BEFORE THE SOUTHLAND REGIONAL COUNCIL

IN THE MATTER OF	The Resource Management Act 1991
AND	
IN THE MATTER OF	Application by Alliance Group Ltd for renewal of resource consents that authorise the operation of a hydroelectricity power plant at Mataura, Southland.

STATEMENT OF EVIDENCE BY MARK RICHARD JAMES

21 NOVEMBER 2018

INTRODUCTION

1. My full name is Mark Richard James.

QUALIFICATIONS AND EXPERIENCE

2. I am an aquatic ecologist holding the following degrees, BSc Victoria University, Wellington; BSc (Hons) Victoria University, Wellington and PhD (Aquatic Biology), University of Otago, Dunedin.

3. I have a background in basic and applied research in marine and freshwater ecology and biology with over 39 years' experience including research, consulting and management of science organisations.

4. Following two years with the Institute of Nuclear Sciences, Department of Scientific & Industrial Research (DSIR) I was employed in 1982 by the Taupo Research Laboratory, DSIR, then moved to Christchurch in 1992 as a scientist with the National Institute of Water & Atmospheric Research (NIWA). In 1994 I was appointed as a Project Director and led large multi-disciplinary Foundation for Research, Science & Technology (FRST) funded programmes including "Lake Ecosystems" and "Sustainability of coastal ecosystems". In 2000 I moved to Hamilton to take up the position of Regional Manager with NIWA and in 2002 was appointed as NIWA's Director Operations. In 2008 I retired from this position taking up a brief position as Chief Scientist for Environmental Information before leaving NIWA in late 2008 and setting up as an independent environmental consultant and ecotour operator.

5. Since 1982 I have been involved in research on the ecology of freshwater and marine systems. These studies aimed to gain a better understanding of ecological processes in lakes, rivers, coastal and open ocean systems. I have worked in New Zealand, Finland, Denmark, Australia and in Antarctica. My research has been published in over 45 papers in scientific journals and books. These publications have included scientific papers in international journals and book chapters on the ecology of freshwater and marine invertebrates,

freshwater management, coastal sustainability as well as the effects of sediments, lake level management, and other anthropogenic activities on aquatic ecosystems.

6. During my 39 years' experience I have been involved with Regional Councils, government departments and industry in establishing guidelines for ecological assessments, providing descriptions of freshwater and marine communities and assessments of potential ecological effects for a wide range of projects throughout New Zealand.

7. My specific experience with the Mataura project began in 2017 but I have been involved in ecological work in rivers and streams throughout New Zealand for over 35 years. I have been involved in the trap and transfer programme for eels in the Waiau Catchment with Meridian Energy Ltd since 2010 and provide the annual reports to MPI on behalf of Meridian Energy Ltd. My evidence is based on the following reports:

- FWS (2018). Mataura River Description of the receiving environment. Report prepared by Freshwater Solutions Ltd for Alliance Group Ltd.
- Golder Associates (2007). Assessment of Hydro-electric Diversion Effects on Fish Passage. Prepared for Alliance Group Limited by Golder Associates (NZ) Ltd.
- Golder Associates (2016). Mataura River – Ecological Summary and Assessment. Prepared for Alliance Group Limited by Golder Associates (NZ) Ltd. Report number: 1656011_7410-002-R-Rev4.
- Hay, J. (2018). Review of fish screening monitoring provisions at Mataura Meatworks hydro intake. Review prepared for Department of Conservation, Ngai Tahu and Fish & Game New Zealand.
- PDP (2017). Fish screening requirements for hydroelectric intake channel. Report to Alliance Group Ltd by Pattle Delamore partners Ltd.
- Vaipuhi Consulting (2018a). Draft Elver Trap and Transfer Plan for Mataura Falls. Prepared for Alliance Group Limited. Vaipuhi Freshwater Consulting Report No: 201801.

- Vaipuhi Consulting (2018b). Draft Downstream Eel Monitoring Programme for Mataura Falls. Prepared for Alliance Group Limited. Vaipuhi Freshwater Consulting Report No: 201802.

CODE OF CONDUCT

8. Although these proceedings are not before the Environment Court, and acknowledging that I am contracted to Alliance, I have read the Environment Court's Code of Conduct for Expert Witnesses and I agree to comply with it as if these proceedings were before the Court. My qualifications as an expert are set out above. I confirm that the issues addressed in this brief of evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

9. The purpose of my evidence is to set out:

- A description of the native and introduced fish found in the Mataura River and their migration patterns;
- An assessment of the effects of the hydro scheme on these fish species and issues that need to be addressed as part of the application for key components (eels); and
- Monitoring required

EXECUTIVE SUMMARY

10. Alliance is applying to renew its consent to divert water from the Mataura River to operate a small hydro-electric generator at its processing plant in Mataura. My evidence describes the fish species that are found in the Mataura River in the area of the Mataura Falls where Alliance operates, provides an assessment of effects on fish passage and summarises the monitoring plan proposed.

11. The Mataura River is highly valued for its eel fishery, biodiversity and supports a nationally outstanding important brown trout fishery which provides angling

amenity. These values have not changed over the long period that Alliance has been operating the small hydro-electric plant. It is acknowledged however, that the threatened status of the longfin eel in New Zealand means that its populations are potentially more vulnerable now than in the past noting that there is still a commercial fishery.

12. The species of concern which may be affected by the operation of the hydroelectric plant by Alliance on the Mataura River are the obligate diadromous longfin eel and lamprey. Other fish species are either generally restricted to the upper or lower catchment or are landlocked and do not require migration pathways past the Mataura Falls.

13. Adult lamprey and longfin eel elvers are able to migrate upstream past the falls under some flow conditions. A trap and transfer programme is in place to facilitate the migration of elvers. Other fish caught in the trap are also transferred.

14. Most juvenile lamprey migrating downstream will pass through the turbines without being impacted but some adult eels will impinge on the intake screen or be entrained and suffer mortality. The extent of this mortality for eels that migrate down the raceway is not known.

15. A comprehensive monitoring programme has been designed to monitor the impingement and mortality of migrating eels and this will be used to determine what, if any, mitigation is required. Based on my experience this adaptive management approach based on monitoring and then management responses, if required, is appropriate.

NATIVE AND INTRODUCED FISH FOUND IN THE MATAURA RIVER

16. The following brief descriptions are summarised from a report recently completed for Alliance (FWS 2018) and previous reports as listed above.

17. The New Zealand Freshwater Fish Database (NZFFDB) provides records for fish that have been found throughout New Zealand. Records for the lower Mataura River show that it supports moderate to high native fish diversity (13 native fish have been recorded) including eight species with an ‘At Risk-

Declining' conservation status - longfin eels, torrentfish, lamprey, gollum galaxias, galaxias southern, inanga, giant kokopu and koaro.

18. The conservation status of longfin eel (*Anguilla dieffenbachii*) was re-assessed along with other freshwater fish species in 2017 (Dunn et al 2018). This report states that recent data suggests that the abundance of the longfin eel may be stable or increasing in commercial fisheries and that new Total Allowable Commercial Catch limits in the South Island should further decrease pressure on populations. Because of concerns about habitat loss the assessment remained as "At Risk – Declining". However, the panel also noted that public discourse on the longfin eel portrays the species as being severely threatened despite data that indicates otherwise.

Eels

19. The Mataura River is an important eel fishery for iwi and commercial purposes. The main stem is fished commercially several times each year focussed downstream of the Falls and the Mataitai, and the River provides good habitat for both longfin and shortfin eels. Large longfin eels prefer deep (>1 m), slow flowing water (< 0.2 m/s) with good cover or deep turbid water and tend to be found more commonly in the upper part of catchments. Shortfin eels tend to be more common in the lower reaches of rivers such as the Mataura.

20. Monitoring of the elver population that reach the Mataura Falls (**Falls**) has been carried out since 2014 by Mataura Industrial Estates and will now be in conjunction with Alliance (the two consent holders either side of the river) as part of a new trap and transfer programme. In summer 2014-15, 100 small eels and 9.1 kg of elvers were gathered with a hand net and transferred upstream. The following summer (2015-16) 8.5 kg of elvers along with a small number of galaxiids were transferred upstream. There were not enough elvers to warrant setting traps in the summers of 2016-17 and 2017-18

Inanga

21. The lower Mataura River has large whitebait populations and is popular with whitebaiters. As with other whitebait runs throughout the country the most abundant species by far is inanga. Inanga is a diadromous species that lays

eggs in the tidal zone near estuaries in autumn, generally on a spring tide. Larval inanga will hatch out on the following spring tide. Juveniles may migrate up the lower Mataura River between August and November (**Table 1**), with peak migrations occurring a few days after floods in early spring.

22. Adult inanga form shoals and occur in a range of freshwater habitats including pools and backwaters but prefer habitat upstream of the tidal influence. Juvenile inanga are likely to be an important seasonal food source for large eels and adult brown trout in the lower Mataura River.

23. Inanga are poor climbers and are unlikely to have passed the Falls in its natural state.

Galaxiids

24. The Southern galaxias and Gollum galaxias are both non-diadromous and found to co-occur. Southern galaxias are found in a range of habitats from streams to braided rivers and tributaries but typically are not found in headwaters of upper catchments. Gollum galaxias prefer pools and slower margins of wetlands, springs, ponds and ditches as well as side tributaries with instream cover and are not common in the mainstem of rivers. Gollum galaxias are sensitive to predation and competition by trout while southern galaxias co-occur with brown trout.

25. Giant kokopu are generally found in lower gradient streams and rivers in areas with bank cover and log-jams and boulders in pools. Koaro favour clear, small to medium sized cobbled streams with moderate to fast-flow and canopy shading. Both giant kokopu and koaro are expected to have passed the Falls in its natural state.

Smelt

26. Juvenile smelt migrate up the lower Mataura River at the tail end of the whitebait run (**Table 1**). Smelt are likely to spend up to a year in the Mataura River before spawning on sand banks and sand bars in the lower river. Juvenile smelt are also likely to be an important seasonal food source for large eels and adult trout

in the lower Mataura River. They are not good climbers and are unlikely to have passed the Falls in its natural state.

Lamprey

27. Lamprey begin life in freshwater where juveniles live in burrows in muddy/sandy backwaters and along river margins, and filter feed on microorganisms. After approximately 4–5 years, juvenile lamprey begin to migrate to sea in late winter early spring (**Table 1**). At that stage they are about 100 mm long. Lamprey adults come back into freshwater to spawn and support a valued traditional fishery. These adults are good climbers and continue to pass the Falls in its present modified state.

28. The area around the Falls is important for mahinga kai, particularly for the lamprey or kanakana which have historically been collected at the bottom of the Falls. The Mataitai Reserve along the River, including the Falls area, recognises the cultural value of the area.

Torrentfish

29. Torrentfish have been recorded downstream and upstream of Mataura. They are diadromous with a marine phase for the larvae and juveniles return from the sea to migrate upstream. Torrentfish juveniles are reasonably good climbers and some are expected to have passed the falls in its natural state.

Bullies

30. Some populations of juvenile common bully migrate from estuaries into freshwater to spawn in summer (**Table 1**) while other populations are landlocked and lay eggs on hard surfaces in suitable stretches of rivers and lakes. Common bully have a varied diet consuming a range of foods including mayfly, caddisfly, and chironomid larvae. Common bully in turn are an important food source for large eels and brown trout.

31. The juveniles of the Upland bully do not need to migrate to sea and form land-locked populations. The larvae are carried downstream some distance soon

after hatching and the yearlings migrate back upstream to occupy adult habitat. Upland bully is also likely to be a food source for large eels and brown trout.

Trout

32. The Mataura River is regarded as one of New Zealand's premier lowland brown trout fisheries and is internationally recognised. The Water Conservation Order (1997) recognises the importance of the River from source to sea with its outstanding fisheries and angling amenity.

33. National angling survey results are collated and reported by NIWA. In the 2014/15 season 19,100 ± 3,000 angler days were spent fishing the lower Mataura River (below Gore) with the Mataura River recording the greatest number of angler-days in the Southland Region (36% of regional total) (Unwin 2016). In Southland the Mataura River was ranked 4th out of 25 recreational locations (including coastal, lake and river locations) in a 2015 survey.

34. Brown trout are found throughout the Mataura River. Spawning habitat occurs upstream and downstream of the Falls but the main spawning habitat is likely to be upstream. They do not have an obligate marine phase to their life cycle, although dispersal between populations and colonisation of new river systems can occur and sea-run trout will enter the lower reaches of rivers in spring to feed on whitebait and in late summer to spawn.

ASSESSMENT OF THE EFFECTS OF THE HYDRO SCHEME ON THESE FISH SPECIES AND ISSUES TO BE ADDRESSED

35. The Mataura Falls are located on the Mataura River at Mataura and extend right across the width of the River. The Falls, weir and hydro-race are shown in **Figure 1**. The Falls are a natural feature while the water take weir was constructed in the 1890s and the two water races for hydro-electric power were built in the 1920s/1930s. The Falls have always provided a natural barrier to upstream fish migration (see **Figure 2** for around 2010), however, the Falls is passable under certain flow conditions and physical conditions (suitable rock surfaces) for those species with good climbing ability (eels, lamprey, giant kokopu (juveniles) and koaro). A Water Conservation Order in 1997 requires

that no permit is granted that would dam the Mataura River, but this does not apply to the weir.

36. Both the Mataura Industrial Estate on the true left bank and Alliance Group Ltd meat works on the right bank divert water for general operations and operate small hydro-electric plants. A weir was constructed above the Falls in the late 1890s to provide additional head and to assist with diverting the water. There is a minimum depth of 0.05 m which has to be maintained and if necessary generation by both plants must be reduced or cease.

37. The Alliance hydro-race has a permanent flow of ~6-10m^3/s to a 530 kW hydro-electric plant with an Open Flume Francis Turbine. Before entering the turbine the water passes through a trash screen (60 mm between the bars) (see **Figure 3**). It is this trash screen that will be modified with narrower spacings (20 mm) to retain migrant longfin females, Vaipuhi Consulting 2018b)). Water that passes through the plant is diverted back into the River just below the Falls. The Alliance diversion is estimated at approximately 23% of the median daily river flow with 14,400 m^3/day taken for processing water.

38. The existing river environment around the Falls and the hydro-electric plant operated by Alliance, has been significantly altered over time. It should be noted here that the proposed application will have no further impact than what has occurred historically over some 100 years and there are no changes to flows or habitats proposed.

39. The main potential ecological effect of the operation of the hydro-electric plant is the barrier it presents to migrating fish and mortality caused particularly through entrainment into the turbines. There are no identified effects on physical characteristics or water quality as the water is diverted through the hydro-electric plant and is returned directly back into the middle of the river some 375 m downstream. Habitat for macroinvertebrates and fish is very limited in this stretch of the River.

40. A report by Golder Associates (2007) identified “five native fish species that would be able to ascend the Mataura Falls before encountering the weir structure..”. Golder concluded that the weir does not provide a significant barrier

for fish that can ascend the Falls but that some effort should be put into ensuring they can get above the Falls. In terms of downstream migration there is potential for native fish (shortfin and longfin eels, lamprey and giant kokopu and potentially koaro) and brown trout to be entrained and suffer mortality going through the turbines, depending on their size. Predictions are that mortality of fish 100 mm in length (e.g. lamprey juveniles) going through the Francis turbine is likely to be about 14%, 26% for fish 200 mm, 60% for fish 500 mm (large eels) and up to 97% for fish over 800 mm (large eels) (Golder Associates 2016). These mortalities seem reasonable based on information available.

41. The five native fish that need consideration for migration past the Mataura Alliance Plant are listed below with migration periods presented in **Table 1**:

- Shortfin eel – Generally don't occur above the Mataura Falls but will occasionally pass through upstream and downstream;

- Longfin eel – Longfin eels are found throughout the Mataura catchment. Given the larger size of elvers they have less climbing ability than the shortfin eel and probably can only get past the Falls at high flows that occur during the migration period (Jan-Mar). This would have been the case naturally before the hydro-electric plant was built. Observations indicate the main migration is likely to occur in summer (Jan/Feb).

- Eels (longfin and shortfin) - Downstream migration is critical as eels are diadromous and must go to sea to complete their life-cycle (thought to spawn somewhere off Fiji or Tonga). Downstream migration occurs in autumn (Mar-May) when larger adult eels, both male and female take on a silver to bronze colour, cease feeding and begin their seaward migration. Jellyman et al. (2012) suggested a range of physical conditions (e.g. temperature, lunar cycle) that may stimulate migration downstream but the main stimulant is likely to be flows well over ~39 m^3/s. Thus the percentage of water diverted would be even smaller during floods than the 23% at median flows. Of note is that the Mataura River is still regarded as having the third largest eel fishery in the South Island (Ryder 2005) and there is no evidence that populations have declined from what would be expected of such a River despite the existence of the Alliance and MIE structures;

- Lamprey – Adult lamprey travel upstream to spawn and juveniles (ammocoetes) have been observed at numerous sites above the Falls. Lamprey can clearly migrate past the Falls and weir as they have been observed aggregating at the bottom of the Falls and then disappear, presumably upstream as they are found throughout the catchment. Juveniles migrate downriver in winter (Jul-Aug) and then out to sea. Observations in other rivers suggest they tend to migrate in the middle of rivers near the surface during increased flows and thus most would not go into the hydro-race. Those that do go through the hydro-electric plant and turbines, being small, would mostly survive. Golder Associates (2016) predicted a mortality rate of ~4-14% for those passing through the turbine;

- Giant kokopu – Juveniles would be able to climb the Falls, but they are generally found in lowland tributaries and close to the coast. Landlocked populations do occur above the Falls thus we would not expect any effects on these upstream populations, and migration past the falls area is not required for their sustainability as giant kokopu can form land-locked populations;

- Koaro – Juveniles have good climbing ability and are expected to get past the Falls and weir at times. Small numbers are found around the Falls area but most are found in the lower River. The turbines at the hydro-race, working at relatively small head, would have minimal impact as koaro migrating downstream are larvae only a few millimetres long so should survive passage through the turbines.

42. It can be concluded that upstream passage of eels and lamprey and possibly trout is not unduly constrained by the presence of the Falls, weir and the diversions to the hydro-race and species that are good climbers would continue to migrate upstream when flow conditions are right. Downstream passage is of concern for large migrant eels as they are reliant on passage in the Mataura River, past the Alliance Matuara Plant, for breeding in the Pacific.

43. The Mataura River is significant to Maori for a wide range of values including mahinga kai and the Mataura has “outstanding fishery and angling amenity” for brown trout, as recognised by the Water Conservation Order.

44. Brown trout are found throughout the catchment but generally form resident populations as long as they have access to spawning streams. Observations in the Motupiko River by Young et al. (2010) found most adult brown trout moved less than 1 km with movement related to higher flows. A fish ladder is in place (**see Figure 4**) to aid upstream migrations for those that get past the Falls and are migrating upstream to suitable spawning areas. There are however suitable spawning areas downstream and upstream so they do not rely on migration to sustain the population. It seems unlikely there is significant downstream migration or loss through the turbines. However, any large trout caught should be recorded as bycatch when monitoring for eels.

45. Accumulations of elvers and lamprey at the base of the Falls are observed and at times have been an important food gathering location for Maori. Various attempts have been made to aid upstream passage of eels, including use of spat ropes hung over the edge of the Falls and pipe ladders, but none have been successful. A fish pass is required at the Falls and as described above a trap and transfer programme is considered the best mitigation option for upstream migration, noting that the Falls would have always provided a barrier to most fish species, except for good climbers, under certain conditions of high flows.

PROPOSED MONITORING

46. PDP (2017) assessed the importance of migration of downstream migrants through the hydro-race and concluded that monitoring should be undertaken to determine the extent of mortality and to assist in determining the most appropriate mitigation method. Dr Jacques Boubee an internationally recognised expert in fish migration and eels, has developed a suitable trap and transfer plan for elvers (Vaipuhi 2018a) and a monitoring programme for downstream migrants (Vaipuhi 2018b). This plan was further refined following discussion with stakeholders, including Te Ao Marama, Fish and Game and the Department of Conservation.

47. The main elements of the elver trap and transfer plan are:

- The objective of the plan is to facilitate a trap and transfer system to maintain and enhance the upstream passage of elvers over the Mataura Falls and Weir;

- Observations will be made once a week from 1st December to 15 March when flows are below 80 m^3/s. This is consistent with when trap and transfer is carried out on the Waiau River by Meridian Energy Ltd (James 2018). When there are more than 50 elvers observed at the base of the Falls a suitable trap will be installed, regularly inspected and elvers and other fish trapped will be transferred and released to a safe location upstream. The trap is to be left in place until flow conditions require its removal or the 15 March. Based on my experience with Meridian's successful trap and transfer programme for elvers this timing is appropriate; and

- The plan sets out the details of the trap and its operation, procedures for transfers to minimise stress on elvers, and the data that needs to be collected.

48. The main elements of the downstream migrant monitoring programme can be summarised as:

- The purpose of the monitoring plan is to identify if any migrant eels are entering the turbines during the downstream migration period, and if so, how many, what size and species, and when. This will be used to assess whether mitigation is required;

- The monitoring will require modifications to the trash screen bar size so as to capture the migrating eels. The efficiency of the screens and cleaner in terms of capturing fish that would have otherwise gone through the turbines and suffered mortality will be assessed after the first year and modifications made if necessary;

- Regular observations of fish will be made and fish collected at least once a day. The state of the migrant eels will be recorded along with details of each individual and live eels returned to the River. Eels that suffer mortality

will be retained and offered to Hokonui Rununga. Bycatch will be recorded and live fish returned to the River as soon as practical;

- Monitoring will be carried out over 5 years from 1 February to the end of May and reported annually. This timing is based on observations of peak downstream migrations in the Mataura River in March/April (Golder Associates 2016); and

- The plan also provides options and possible mitigation if significant numbers of migrant eels suffer mortality. The PDP (2017) report also provides possible mitigation options if required.

49. The focus for the monitoring plan is on eels for the following reasons:

- The longfin eel which dominates the eel population above the Falls is classified as "At risk – declining" and its declining population and concerns over its future was the subject of recent report by the Parliamentary Commissioner for the Environment (2013);

- Eels are obligate migrants between fresh water and marine environments breeding off Fiji or Tonga after a long period in freshwater (at least 40-50 years). Thus their survival as a species depends on migrant adults throughout New Zealand being able to access the open sea. Migrants from the Mataura will play an important part in overall sustainability;

- Lamprey are also a threatened species classified as "Nationally vulnerable" and are diadromous, spending a juvenile phase at sea and migrating upstream to spawn. Juveniles passing through the hydro-race at the Alliance Plant will be small (~100 mm) with low mortality as most will pass through the turbines and into the river below with no or little injury;

- Other populations of native fish will be self-sustaining and either resident in the upper or lower River or not reliant on migration past the Falls. Thus the populations are not significantly affected by the presence of the hydro-electric power plant;

- The Mataura River is a nationally important and internationally recognised trout fishery but the brown trout forms populations throughout rivers such as the Mataura and is not reliant on migration through the Falls area; and

- The weir, hydro-race and hydro-electric plant have been in place for some 100 years (installed in late 1800s/early 1900s) and through that time the trout fishery has developed into a strong, high quality and renowned brown trout fishery. There is no evidence that the fishery has or is being significantly impacted by the presence of the hydro-electric plant.

50. The comprehensive monitoring programme has been designed to monitor the number of migrant eels entrained (Vaipuhi 2018a, b) and thus the potential effect on the downstream migration of eels. The results of this 5-year programme will be used to determine what, if any, mitigation is required. Based on my experience this adaptive management approach based on monitoring and then management responses, if required, is appropriate.

51. Observations of other bycatch species will be recorded and live individuals returned as soon as practical to the River.

RESPONSE TO SUBMITTER

52. Fish and Game have submitted that the monitoring programme should include other native fish and brown trout that that could pass through the hydroelectric power plant. As described above the key species of concern is the eel population because of its threatened status and requirement to pass through the area as part of its life cycle. Other fish species including brown trout are not obliged to migrate, and brown trout and some other species will form self-sustaining populations above and below the Falls area. A number of native fish and brown trout will continue to pass down the River as the majority of the flow will continue down the main stem.

53. The Mataura River supports a productive and nationally recognised brown trout fishery and this will continue as it has over the last some 100 years. Alliance have agreed to record trout that are found on the screens and to return any live animals to the River as quickly as practical. It is also worth noting that brown

trout will potentially move throughout the year and the period chosen is to coincide with the main eel migration not trout migration. There will be some sea-run brown trout in the lower River that will go to sea as juveniles and come back to freshwater to spawn.

54. I consider the focus on eel populations in terms of the monitoring programme and subsequent assessment is appropriate and that other species should be recorded, but not be the main focus. I would also note that in the review of the monitoring programme carried out by Cawthron Institute for DoC, Ngai Tahu and Fish and Game it was concluded that overall the proposed monitoring programme is a reasonable study design, given the environmental and logistic restraints, but could still be improved. The suggested improvements included more information related to smaller eels and other fish that may be entrained and the fate of those fish. However the primary purpose of the programme is to establish the number of large migrant eels that may be entrained.

RESPONSE TO OFFICERS REPORT

55. The Officers Report identifies the potential main effects of application as water quality, natural character and fish passage. As water is returned to the River a short distance downstream there are unlikely to be effects on water quality thus as agreed in the Officers Report the “key effect on the environment is the impediment to the life cycle of longfin eels”. This supports the conclusion in my evidence that the focus should be on migrating eels.

56. The Officer notes the uncertainty with regard to effects and effectiveness of possible mitigation options. The results of proposed monitoring will be used to assess whether mitigation is required and if so what is the best option. The conditions attached to the evidence of Mr Kyle show how this will be achieved.

57. The Officer’s Report recommends granting the consent subject to a number of conditions including maintaining the existing flows over the weir, an elver trap and transfer programme is put in place, the screens on the intake are modified, effects on adult eels are monitored, recording of bycatch but not to the same level as eels, involvement of Hokonui Runaka, allow feedback from submitters

and includes a review condition. All these aspects, except for involvement of Hokonui Runaka, have been dealt with in my evidence and all are supported.

SUMMARY AND CONCLUSIONS

58. The Mataura River is highly valued for its eel fishery and biodiversity, and supports a nationally important trout fishery and angling amenity. These values have not changed over the long period that Alliance has been operating a small hydro-electric plant. It is acknowledged however that the threatened status of the longfin eel in New Zealand means that its populations are potentially more vulnerable now than in the past.

59. The species of concern which may be affected by the operation of the hydroelectric plant by Alliance on the Mataura River are the obligate diadromous longfin eel and lamprey. Other fish species are either generally restricted to the upper or lower catchment or are landlocked and do not require migration pathways past the Mataura Falls.

60. Adult lamprey and longfin eel elvers are able to migrate upstream past the falls under some flow conditions. A trap and transfer programme is in place to facilitate the migration of elvers and other fish trapped are also transferred.

61. Most juvenile lamprey will pass through the turbines without being impacted but adult eels will be entrained and suffer mortality. The extent of this mortality for eels that migrate down the raceway is not known.

62. A comprehensive monitoring programme has been designed to monitor the entrainment and mortality of migrating eels and this will be used to determine what, if any, mitigation is required.

Mark James
21 November 2018

References:

Beentjes, M. P.; Jellyman, D. J.; Kim, S. W., (2006) Changing population structure of eels (Anguilla dieffenbachia and A. australis) from southern New Zealand. *Ecology of Freshwater Fish, 15*: 428-440.

Boubee, J.A.; Mitchell, C.P.; Chisnall, B.L.; West, D.W.; Bowman, E.J.; Haro, A. (2001) Factors regulating the downstream migration of mature eels (Anguilla spp.) at Aniwhenua Dam, Bay of Plenty, New Zealand, *New Zealand Journal of Marine and Freshwater Research, 35:1*, 121-134.

Boubee, J.A.; Williams, E. K. (2006) Downstream passage of silver eels at a small hydroelectric facility. *Fisheries Management and Ecology, 13*: 165-176.

Dunn, N.; Allibone, R.; Closs, G.; Crow, S.; David, B.; Goodman, J.; Griffiths, M.; Jack, D.; Ling, N.; Waters, J.; Rolfe, J. (2018). Conservation status of New Zealand freshwater fishes, 2017. New Zealand Threat classification series 24. Department of Conservation, Wellington, New Zealand. 11p.

FWS (2018). Mataura River Description of the receiving environment. Report prepared by Freshwater Solutions Ltd for Alliance Group Ltd.

Golder Associates (2007). Assessment of Hydro-electric Diversion Effects on Fish Passage. Prepared for Alliance Group Limited by Golder Associates (NZ) Ltd.

Golder Associates (2016). Mataura River – Ecological Summary and Assessment. Prepared for Alliance Group Limited by Golder Associates (NZ) Ltd. Report number: 1656011_7410-002-R-Rev4.

Hay, J. (2018). Review of fish screening monitoring provisions at Mataura Meatworks hydro intake. Prepared by Cawthron Institute for Department of Conservation, Ngai Tahu, and Fish and Game New Zealand.

James, M. (2018). Manapouri Power scheme longfin eel mitigation report 2017-2018 season. Report to Meridian Energy Limited.

Jellyman, D.J.; Unwin. M.J.; Graynoth, E. (2012). Review of eel research from the upper Waiau catchment 2005-2011. NIWA Client Report CHC2012-013.

NIWA (2015). Freshwater Fish Spawning and Migration Periods. MPI Technical Paper No. 2015/17. Prepared for MPI by NIWA. June 2015.

PDP (2017). Fish screening requirements for Hydroelectric intake channel. Report by PDP to Alliance Group Ltd.

Ryder, G. I. (2005). Mataura Industrial Estate Hydro-Electric Power Generation Ecological Considerations for plant upgrade. Prepared by Ryder Consulting Ltd, Dunedin.

Unwin, M. (2016). Angler usage of New Zealand lake and river fisheries. Results from the 2014/15 National Angling survey. Prepared for Fish & Game New Zealand by NIWA Client report no: 2016021CH.

Vaipuhi Consulting (2018a). Draft Elver Trap and Transfer Plan for Mataura Falls. Prepared for Alliance Group Limited. Vaipuhi Freshwater Consulting Report No: 201801.

Vaipuhi Consulting (2018b). Draft Downstream Eel Monitoring Programme for Mataura Falls. Prepared for Alliance Group Limited. Vaipuhi Freshwater Consulting Report No: 201802.

Young, R; Wilkinson, J.; Hay, J.; Hayes, J. (2010). Movement and mortality of adult brown trout in the Motupiko River, New Zealand: Effects of water temperature, flow and flooding. *Transactions of the American Fisheries Society 139*:137-146.

Table 1: Migratory periods for migratory fish found in the Mataura River catchment. (from FWS 2018). **Note:** Migration periods are for the full range of months identified in MPI (2015). An * denotes species that must migrate to sea for part of their lifecycle.

Common name	Life stage	Direction	Peak migration period
Longfin eel*	Glass eel	Up (as far as estuary)	Aug - Oct
	Juvenile	Up	Jan - Mar
	Adult	Down	Mar - May
Shortfin eel*	Glass eel	Up (as far as estuary)	Sept - Nov
	Juvenile	Up	Dec - Mar
	Adult	Down	Feb - May
Lamprey*	Juvenile	Down	Jul - Aug
	Adult	Up	Jan - Dec
Common bully	Juvenile	Up	Dec - Mar
	Larvae	Down	Oct - Nov
Upland bully	Juvenile	Up	Dec - Mar
	Larvae	Down (remain within river)	Oct - Nov
Inanga*	Juvenile	Up	Aug - Nov
	Larvae	Down	Mar - Aug
Smelt	Juvenile	Up	Sept - Oct
	Larvae	Down	Apr - Jun
Torrentfish	Juvenile	Up	Apr-Nov
	Larvae	Down	Sept-May

Brown trout	Adult	Up	Dec - May
	Juvenile	Down	Jan - Dec
Giant kokopu	Juvenile	Up	Oct-Dec
	Larvae	Down	May-Sept
Koaro	Juvenile	Up	Sept-Nov
	Larvae	Down	May-Sept

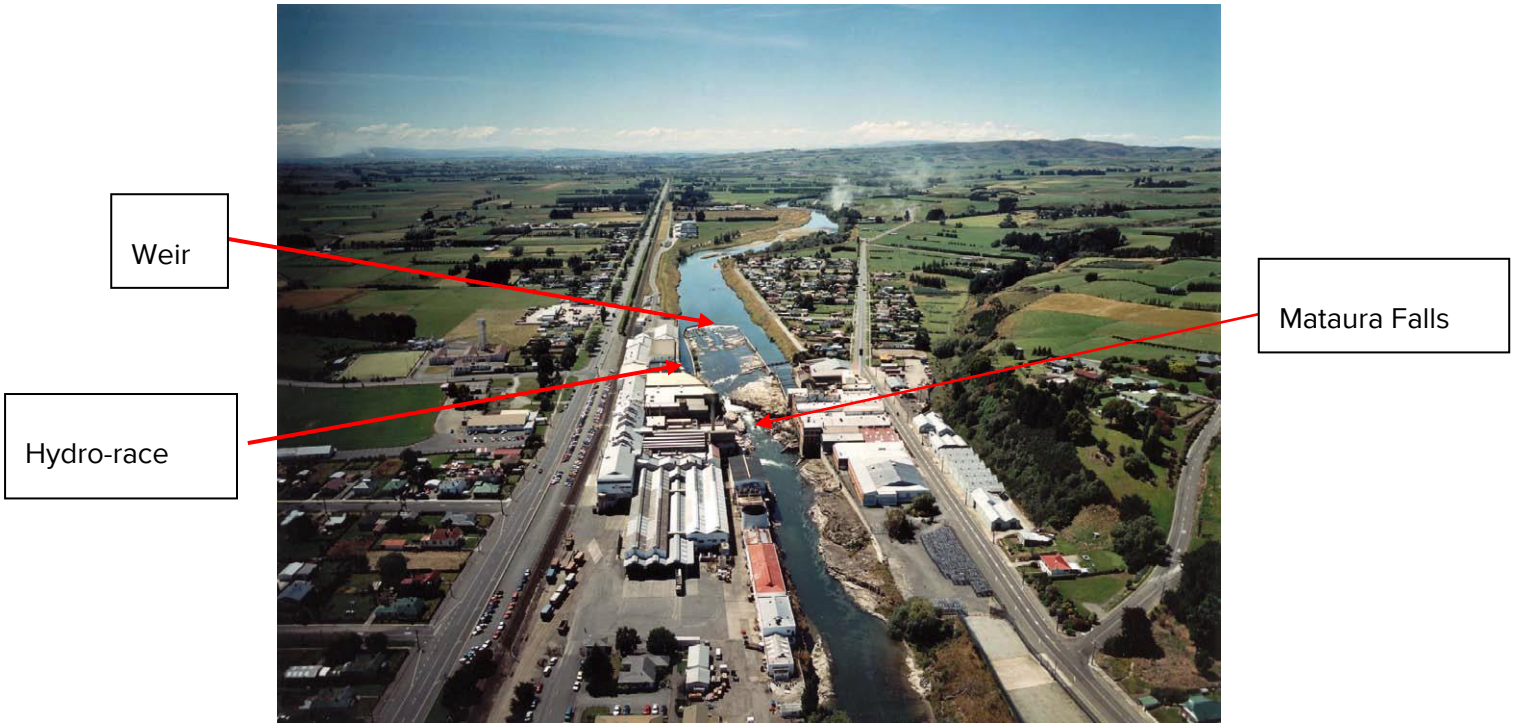

Figure 1: Upstream view of the Mataura Falls and associated infrastructure. The Alliance Plant is on the left (true right bank). From Golder Associates 2007.

Figure 2: Upstream view of the Mataura Falls 2014. Photo credit Andrew Ross MT2015.25.54. Copyright Mataura and Districts Historical Society Incorporated. (from Vaipuhi 2018b)

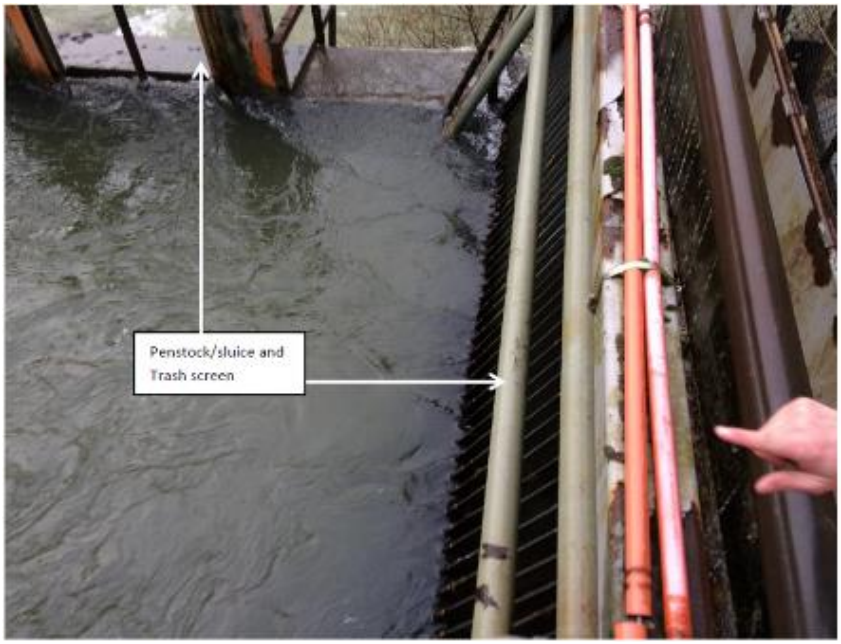

Figure 3: Trash screen and sluice before entering the turbine. Photo courtesy Alliance. (from Vaipuhi 2018b)

Figure 4. The Mataura Weir summer 2017. Note salmonid ladder at centre weir. Photo courtesy Alliance. (from Vaipuhi 2018b)