

**BEFORE THE ENVIRONMENT COURT | MUA I TE KOOTI TAIAO O
AOTEAROA**

UNDER the Resource Management 1991
IN THE MATTER of appeals under Clause 14 of the First Schedule of the Act

BETWEEN **TRANSPower NEW ZEALAND LIMITED**
(ENV-2018-CHC-26)

FONterra CO-OPERATIVE GROUP
(ENV-2018-CHC-27)

HORTICULTURE NEW ZEALAND
(ENV-2018-CHC-28)

ARATIATIA LIVESTOCK LIMITED
(ENV-2018-CHC-29)

WILKINS FARMING CO
(ENV-2018-CHC-30)

(Continued next page)

**STATEMENT OF EVIDENCE OF PAUL DAVID MARSHALL ON
BEHALF OF ARATIATIA LIVESTOCK LIMITED
TRANCHE 3 – MANAPOURI HYDRO-ELECTRIC GENERATION SCHEME
29 July 2022**

Judicial Officer: Judge Borthwick

**GORE DISTRICT COUNCIL, SOUTHLAND DISTRICT
COUNCIL & INVERCARGILL DISTRICT COUNCIL**
(ENV-2018-CHC-31)

DAIRYNZ LIMITED
(ENV-2018-CHC-32)

H W RICHARDSON GROUP
(ENV-2018-CHC-33)

BEEF + LAMB NEW ZEALAND
(ENV-2018-CHC-34 & 35)

DIRECTOR-GENERAL OF CONSERVATION
(ENV-2018-CHC-36)

SOUTHLAND FISH AND GAME COUNCIL
(ENV-2018-CHC-37)

MERIDIAN ENERGY LIMITED Act 1991
(ENV-2018-CHC-38)

ALLIANCE GROUP LIMITED
(ENV-2018-CHC-39)

FEDERATED FARMERS OF NEW ZEALAND
(ENV-2018-CHC-40)

HERITAGE NEW ZEALAND POUHERE TAONGA
(ENV-2018-CHC-41)

STONEY CREEK STATION LIMITED
(ENV-2018-CHC-42)

THE TERRACES LIMITED
(ENV-2018-CHC-43)

CAMPBELL'S BLOCK LIMITED
(ENV-2018-CHC-44)

ROBERT GRANT
(ENV-2018-CHC-45)

**SOUTHWOOD EXPORT LIMITED, SOUTHLAND
PLANTATION FOREST COMPANY OF NZ,
SOUTHWOOD EXPORT LIMITED**
(ENV-2018-CHC-46)

**TE RUNANGA O NGAI TAHU, HOKONUI RUNAKA,
WAIHOPAI RUNAKA, TE RUNANGA O AWARUA & TE
RUNANGA O ORAKA APARIMA**
(ENV-2018-CHC-47)

PETER CHARTRES
(ENV-2018-CHC-48)

RAYONIER NEW ZEALAND LIMITED
(ENV-2018-CHC-49)

**ROYAL FOREST AND BIRD PROTECTION SOCIETY OF
NEW ZEALAND**
(ENV-2018-CHC-50)

Appellants

AND

SOUTHLAND REGIONAL COUNCIL

Respondent

Introduction

- 1 My full name is Paul David Marshall.
- 2 This evidence addresses Aratiatia Livestock Limited's ("**Aratiatia**") appeal and section 274 RMA notices in relation to Rule 52A in the proposed Southland Water and Land Plan ("**the Plan**"). The evidence addresses three matters:
 - (a) The size of the water take consumed by the Manapōuri Hydro Electric Power Scheme ("**the Scheme**")
 - (b) The effects of the Scheme on the Waiau River and the community the River sustains.
 - (c) The Southland Regional Council's Freshwater Management Unit ("**FMU**") process and the Role of the Regional Forum.
- 3 Aratiatia is also an appellant with respect to Policy 26 and Appendix E. In these matters I defer to the evidence of Ms Jordan.

Qualifications and Interest in this Issue

- 4 I am neither an expert in planning matters nor an expert in freshwater river systems. For more than 40 years, however, I have been a keen observer of the Waiau River, and this evidence reflects my lived experience.
- 5 I hold a B.Agr.Econ (Hons) ¹ in Natural Resource Economics (1981) from Massey University. Between 1981 and 1986 I was employed first as a NZ Treasury Investigating Officer in its Land Use Division and then as an Economist in the Banking Section of the Reserve Bank of NZ, Wellington.
- 6 Since 1986 I have lived and worked on the 600ha farm now owned by Aratiatia located at Motu Bush, Western Southland ("**the Property**"). I am a director and minority shareholder (1 share of 1200 on issue) of Aratiatia and a beneficiary of the PD and JP Marshall Family Trust which holds 1198 shares in Aratiatia.
- 7 My wife Juanita is the other director and minority shareholder of Aratiatia. I am authorised to give this evidence on behalf of Aratiatia and Juanita.

¹ The title of my Honours dissertation was "Marginal Cost Pricing and Retail Electricity Supply"

- 8 My daughter Claire Jordan, and her husband Peter live on the Property with their children. Peter and Claire's company Totara Agricultural Ltd is Aratiatia's contract milker.
- 9 I have extensive involvement as a member of the Waiau community, in organisations associated with the River:
- (a) From 1990 to the present, I have been and remain a member of the Waiau Working Party. I had direct involvement in negotiating the 1996 Waiau Agreement between the Electricity Corporation of NZ (ECNZ), Southland Regional Council ("**Council**") and Federated Farmers Southland, (representing the community), which is a side agreement to the 1996 consenting process of the Scheme².
 - (b) I am a founding member and Co-chair of the Waiau Rivercare Group ("**WRG**") Inc. The WRG was established in 2017 and incorporated in 2019. It is an environmental group focused on enhancing the hauora (wellbeing) of the Waiau River and the communities it sustains. The WRG is a s274 party to these proceedings. The WRG has 425 members, who either live within the Waiau catchment or have a strong connection to the Waiau River.
 - (c) In 2021 I became Co-Chair of the Waiau Catchment Liaison Committee ("**WCLC**"), which was formed in 1996 as part of the Scheme's consenting process. The WCLC was a submitter on the Plan and was initially a s274 party to these proceedings. Following Meridian Energy Limited's ("**Meridian**") challenge of the WCLC's s274 notice, the Court determined that the WCLC is a committee of Council, and consequently could not remain a s274 party³.
 - (d) In 2018 I was appointed to the Regional Forum. The Regional Forum is a community-based advisory group constituted in 2018 as a joint initiative of Council and Te Ao Marama Inc (TAMI), to provide advice to Council on freshwater quantitative and qualitative limit setting – the FMU Process.

² Appended to Statement of Evidence of Andrew Bazel Conrad Feierabend for Meridian Energy Limited 15 February 2019 - Court File Reference: ENV-2018-CHC-38

³ 2018-11-14 Decision NZEnvC 218 - Aratiatia Livestock Ltd and Ors v SRC - s274

Size of the Scheme's Water Take

- 10 The quantum of water taken by Scheme exceeds 60% of New Zealand's total consented surface water take including that serving all cities, industries and irrigation.
- 11 The Scheme's consented water take (represented by maximum discharge through the tailrace tunnels into Deep Cove) is 550 m³/sec (or 17.3 km³/year). That is a column of water with a footprint of 1 square km, (about the size of Invercargill's CBD) extending into the stratosphere⁴ 17.3kms. Most jet airliners cruise at around 11,500m.
- 12 Another way of thinking about the quantum of water consumed by the Scheme is to use dollars as a comparator. Aratiatia operates a large dairy farm. This season we will milk about 1,200 cows. To give our cows water to drink, to cool their milk and to clean our milking parlours, Aratiatia holds a water permit to abstract a maximum of 56,575 m³/year of ground water.
- 13 Were the Regional Council to institute a water rate on our business at say \$0.01 (1 cent) per cubic metre of consented water take, that would cost our business \$567.60 per year. Extrapolated across the 37 dairy farms within the Waiau FMU, the total consented water takes from those farms⁵ would generate a total annual rates bill of \$12,045.
- 14 Were the Regional Council to apply the same water rate to the Manapouri Power Scheme, the cost to Meridian would be \$173,448,000 per year⁶.
- 15 The difference gives a sense of the sheer size of the water take consumed by the Scheme's operation.

The effects of the Manapouri Power Scheme

Background

- 16 The Scheme has had a devastating impact on the Lower Waiau River, the Te Waewae Lagoon and Te Waewae Bay, since the Scheme was commissioned in

⁴ Stratosphere is defined as 10-30km above the surface of the Earth niwa.co.nz/education-and-training/schools/students/layers

⁵ Based on the average consented water take of 2.3m³/sec

⁶ Based on Meridian's total consented discharge from the Power Scheme of 550 m³/sec

1969.

- 17 The adverse effects I wish to focus on in this evidence are:
- Loss of sand on Bluecliffs Beach.
 - Algal blooms in the River
 - Bank erosion along the length of the Lower Waiau
 - Loss of amenity values, including swimmability, fishing
 - Weed infestation within the historical riverbed margin
 - Impacts on the Te Waewae Lagoon
- 18 The Scheme is authorised to dam and to divert the lower Waiau and discharge into Doubtful Sound. The maximum consented watertake (represented by the consented discharge into Deep Cove) has increased from 510m³/sec in 1996, to the current maximum of 550m³/sec. The minimum consented discharge into the bed of the Waiau River through the Wier is between 12-16 m³/sec. That minimum discharge represents about 3% of the pre-control flow of 450 m³/sec⁷.
- 19 The activity status of the Scheme between 1996 and 2018 was “discretionary activity”. Meridian did not require the matters which Council could consider to be proscribed under either a restricted discretionary or controlled activity status, for the changes to the Scheme to be consented. The changes included the consented construction and commissioning of a second 10km long tail race tunnel (completed 2002) and in 2010 a consented increase in the maximum discharge of Waiau waters to Deep Cover to 550 m³/sec. – remarkable within the Fiordland National Park⁸ and Te Wahipounamu UNESCO World Heritage Site⁹.
- 20 During those consenting processes the thrust of advice presented to the Council was that any adverse effects of the proposed tunnel and subsequent increases in discharge would be negligible, or at worst, no more than minor. In granting those consents, Council appears to have accepted those assurances.

⁷ Reference – Dave Riddell – Hydrological assessment of the Waiau River for the Waiau River Working Party 1993.

⁸ <https://www.doc.govt.nz/parks-and-recreation/places-to-go/fiordland/places/fiordland-national-park/?tab-id=50578>.

⁹ https://en.wikipedia.org/wiki/Te_Wahipounamu

Loss of sand on Bluecliffs Beach¹⁰.

- 21 Over the life of the MPS, the community has witnessed the near total collapse of the Toheroa beds on the Beach. This local knowledge is echoed by the science. In 1969 (the year in which the Scheme first generated electricity) a survey of adult Toheroa on the beach (based on 46 transects) estimated the adult population at 2.2million¹¹. By 2008, (the last year of the survey) the adult population had collapsed to 34,000.

“The results show an overall decline which is steepest over a 10 year period between the mid 1960s and mid 1970s where the population of toheroa 75 mm and over declined from about 2.2 million to about 500 000. This was followed by a further decline in the late 1980s to about 85 000 by 1990. The most recent surveys from 1997 through to 2009 indicate that the population has not recovered with consistently low numbers of toheroa 100 mm and over (mean number = 92 000, range =10 000 to 165 000). The estimate for 2005 of 165 000 was the highest since 1987 indicating a partial recovery, but the 2009 estimate of only 34 000 confirms that the population continues to track at historically very low numbers”.

- 22 The decimation of toheroa numbers was largely complete by 1990 (a surveyed 96.2% reduction in the adult population). Even then Bluecliffs Beach was still sandy. Since the commissioning of the second tailrace tunnel of the Scheme and the Manapouri Tail race Amended Discharge our community however, has observed an acceleration in the loss of sand from Bluecliffs Beach. By 2019 the beach was largely comprised of fist size cobbles. That remains the situation today.

¹⁰ Waiiau Rivercare Group Inc – submission on the NPSFM 2020. Bluecliffs Beach is a long stretch of beach along Te Waewae Bay, west of the mouth of the Waiiau River.

¹¹ Beentjes, M.P. (2010). Toheroa survey of Bluecliffs Beach, 2009, and review of historical surveys. New Zealand Fisheries Assessment Report 2010/7. 42 p.



Figure 1 Bluecliffs Beach (1994 and 2019) - (credit - Glenys Steele)



Figure 2 Bluecliffs Beach looking West July 2022

- 23 The Bluecliffs Beach experience highlights to me how difficult it must be for Council to consider activities for consent when the outcomes of those activities have high levels of uncertainty when Council is unrestricted in the matters it may

consider. That difficulty surely increases if the matters over which the regulator has discretion and can impose constraints or obligations is reduced.

Algal Blooms in the River

- 24 Resource Consent 96023 allows Meridian to discharge highly sedimented flows from the Mararoa River into the bed of the lower Waiau River. Pre-control, that sediment would of course, have entered the Waiau River. But that sediment would always have been accompanied by significant volumes of alpine water (on average 400-450 m³/sec) from Lakes Te Anau and Manapouri. As a consequence, the lower Waiau River is frequently discoloured by sediment-laden flows from the Mararoa River. I understand that Mararoa flows are used first to meet the consented minimum flow discharges through the Weir, into the lower Waiau.
- 25 The current flow regime leaves the river below the Weir vulnerable to both bloom of nuisance periphyton and to toxic algal blooms. In or about 2004 *Didymosphenia geminate* (Didymo) was introduced by accident and became established as an invasive nuisance periphyton in the Waiau River. Didymo forms great rafts of slime that shed tissue-like structures into the water column. The algae smothers rocks, adversely impacts on macro invertebrates and generally degrades river ecosystems. Its colloquial name is “rock snot”.
- 26 As I recall, the work of Dr Cathy Kilroy (NIWA) reported to the Waiau River Working Party, suggested that a flow rate of 0.3m/sec across the stream bed for 24 hours was sufficient to shear didymo and allow it to wash out to sea. My understanding is that the desired flow rate can be achieved by a discharge through the Weir of at least 160 cumecs for 24 hours.
- 27 While Meridian was not responsible for Didymo, the effective dewatering of the Waiau River below the Weir has undermined the resilience of the River. Persistent low flow discharges through the Weir have prevented the River from being able to slough off the didymo.
- 28 The invasion of Didymo could not have been anticipated. But again, this highlights the uncertain and dynamic nature of the Waiau River system and why the Regional Council should retain as much flexibility as possible in the matters it may consider when considering the consenting of any significant activity that impacts on the River.

29 Dr Kilroy's work¹² informed the negotiated voluntary flushing protocol in the lower Waiau, to discharge up to 5 "flushing flows" into the lower Waiau each year.

30 Council, in the context of its Water Shortage Procedure has observed that:

*"decreased water quantity (which results in decreased water quality and increased water temperatures) jeopardises the health of both aquatic and terrestrial ecosystems"*¹³

31 My understanding is that the reduced flow, and reduction in cold alpine water entering the Waiau results in an elevation in the River's water temperature. Elevated water temperature in association with low flows and high levels of sediment and nutrient¹⁴ are preconditions for toxic cyanobacteria blooms. During December 2018 and January 2019 toxic cyanobacteria blooms were recorded in the Waiau River at Tuatapere and at Clifden, for the first time.

32 Given the significant potential health effects of cyanobacteria blooms, the lack of conditions in the Scheme resource consents to address toxic cyanobacteria blooms suggests such blooms in the catchment's swimming spots were not anticipated through the consenting process. That serves to illustrate that not all matters can be anticipated.

33 The above examples illustrate the influence of the artificial flow regime on the Lower Waiau River, and how that influence can manifest in unanticipated ways over time. These local observations suggest that the flow regime in the lower Waiau must always remain within the purview of the regulator.

Bank Instability and Erosion due to Artificial Flow Regime

34 The managed flow regime through the Weir is constrained with respect to the turbidity of Mararoa waters that are permitted to flow back into Lake Manapōuri, allowed under Scheme resource consent^{15,16} and the Guardians of the Lakes

¹² NIWA News and Publications "Fit-for-purpose periphyton monitoring: a case study" – Dr Cathy Kilroy, Feb 2015

¹³ <https://www.es.govt.nz/about-us/plans-and-strategies/strategies/water-shortage-procedure>

¹⁴ LAWA.org.nz/get-involved/newsandstories/enviromentsouthland ; Toxic Algae found in Waiau River at Tuatapere

¹⁵ A useful summary of the Meridian Consent Conditions and Regulatory Framework is to be found at page 175-183 of Statement of Evidence of Andrew Bazel Conrad Feierabend for Meridian Energy Limited 15 February 2019 - Court File Reference: ENV-2018-CHC-38

¹⁶ ES Consent No: 96022 appended to Statement of Evidence of Andrew Bazel Conrad Feierabend for Meridian Energy Limited 15 February 2019 - Court File Reference: ENV-2018-CHC-38

Operational Guidelines¹⁷. That is, the conditions of consent restrict the extent to which turbid waters from the Mararoa may back up into the Lake.

- 35 Compliance with that regime is achieved by discharging any highly sedimented Mararoa water direct to the lower Waiau. To that end, the final 1 km of the Mararoa River above the confluence has been realigned so that the Mararoa flow is directed at the Weir gates.
- 36 My understanding is that once turbidity is below consented levels, the Weir gates are closed and immediately return the discharge into the Waiau to the consented minimum.
- 37 I have observed that, with a consistently high flow, although the riverbanks become saturated, they are supported by the high flow in the river. Once the gates at the Weir close, flow drops faster than the banks can drain. The consequence is that the banks collapse. The slumping of high banks on the Waiau is a common sight the length of the River.



Figure 3 Bank Slumping 3kms upstream of Clifden - Jan 2020

¹⁷ See schedule of conditions attached to Resource Consent 96022



Figure 4 Bank erosion 2km downstream from Tuatapere - Jan 2020

- 38 Bank collapse contributes additional gravel and fine sediment to the River. Concurrently, there has been a significant and observable build-up of gravel immediately below the Tuatapere Bridge and deposited fine sediments into the Te Waewae Lagoon.
- 39 The water permit¹⁸ held by Meridian to dam and divert the waters of Lake Manapōuri and the Waiau and Mararoa Rivers, is subject to an Erosion condition (Condition 11) which reads:

Erosion

The Consent Holder shall:

- (a) Take such precautionary measures which the General Manager, Southland Regional Council may require to prevent damage from erosion which is likely to occur as a result of the exercise of this permit; and*
- (b) Make such remedial repairs which the General Manager, Southland Regional Council may require to remedy damage from erosion which occurs as a result of the exercise of this permit.¹⁹*

- 40 As a riverside landowner Aratiatia is keenly interested in riverbank stability and associated erosion. To my knowledge Condition 11 has never been used by the General Manager of the Regional Council either as precautionary or retrospectively as remedial.

¹⁸ Manapouri Te Anau Development Act 1963, Section 4 and Section 4A

¹⁹ Consent No 96022 – Condition 11 - Erosion

41 The structure of Condition 11(b) seems to require Council to establish a causal link – “a smoking gun” – between the exercise of the water permit and downstream erosion.

42 In 2018, Ellis, Hodgetts and McMecking²⁰ reported on stream bank erosion across Murihiku/Southland generally and used the lower Waiau as one of two case studies. They concluded:

Regulation of river flows can have complex effects on downstream morphology and will necessarily affect stream bank erosion rates and locations, although these are difficult to predict (Brandt, 2000²¹; Church, 1995²²; Hicks, 2009).

Further complicating these relationships in the case of the Waiau River are additional changes to flow and sediment loads. These include:

- *the arrest of bed load entering the Waiau River from the Mararoa River when the Manapouri Lake Control Structure (Weir) was installed in 1970;*
- *reintroduction of bed load to the top of the main stem from the Mararoa River (1987). This was achieved by installing the ‘Mararoa cut’ which, under high flow conditions, is used to bypass the Weir.*
- *restoration of minimum flows into the Waiau River by altering lake level regulation rules.*
- *an increase in flow diversion from the Waiau River called the Manapouri Tail race Amended Discharge (MTAD, circa 2010) (Hicks, 2009)²³;*
- *an increase in sediment load (probably both suspended and bed load) following the Lower Mararoa Rehabilitation Scheme that removed woody weed infestation that has built up in the channel and flood fairway since about the 1960s.*

43 It is self-evident that the flows into the lower Waiau are not natural. They are the result of the exercise of Water Permit 99603 by Meridian. The further “complicating” matters (bulleted in paragraph 42) are all features of the regulation of the Waiau River system by Meridian, which I have observed.

44 My understanding of the operation of the flow regime through the Weir is that every cubic metre of discharge is the direct result of an explicit decision of the managers of the Scheme. That is, those discharges do not occur by accident, nor as a natural

²⁰ Stream bank erosion in Murihiku/Southland and why we should think differently about sediment June 2018 Tim Ellis, Janet Hodgetts and Jane McMecking

²¹ Brandt, S. A. (2000). Classification of geomorphological effects downstream of dams. CATENA 40, 375-401.

²² Church, M. (1995). Geomorphic response to river flow regulation: Case studies and time-scales. Regulated Rivers: Research & Management 11, 3-22.

²³ Hicks, D. M. (2009). Statement of Evidence of Darryl Murray Hicks on Behalf of Meridian Energy Limited - River Sediment Transport. Anderson Lloyd Lawyers, Dunedin.

process. It follows that where damage from such discharge occurs downstream of the MLS, Meridian should properly be held to account. My recollection from having been involved in the 1996 consenting process, is that this was the intent of the wording of Condition 11 of Consent No: 96023.

- 45 During November-December 2019, there was a 5-week period of sustained high discharges through (and over) the Weir. Those flows caused extensive erosion damage within the lower Waiau catchment. \$1,000,000 of remediation works were required as a result. Meridian did not contribute to the remediation of the damage. \$750,000 was covered by the Government's Shovel Ready Project fund and the Waiau Catchment Liaison Committee (WCLC) drew down on its reserves to fund the 25% local share. The WCLC reserves had been accumulated through surpluses from its annual works programme. The annual works programme covers riparian fencing and riverbed spraying and is funded under the 1996 Waiau Agreement between Meridian, ES and the landowners.
- 46 I consider that this is another example of why the Council must retain flexibility to ensure that the adverse effects of the Scheme are avoided, mitigated or remedied. My experience with Meridian both as a ratepayer and in my capacity as a community elected Co-Chair of the WCLC, leads me to believe that unless Meridian is compelled to avoid, mitigate or remedy, Meridian is unlikely to do so.

Loss of Amenity

- 47 My family keenly feels the loss of amenity the operation of the Scheme has caused.
- 48 During the summer we routinely swim and fish for trout in the Waiau River. In the 1960s, Juanita's family dug for toheroas at Bluecliffs Beach. In the early 1990's, we used to net for flounders until the beach became too steep to do so safely. Bluecliffs Beach over the lifetime of the Scheme has been transformed from a sandy beach with sand dunes to a steeply shelving, cobbled beach.
- 49 In the Waiau River, sediment now covers the rocks underfoot and the presence of periphyton throughout the water column in the River often makes swimming an unpleasant experience. Swimming in waters awash with didymo is akin to swimming through toilet paper. The Youtube video clip²⁴, provides an excellent

²⁴ https://www.youtube.com/watch?v=_tOMSnnAVSU – Fish & Game NZ

insight into Didymo. Extensive algal blooms (didymo) make fishing difficult and my impression is that fish stocks, both in terms of size and quantity, have reduced. The rafts of “rock snot”²⁵ affect habitat by suppressing macroinvertebrate communities. Primary trout feed source is reduced as a result.

- 50 The occasional presence of toxic cyanobacteria means that we can never be assured of the safety of our swimming holes. That has had a direct impact on us, reinforced by Council signage posted at the Tuatapere Domain and at the Clifden Bridge, warning of the potential presence of toxic cyanobacteria.



Figure 5 ES Signage at Historic Clifden Suspension Bridge

Weed Infestation in the Historical Riverbed

- 51 Integral to the consenting of the Scheme in 1996 was the signing of the 1996 Waiau Agreement between the then owner of Scheme (ECNZ), Council and Federated Farmers Southland acting for the community. That agreement provided for the establishment of a special rating district with provision for the rate take from

²⁵ Didymo directly affects freshwater fish: new study – University of Canterbury – News -16 August 2016

landowners to be matched dollar for dollar by the generator, once the initial rates take exceeded a \$10,000 threshold. In addition, ECNZ further agreed to contribute an annual sum of \$200,000 (indexed for inflation) to the annual works programme.

- 52 The majority of the annual works programme of the WCLC provides for the extensive spraying by spray-boom-mounted helicopters, of herbicide to kill weed grasses, broom and gorse that have colonised gravel fans that have become established due to the Scheme-induced low river flows.



Figure 6 Broom infestation within the Historical Waiau Riverbed - Rakatu

- 53 The image in Figure 8 is a typical example of how gravel islands, formed within the historical riverbed, have been colonised by invasive weeds. The yellow flowering in the middle distance is broom, which can be seen to have spread onto the true left bank of the River. These tracts of weed infested river margins are the target of the annual spray works programme.
- 54 My understanding of the proposed 3-Waters Reforms is that they prevent the spraying of herbicide upstream of consented water takes for human use. That may raise issues in the context of Tuatapere Township's water supply.

- 55 It is unclear how weed ingress over the historical riverbed margins might be managed should the 3-Waters Proposals become law. Council needs to have available to it the ability to consider all factors when making consenting decisions.

Impacts on the Te Waewae Lagoon

- 56 The Waiau River has as its receiving body the Te Waewae Lagoon. My observation is that the lagoon is choked with sediment. In 2012 the Lagoon was described as moderately eutrophic²⁶. My understanding is that pre-control, the Lagoon mouth was always open to the sea. Then the entire lagoon was connected to the River. The River mouth migrated east to west along the 10km long seaward barrier bank.
- 57 Since the operation of the Scheme, the classification of the Lagoon as an ICOLL²⁷, (an intermittently closed and open lagoon) has changed. Now, reduced connectivity to the river due to hydroelectric abstractions and sedimentation within the lagoon has effectively closed off the eastern half of the lagoon. Council now classifies the eastern section of the lagoon as a shallow brackish lake. Only the western portion of the lagoon remains classified as an ICOLL.
- 58 Those modelling insights are consistent with my observation of sedimentation in the Lagoon. The reduced connectivity between the Lagoon and the River are consequences of the dewatering of the Waiau River by hydroelectric power generation. Hydroelectric power generation can result in more than 95%²⁸ of the River's natural flow (being the pristine alpine water) being diverted to Deep Cove, Doubtful Sound. It is clear to me that it is the damming and diversion (the magnitude of which I explored above) that has increased the intensity of resource use (in this case freshwater) within the Waiau FMU.
- 59 The reduction in total flow in the Lower Waiau River compromises the River's ability to flush its channel, to dilute sediments and to maintain its connection to its historical Lagoon footprint. The flow allowed through the Weir is often largely

²⁶ Stevens LM, Robertson BM 2012. Waiau (Te Waewae) Lagoon 2012: Fine Scale Monitoring and Macrophyte Mapping. Wriggle Coastal Management report, prepared for Environment Southland. 19p

²⁷ Te Waewae (Waiau) Lagoon Broad Scale Habitat Mapping 2019 Prepared by Barrie Forrest, and Leigh Stevens for Environment Southland October 2019

²⁸ Regional Forum Recommendations Report to Environmental Southland and Te Ao Mārama Inc. Board - Achieving the Community Aspirations for Freshwater - June 2022 – Page 44

sourced from the highly sedimented Mararoa River and therefore has much higher sediment concentration than was the case prior to the MPS.

Relative intensity of resource use in the Waiau Catchment

60 During my tenure on the Regional Forum (discussed below), I have seen where water bodies and wetlands are now degraded because of intensive human activity, be that urban or rural. I recognise that there exists a continuum of resource use intensity (with associated adverse effects) across the Region.

(a) At the upper extreme I would place New River Estuary of the Oreti River (which is located between the Invercargill urban area and Oreti Beach)²⁹. I have stood in the black, anoxic³⁰ goop at the northern end of Pleasure Bay and reflected on how different the estuary might have been had neither the reclamation of land from Stead Street to Bay Road, Invercargill, nor the reclamation of land beside the Waihopai River through successive landfill sites, occurred.

(b) I have reflected on the intensification of land use that the extensive drainage and straightening of the Makarewa River (a tributary of the Oreti) allowed. That straightening resulted in the shortening of the River by 80 kms³¹, increased the speed of water through that catchment and with it the scale of sedimentation that occurred within New River Estuary.

(c) These major works, which continue to make a significant contribution to Regional GDP, were the outcomes of deliberate central and regional Government policies during the 1960's^{32,33}. The consequences of those development strategies were, I think simply not foreseen as being "adverse" effects.

²⁹ Environment Southland, & Te Ao Marama Incorporated. (2011). Our Ecosystems: How healthy is the life in our water and our freshwater ecosystems. Part 2 of Southland Water 2010: Report on the State of Southland's Freshwater Environment. Invercargill.

³⁰ New River Estuary Reclaimed Land Desktop Assessment Environment Southland October 2019 page 37

³¹ MacIntosh, J. (1979). A Regional History of North Makarewa. Makarewa: Makarewa Jubilee Committee.

³² Water and Soil Conservation Act 1967 (1967 No 135) - NZLII

A Water and Soil Division was set up within the Ministry of Works and Development. Under its control were the Soil Conservation and Rivers Control Council, the Water Pollution Control Council and the Water Allocation. These were instruments of central government designed to achieve these development outcomes.

³³ <https://teara.govt.nz/en/soil-erosion-and-conservation/page-6>

- 61 Where does land use intensity in the Waiau FMU sit on that continuum?
- 62 In 2021 a Council-commissioned study³⁴ confirmed that, within the Waiau FMU land use as a percentage of the total area comprised

	Extent as proportion of FMU (%)
Arable	0
Dairy	3
Deer	1
Forestry	4
Horticulture	0
Indigenous Forest and Conservation	71
Sheep and Beef	19
Urban and Industry	1

- 63 The total number of dairy farms in the FMU is currently only 37³⁵, occupying less than 6%³⁶ of the dairy land in the Southland Region.
- 64 Much of the western part of the catchment (ie: the land along the true right bank of the river) and significant parts of the balance of the catchment remain heavily forested mountainous areas.
- 65 Land Cover data from Lawa 1996-2018³⁷ and comparison of GSI maps from ES for the period 1996-2015, suggests while some land use change is evident in the Waiau FMU over those time periods the extent is modest compared to other FMUs.
- 66 Those data suggest to me that as far as land use intensity is concerned the Waiau FMU should sit at the low intensity end of the scale. But land use is only part of the picture. The intensity of use of the Waiau FMU's total resources is, in my view,

³⁴ Modelling baseline suspended sediment loads and load reductions required to achieve Draft Freshwater Objectives for Southland Contract Report: LC3749 Andrew Neverman, Hugh Smith, Alexander Herzig, Les Basher Manaaki Whenua – Landcare Research, May 2021

³⁵ <https://maps.es.govt.nz/index.aspx?app=consents>

³⁶ Southland Economic Project – Derived from Table B11: Land area used for milking platform by FMU, Page 104, 2016

³⁷ <https://www.lawa.org.nz/explore-data/land-cover/> southland- Waiau Catchment 1996-2018

very different. In my view the Manapōuri Power Scheme's claim on the Waiau's freshwater resource places the FMU at the highest intensity end of the continuum.

FMU process and the Regional Forum

Background

- 67 In 2019 Council and Te Ao Marama Inc (TAMI) jointly called for expressions of interest from individuals to join a community-based Forum to provide advice to the Council on quantitative and qualitative limits that might be set to meet the Community's expectations with regards to its values and objectives for freshwater.
- 68 In March 2019 a forum comprising 17 members, was appointed³⁸. I was appointed as a founding member of the Forum.
- 69 The Forum met on 22 occasions. 18 sessions were held face-to-face hui and those included an opportunity for Forum members to meet members of the local community in which that Forum session was being held. Of those 18 sessions, 4 were held in the Waiau Catchment: 3 in Te Anau, and 1 in Tuatapere.
- 70 Public attendance at those sessions ranged from 3 and 120 attendees. Tuatapere was the session at which 120 members of the public were present. For me, the Community's feeling of grief at the loss of the River and the adverse effects that the operation of the Scheme had had on the Community's sense of wellbeing, was palpable.
- 71 Representatives of Meridian presented to the Forum at two of Hui held at Te Anau (June 2019 and December 2021) but did not attend the third hui in Te Anau nor the only public session held by the Regional Forum at Tuatapere.

Regional Forum Terms of Reference

- 72 The Terms of Reference for the Regional Forum directed that the Regional Forum would provide recommendations that consist of:

“An agreed programme, to update the Southland Water and Land Plan, which will implement the National Policy Statement – Freshwater Management (NPS-FM). The programme will include regulatory and non-

³⁸ Candidates applied to a joint TAMI and ES Section panel.

regulatory methods to achieve the community's values and objectives for freshwater."

... [and]... will:

- a. Review and develop proposed methods that are the most efficient, effective, and appropriate, to address the adverse effects of point and non-point discharges to land and water in Southland.*
- b. Focus on improving water quality over time, taking into account all the influences on it.*
- c. Consider and recommend water quantity allocation regimes for surface and groundwater systems.*
- d. Understand the wide range of values associated with Southland's waterbodies, including how values vary in different parts of the region".*
- e. Understand the national frameworks and how they potentially impact on the Regional Forum recommendations.*
- f. Understand and consider the impacts that are anticipated from the recommendations developed by the Regional Forum.*
- g. Take a strategic approach in considering the future needs of Southlanders and the legacy for generations to come."*

Regional Forum Final Report and Recommendations

- 73 The Forum's Final Report and Recommendations³⁹ were presented to the TAMI Board and Regional Councillors on 13 July 2022. I signed that report.
- 74 The Forum commented:
- "What this report represents, when all the recommendations are considered as an integrated suite of measures, is a system reset – a very different way of managing Southland's freshwater resources in the future"*⁴⁰
- 75 The Regional Councillors unanimously supported a resolution to "Accept and consider" the Report and Recommendations from the Regional Forum⁴¹.
- 76 The TAMI Board commented in relation to the Report:
- "The Te Ao Mārama Board members note that the recommendations report of the Regional Forum is a taonga for the region. The Board acknowledges the significant commitment of the Regional Forum to identifying a package of recommendations that have the potential to provide for te hauora o te wai, te taiao and te tangata within a generation, and therefore give effect to Te Mana o te Wai. The Board supports acceptance of the report and consideration of the full suite of recommendations during development of Plan Change Tuatahi. The Board notes that the Regional Forum advice constitutes an interrelated package of recommendations which should be considered as a whole and which may be added to or built upon to achieve freshwater objectives and environmental outcomes. The Board determines that consideration of*

³⁹ Achieving the Communities' Aspirations for Freshwater 2022

⁴⁰ Achieving the Communities' Aspirations for Freshwater 2022 Page 8

⁴¹ Ordinary Meeting of Environment Southland, 13 July 2022. Agenda Item 1, Pages 33-39

Regional Forum recommendations and development of Plan Change Tuatahi must progress as a programme of partnership between Council and Te Ao Mārama, including in relation to resourcing and all associated workstreams. The Board notes that working in partnership in this way will enable mātauranga to continue to inform policy development and implementation⁴²

- 77 Prior to the establishment of the Forum, Council had already undertaken and largely completed its Values and Objectives workstream. That workstream involved canvassing the Southland community to determine its values and objectives for freshwater management. A parallel piece of work was undertaken by TAMI with respect to surveying Ngā Whānau o Ngāi Tahu ki Murihiku to determine the same.
- 78 The first significant work I can recall being undertaken by the Secretariat which serviced the Forum was the weaving together of those two resultant data sets. That weaving process was to form the basis of the Hauora Envelope⁴³ concept.
- 79 In a recorded interview for the Forum communication team, I commented that the most significant feature of considering the values and objectives data sets was how closely aligned the hopes and aspirations (and the values and objectives⁴⁴ that underpin them) were for the two communities. As I recall the only matter which was substantially different was the elevated importance of mahinga kai to Ngāi Tahu respondents, which reflected perceived cultural significance.
- 80 Had the two data sets produced results that were wildly divergent, the subsequent work of the Forum would have been significantly more challenging than it turned out to be. The communities of Murihiku Southland had provided the Forum with a clear and consistent direction of travel.

The Forum's consideration of Manapōuri Power Scheme provisions in the Plan

- 81 Although Forum members are independent, in that they are not employed by either TAMI or Council, it is fair to say that the Forum relied heavily on technical expertise co-ordinated through Environment Southland. Council Staff regularly provided material which fleshed out specific policy questions.

⁴² Ordinary Meeting of Environment Southland, 13 July 2022. Agenda Item 1, Page 35

⁴³ Hauora – healthy resilience

⁴⁴ <https://waterandland.es.govt.nz/about/values-and-objectives>

- 82 At the 2021 Mataura Hui, the Forum considered a staff paper which provided “information and context on the clause in the NPSFM 2020 that applies to the Scheme on the Waiau River”⁴⁵. The specific policy question posed to the Forum to consider was:

“If Council was to set target attribute states below national bottom lines for the Scheme, then what are the important factors to consider when developing methods for the Waiau FMU?”

- 83 The Forum was advised that the Suspended Fine Sediment (SFS) Attribute state in the Waiau River at Tuatapere was worse than the national bottom line given the Lake-fed Classification of the River. I took that to mean that the SFS attribute state indicated degraded water quality. My understanding was that Meridian might be able to use that attribute state as the basis for an application to the Council for an exception to the NPSFM⁴⁶.

- 84 The other matter the same paper mentioned was the Plan Rule 52A. That Staff paper advised that:

“It should be noted that the controlled activity status of Rule 52A is under appeal by five parties to the Environment Court and currently has not had a hearing date scheduled”.

- 85 With this exception Rule 52A (in the Plan) was never discussed. My impression was that Rule 52A was outside the mandate of the Forum because it was/is under appeal.

The Forum’s Terms of Reference establish that the advice the Forum provided to Council, if accepted, would form the basis of the next Plan Change. Rule 52A did not form part of the *Forum’s* deliberations for advice and was not addressed in the Forum’s recommendations. On this basis, it is my understanding that the activity status of the Scheme will be dealt with by the Environment Court in the current appeals process on the Plan and is unlikely to be addressed in Plan Change Tuatahi.

Regional Forum Waiau Specific Recommendations

⁴⁵ “ Policy Context for the Waiau FMU: Hydro-electricity clause in NPSFM” – regional forum Staff Paper July 2021

⁴⁶ NPSFM 2020, Clause 3.31(1)-(5)

- 86 The Regional Forum recommended to Council a suite of Waiau FMU specific recommendations. That suite of recommendations is reproduced below:

Recommendations

Waiau River Classification

- 7.1 For the purpose of hauora-led integrated catchment management of the Waiau FMU, the Waiau river should be classified as lake-fed, in accordance with its original state. Such a classification will allow for management of freshwater objectives against reference state conditions, and importantly, culturally, represents recognition of the whakapapa (lineage) of the Waiau river.

Establishing Hauora-Led Flow Regimes

- 7.2 Mandatory flushing flows must be instituted as soon as possible and remain in place while more comprehensive changes to the lower Waiau flow regime are developed, and are to:
- a. be a minimum of five flushing flows annually,
 - b. be undertaken at times and intervals most conducive to the ecological health of the lower Waiau, and
 - c. incorporate gradual increase and decrease of flow rates for the benefit of river health (for example, giving consideration to riverbank erosion effects).
- 7.3 The flow regime for the lower Waiau must be revisited by the time of the next plan change and an approach developed that will guide the reconsenting of the Manapōuri scheme upon expiry of existing consents, based on:
- a. improving the life supporting capacity of the river,
 - b. a synthesis of available science,
 - c. the potential for staged implementation,
 - d. understanding the impact on national electricity supply and options for security of supply,
 - e. exploration of management options including storage or 'banking' of flows, variable flows, and increased minimum flows, and
 - f. consideration of lake levels and water temperature.

Science Programme

- 7.4 In order to support establishment, and review, of a new flow regime and other actions that help restore te mana o te Waiau, undertake a programme of additional science that is:
- a. funded by ES, with support from Meridian,
 - b. established in partnership with Ngāi Tahu and community stakeholders,
 - c. informed by a gap analysis of existing science,
 - d. on-going,
 - e. able to support intergenerational understanding of the river, and
 - f. addresses predicted climate change effects.

Waiau Catchment Hauora Planning

- 7.5 Support an integrated ki uta ki tai approach in the Waiau catchment by relying on a hauora plan for the catchment in its entirety, and by:
- a. managing contaminant load reductions in the tributaries of the Waiau guided by periphyton objectives; and
 - b. reviewing and undertaking further modelling and analysis of FMU contaminant load reduction targets needed to meet freshwater objectives once the revised flow regime for the lower Waiau is confirmed.

- 87 In summary the Forum's recommendations recognise
- (a) The primacy of Te mana o te Wai and Ki uta ki tai.
 - (b) The need for a science programme to be completed to inform a new flow regime for the Waiau River which restores the mana to the Awa.

- (c) That as a matter of urgency, and if necessary, before the science and flow regime modelling is complete, the current 5 voluntary flushing flow should be made mandatory.
- (d) That Plan Change Tuatahi should be vehicle for delivery.

88 The intensification of the freshwater resource use represented by the operation of the Scheme was recognised by the Forum and is reflected in the Forum's recommendations. As a member of the Regional Forum, I absolutely support these proposals.

89 The Regional Forum's suite of recommendations for the Southland Murihiku Region as a whole and for the Waiau FMU were conceived as a cohesive whole, rather than as a buffet from which some elements of recommendations could be chosen and others left on the shelf.

90 I consider it highly desirable that the form of Rule 52A eventually adopted enables the recommendations of the Regional Forum to be implemented. To do otherwise would prevent the values and objectives for freshwater management of the Southland Murihiku Community from being realised.

Why is Aratiatia concerned about what happens to the River?

91 Aratiatia is a family business. We have always felt close to the land. But why should that connection extend to the River?

92 As I look closely over the nearly 600ha we farm I can discern the influence of the River everywhere.

93 I can see where an ancient back water has likely deposited fine sands. Elsewhere I know that fine gravels will have accumulated, and where heavier boulders will have been dropped out of the ancient river's flow and accumulated as a ridge. At the base of the three major terraces on which the farm sits I know that there will be a shallow iron pan in which water will pool. Layer after layer of the substrate has been created by the actions of the ancient River. The character, the very essence of our land, derives from the River.

94 Our lived experience informs our family's knowledge of how water moves across and through our farm's landforms. We know where to re-create wetlands that have

long since vanished⁴⁷, to capture sediment and nutrients should overland flow occur. Without the River we would not have a farm. Our connection to the River is absolute.

95 My membership of the Regional Forum gave me the opportunity to see that everything is connected, from the mountains to the sea. For me, that is the essence of Ki uta ki tai.

96 We see that our farm - the land, the whenua – is our Tūrangawaewae – our place to stand.

97 And our Awa flows through it.

98 Te mana of Te Waiau.

Paul Marshall

Managing Director
Aratiatia livestock Ltd

⁴⁷ Our family has identified around 13% of Aratiatia's land holding as potential sites for constructed/recreated wetlands.