) for monitoring.

As a minimum the Monitoring Report shall:

- (a) Include a summary of all data collected as required under the conditions of this consent and the Downstream Fish Migration Monitoring Programme with regard to impacts on downstream fish migration including the number and species of fish that were impinged on the screen and would otherwise have entered the turbine operated by the Consent Holder and their fate;
 - (b) Critically analyse the information collected in accordance with the conditions of this consent, in terms of identifying the magnitude of the potential or actual adverse effects of the hydro scheme on downstream fish migration;
 - (c) Critically evaluate the data in order to recommend whether alterations/additions to the monitoring programme are required;
 - (d) Include a summary of the fate of fish that have been collected as part of the Downstream Fish Monitoring Programme, including the numbers of fish released back into the mainstem of the Mataura River below the Mataura Falls; and
 - (e) Any matters raised by Hokonui Rūnaka that would assist with the implementation of the Downstream Fish Migration Monitoring Programme in subsequent seasons.
- 20 The Monitoring Report required by condition 19 shall be submitted to the Consent Authority within 30 working days of the annual monitoring required by condition 18 being completed and a copy of the Monitoring Report shall also be provided to the Department of Conservation Attn: Operation Manager Murihiku (or equivalent), Hokonui Rūnaka Attn: The Chair, Te Ao Marama Inc Attn: Kaupapa Kaiāo Manager (or equivalent), and the Southland Fish and Game Council Attn: Manager Southland Fish and Game (or equivalent).
- 21 Where the Consent Holder is required to submit the Elver Trap and Transfer Plan and Downstream Fish Migration Monitoring Programme (each hereafter constituting a 'document') to the Consent Authority for "certification" it shall mean the process set out in the following paragraphs (a) to (d) and the terms "certify" and "certified" shall have the equivalent meanings:
- (a) The Consent Holder supplies the document to the Consent Authority, Attention: RMA Compliance and Enforcement Manager (or their equivalent), and the council assesses the document submitted to ensure it achieves the requirements of the relevant condition(s) of consent (this will include that the document proposed for certification meets the objective(s) and content requirements set out in the condition(s));
 - (b) Should the document supplied in accordance with (a) above, in the opinion of the Consent Authority, achieve the requirements of the relevant condition(s), the Compliance and Enforcement Manager (or their equivalent) will issue a written

confirmation to the Consent Holder that the requirements of the relevant condition(s) have been satisfied;

- (c) If the Consent Authority is not satisfied that the document supplied is in accordance with (a) above achieves the requirements of the relevant condition(s), the Compliance and Enforcement Manager (or their equivalent) will advise (in writing) the Consent Holder of the Consent Authority's concerns and ask that the document be modified so as to address the concerns, and then be resubmitted;
 - (d) This process shall be repeated until the Compliance and Enforcement Manager (or their equivalent) is able to certify that the requirements of the applicable condition(s) have been satisfied.
- 22 Where no written confirmation, pursuant to either Conditions 21(b) or 21(c), is provided within 20 working days of document being provided to the Consent Authority, the document shall be deemed to be certified for the purpose of the respective condition to which the document pertains.
- 23 The Consent Authority may serve notice of its intention to review the conditions of this consent in terms of section 128 of the Act as follows:
- (a) Within three months of receiving the annual Monitoring Report required by condition 19 of this consent, should the monitoring identify that significant adverse effects on downstream fish migration are arising.

Appendix 6 – Maitara River Weir Fish Ladder Inspection

report



February 2020
**Mataura River Weir
Fish Ladder Inspection**

Submitted to:
Alliance Group Limited

Prepared by: Phil Taylor
Freshwater Ecologist



Reviewed by: Richard Montgomerie
Director



Status: Final

18 February 2020

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1.0 Introduction

1.1 Background

Alliance Group Limited (Alliance) have recently had their Hydro consent renewed. Condition 6 of the consent requires that, within 12 months, Alliance must have the fish ladder inspected and a report on the inspection must be provided to within 1 month of the inspection. This report outlines the detail of the fish ladder inspection and provides an assessment in relation to whether the fish ladder will provide passage for migrating salmonids at this point in the river.

1.2 Resource consent

Alliance's Hydro consent states:

- (a) *The Consent Holder shall maintain a fish ladder across the weir structure at all times.*
- (b) *Within twelve months of the date of commencement of this consent the fish ladder shall be inspected by a suitably qualified, independent and experienced freshwater fisheries biologist (the Biologist) to assess whether it adequately provides for the upstream passage of salmonids that would normally migrate past this point in the river. A report (the Fish Ladder Review Report) prepared by the Biologist on the findings of this inspection, including recommendations, if any, of any amendments needed to the fish ladder to ensure its ability to function adequately, shall be prepared and provided to the Consent Authority, Attention: RMA Compliance and Enforcement Manager (or their equivalent) within one month of the inspection.*
- (c) *If the Fish Ladder Review Report contains any recommendations for amendments to the fish ladder, then these shall be implemented within three months of the report being submitted to the Consent Authority. Once the amendments are made the Consent Holder shall arrange for the Biologist to reinspect the fish ladder to confirm that the recommended amendments have been appropriately made. A letter/report from the Biologist shall be provided to the Consent Authority within one month of the reinspection confirming that the recommended amendments have been appropriately made to the fish ladder.*
- (d) *A Fish Ladder Operation and Maintenance Plan shall be provided to the Consent Authority, Attention: RMA Compliance and Enforcement Manager (or their equivalent) within three months of either the Fish Ladder Review Report or the reinspection letter/report (if one was needed) having been provided to the Consent Authority. The Consent Holder shall implement the Fish Ladder Operation and Maintenance Plan once it has been provided to the Consent Authority.*

1.3 Scope

This report has been written to meet Alliance's consent conditions and is based on visual observations at the time of the site inspection, drone and ordinary photographs and a desktop review. This report considers salmonids only and was undertaken prior to the 100-yr flooding event in early February 2020.

2.0 Salmonids in the Mataura River

2.1 Breeding patterns of salmonids in the Mataura River

There are two salmonid species in the Mataura River: Brown trout (*Salmo trutta*), Chinook salmon (*Oncorhynchus tshawytscha*). In terms of the distribution and breeding patterns of Brown trout in the Mataura River, Zane Moss, Southland Fish and Games Regional Manager's statement of evidence presented at the Alliance hearing on the hydrorace states:

“Adult and juvenile brown trout can be encountered throughout the Mataura River system. That said, the migratory behaviour of brown trout in the Mataura River is not fully understood. It is known, however, that the brown trout population of the Mataura River is mobile and that there are both upstream and downstream movements associated with their life cycle, including spawning and juvenile recruitment.”

Moss (2018) also says that even though brown trout spawning occurs throughout the river (i.e., upstream and downstream of Mataura Falls), the majority of the productive spawning habitat utilised by brown trout in the Mataura catchment is most likely to be upstream of the Mataura Falls.

Little is known about the distribution, abundance and spawning behaviour of salmon in the Mataura River.

3.0 Fish Ladder Inspection

3.1 Visual inspection

A site visit to inspect the fish ladder was undertaken in accordance with the consent requirements. The first inspection took place on 26 February 2019 whilst the most recent occurred on 22 January 2020 prior to the 100-yr flooding event on 5 February 2020.

Photographs of the weir were taken by Freshwater Solutions and drone footage captured by Alliance staff at the time of the 22 January 2020 inspection.

Between the Mataura Falls and the weir there is a shallow bedrock dominated 270 m length of river. At low flow most of the flow is in a channel that is located near the centre of the river. At higher flows the entire bedrock channel is covered with swiftly flowing water.

The fish ladder itself is a 'pool and weir' ladder (Figure 1 and Figure 2), which are designed primarily to provide plunging flow and resting areas that provide leaping fish with hydraulic assistance in moving upstream. From the photographs it is evident that the fish ladder, being located mid-stream in the main channel of flow provides a well-situated entrance and flows that are 'attractive' so that they are drawn away from other areas during migration. During periods of low flow, the river flow is concentrated in the centre of the channel almost immediately downstream of the fish ladder, which provides a clear cue or hydrological attractant to trout (Figure 3).

It was also noted from the inspection that there was no sediment build up in the resting pools on the fish ladder and that there appeared to be no structural damage (Figure 4). There was some woody debris caught at the top of the structure at the time of the inspection (Figure 4).



Figure 1. Pool and weir ladder at the Matura River Weir.



Figure 2. Fish ladder looking across to the true-left bank.



Figure 3. Drone photo view of top of the ladder.



Figure 4. Close up of the fish ladder showing debris caught at the top of the weir.

4.0 Summary and Conclusion

The fish ladder at the Mataura River weir was inspected to assess whether it was still functioning as an effective fish passage structure.

The visual inspection found no structural damage to the fish ladder. The fish ladder appeared to be functioning as designed at the time of the inspection. There was a small amount of wood debris caught at the top of the fish ladder.

Assuming the original design was fit for purpose and because it was not damaged at the time of the inspection it is assumed the ladder continues to provide passage for salmonids that are able to traverse the Mataura Falls.

The Mataura Falls are located 270 m downstream of the fish ladder and are a significant natural barrier to all fish species. This means the upstream fish ladder only presents a barrier to those fish that have already negotiated the Falls. Bunt et al. (2012) note that salmonids are generally strong swimmers that can negotiate their way upstream via a wide array of fishways, with close to 100% passage efficiency in some structures such as pool and weir ladders similar to the one on the Mataura River weir.

Perhaps the strongest evidence that the fish ladder is functioning as intended are reports from a senior Alliance staff member whom reported seeing trout (or possibly salmon) successfully using the ladder.

No further work on the fish ladder is recommended based on results of the inspection undertaken. It is recommended that Alliance undertake regular visual checks and that any damage, if it occurs, be remedied as soon as practicable.

5.0 References

- Bunt, C.M., Castro-Santos, T and A. Haro. 2012. Performance of fish passage structures at upstream barriers to migration. *River Research and Applications*, 28: 457-478.
- Freshwater Solutions Ltd. 2019. Assessment of the Effects of Alliance Mataura's Discharges and Water Take on Mataura River and Toetoes Estuary.
- Moss, Z. N. 2018. Statement of evidence of Zane Nigel Moss on behalf of Southland Fish & Game Council. 28 November 2018.