IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of an application by Meridian Energy Limited for the resource consents related to the construction of a new channel to enable a permanent diversion of part of the flow of the Waiau Arm and the associated removal of bed material and gravels, together with any maintenance and ancillary activities.

STATEMENT OF EVIDENCE IN CHIEF OF ANDREW BAZEL CONRAD FEIERABEND

TABLE OF CONTENTS

INTRODUCTION

1. My full name is Andrew Bazel Conrad Feierabend. I am employed by Meridian Energy Limited (Meridian). I hold the qualification Bachelor of Regional Planning from Massey University. I have approximately 36 years' experience in planning and resource management matters, all gained within the local government sector and electricity industry.

2. Meridian employs me to manage its statutory advocacy on regional and district plans nationwide where these plans may impact on the company's licence to operate or renewable energy development aspirations. This has included participation in the development the Proposed Southland Water and Land Plan. A significant portion of my role also relates to oversight of Meridian's compliance obligations associated with the Manapōuri Power Scheme (**MPS**) and, where necessary, reporting on the same to the relevant regulator or stakeholder group.

3. The primary purpose of my statement is to assist the Hearing Commissioners to understand the rationale and need for the work associated with establishing a new channel to improve flow conveyance within the Waiau Arm and the benefits that will arise from its construction on river health in the Lower Waiau River. This statement is factual in nature rather than an expression of expert opinion.

4. While I am an employee of Meridian and am not an independent witness and this is a council hearing, I have read the Environment Court of New Zealand Practice Note 2014. I confirm I have complied with it when preparing my evidence in relation to Meridian's application for resource consent to create a new channel and permanent diversion of part of the Waiau River upstream of the Manapōuri Lake Control structure.

5. In presenting this evidence I have also read the evidence prepared on behalf of Meridian by Dr Jo Hoyle, Dr Mike Hickford, and Dr Kristy Hogsden of NIWA, Scott Hooson of Boffa Miskell, Dougal Clunie of Aushydro (Dr Clunie is formerly of Damwatch Engineering), and Daniel Murray of Tonkin & Taylor.

SCOPE OF EVIDENCE

6. My statement of evidence provides:

   (a) An overview of Meridian as a company and the MPS;

   (b) A description of the relevant authorisations under which the MPS operates, how these affect flow management and the approval of works in the catchment, with a focus on the Lower Waiau River (**LWR**);

   (c) An overview of the introduction of *Didymosphenia geminata* (didymo) in the Waiau Catchment, its impact on aquatic ecology, and the development and implementation of a flushing flow protocol (the **Protocol**) to respond to didymo and nuisance periphyton in general;

   (d) A general project description of the Manapōuri Lake Control Improvement Project (the **MLC:IP**);

   (e) A summary of the consultation and stakeholder engagement undertaken;

   (f) A summary of key points raised by submitters to the MLC:IP application and Meridian's position on the same, and

   (g) An explanation of the development and implementation of a general exception within the Proposed Southland Water and Land Plan Appendix E Receiving Water Quality Standards in the context of maintenance activities associated with the MPS and its applicability to this application.

7. I also comment where relevant on the Section 42A report prepared in response to this application.

8. I am authorised to present this evidence as a representative of Meridian and on behalf of the Company.

OVERVIEW OF MERIDIAN

9. In this section, I provide an overview of Meridian's activities as an operator and developer of renewable energy.

10. Meridian is listed on the New Zealand and Australian stock exchanges and is 51% owned by the New Zealand Government. Meridian's generation portfolio is the product of major investment with long-term objectives to achieve the social, health and economic wellbeing of New Zealanders.

11. Meridian's core business is the generation, trading, and retailing of electricity, and the management of associated assets and ancillary structures in New Zealand. Meridian is committed to generating electricity from 100% renewable sources water, wind, and solar. The company generates around 30% of New Zealand's current electricity production, and retails electricity to around 290,000 customers across New Zealand through its Meridian and Powershop brands.

12. Meridian owns and manages:

    (a) two hydropower schemes in New Zealand: the Waitaki Power Scheme (from Lake Pūkaki down and comprising six power stations) and the Manapōuri Power Scheme; and

    (b) six wind farms in New Zealand: Te Uku (Raglan), Te Āpiti (Manawatu), Mill Creek (Wellington), West Wind (Wellington), White Hill (Southland), and Harapaki (Hawke's Bay) which has very recently completed construction.

    (c) A grid connected battery energy storage system (BESS) of 100 MW, currently being constructed at Ruakākā in Northland.

13. Each year, Meridian's hydro stations generate enough electricity to power approximately 1.7 million homes, and its wind farms generate enough electricity to power approximately 256,110 homes inclusive of Harapaki.

MPS CONTEXT AND LOCATION

14. The MPS is the largest single hydro generation facility in the country with a maximum installed output of 850 MW. The MPS currently generates approximately 12% of the country's total electricity output. The MPS utilises precipitation that falls in the Te Anau and Manapōuri lake catchments and the Mararoa River catchment to generate electricity.

15. The MPS is in the Waiau Catchment, part of the Fiordland National Park and discharges freshwater to Doubtful Sound in Fiordland. The MPS broadly consists of the following structures that affect flows within the Waiau River Catchment and the levels of Lakes Te Anau and Manapōuri:

    (a) A lake level control structure at the outlet from Lake Te Anau (that is, at the top of the Upper Waiau River). Water from Lake Te Anau flows via the Upper Waiau River to Lake Manapōuri;

    (b) A lake level control structure at the downstream end of the Waiau Arm of Lake Manapōuri just below the confluence of the Mararoa and Waiau Rivers which controls:

        (i) flows from the Mararoa River by allowing them to either pass over the control structure into the Lower Waiau River or to be diverted into the Waiau Arm of Lake Manapōuri, and

        (ii) flows out of Lake Manapōuri to the Lower Waiau River;

    (c) The Manapōuri Power Station itself, which is located in the West Arm of Lake Manapōuri;

    (d) Two 10-kilometre tailrace discharge tunnels that discharge water from Lake Manapōuri through the Manapōuri Power Station. The tailrace outfall is into the head of Deep Cove in Doubtful Sound.

16. The MPS takes and diverts water from the Waiau Catchment and discharges this into Deep Cove in Doubtful Sound. The MPS is represented schematically in Figure 1 below and its physical layout is represented in Figure 2.

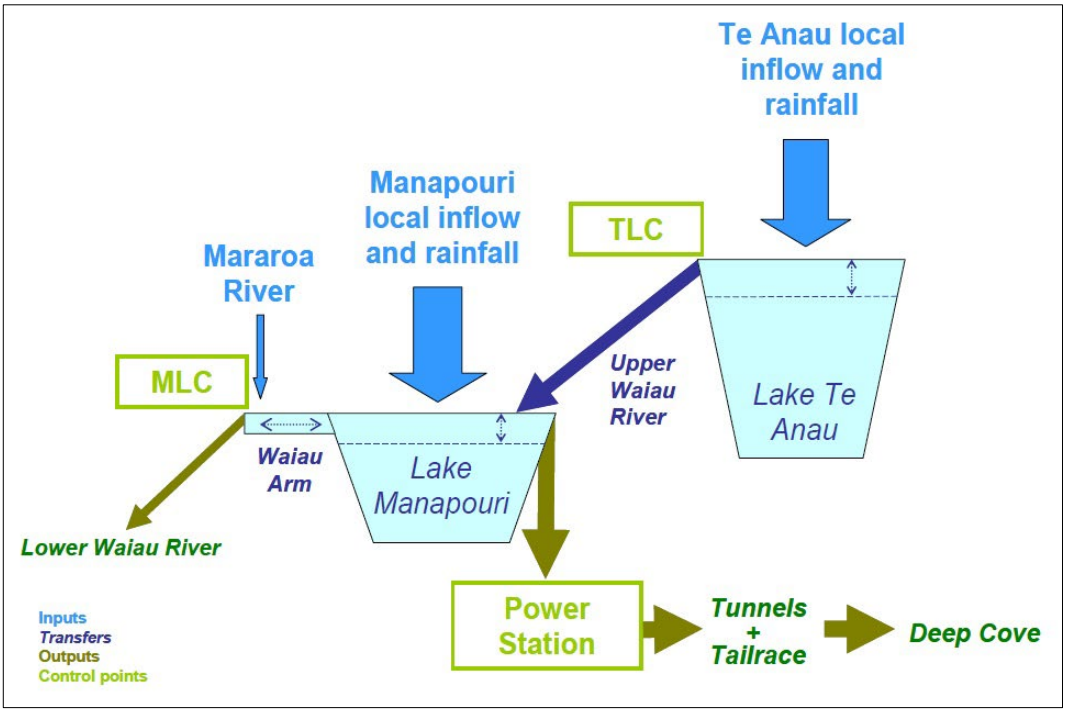


Figure 1: Schematic Diagram of MPS

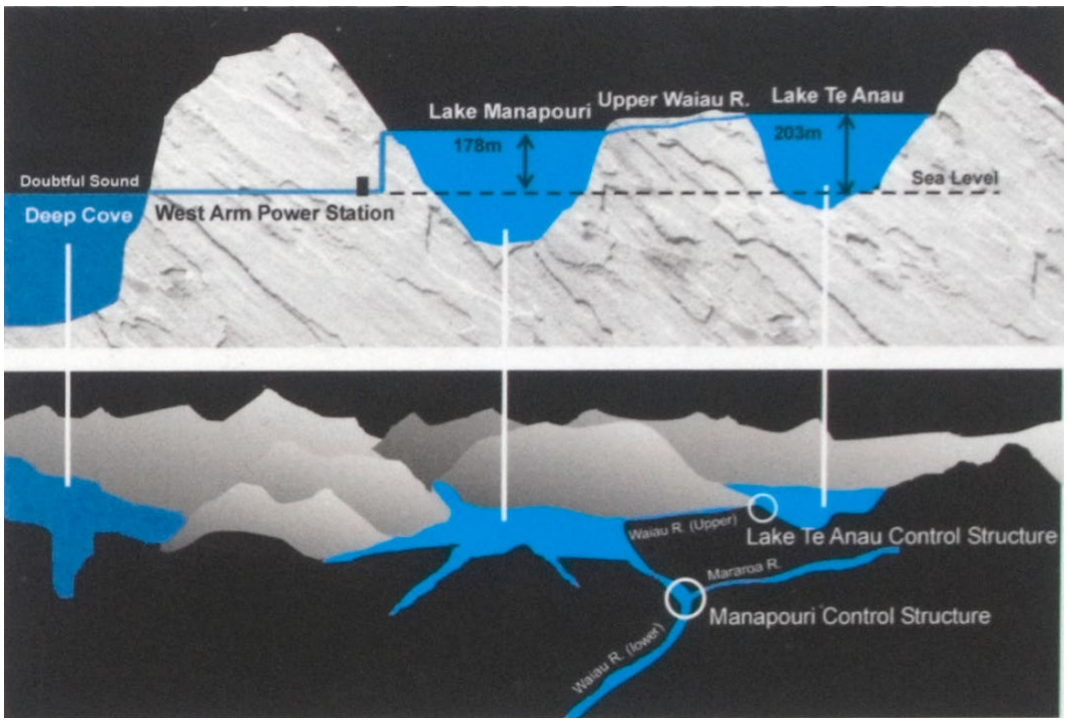


Figure 2: Physical Location of the MPS Waiau Catchment Southland

17. The flow in the Lower Waiau River is affected by the diversion at the power station in the West Arm of Lake Manapōuri and the diversion and discharge at the Manapōuri Lake Control structure at the top of the Lower Waiau River. The control structures of Lakes Te Anau and Manapōuri allow the management of those lakes to provide short-run storage of water for electricity generation.

SCHEME AUTHORISATION TO OPERATE UNDER MANAPŌURI – TE ANAU DEVELOPMENT ACT 1963

18. The original construction and operation of the MPS was authorised by its own unique empowering legislation – Manapōuri – Te Anau Development Act 1963 (**MTADA**). Aspects of the MPS continue to be regulated and authorised in by MTADA today. The key MTADA authorisation is contained in Sections 4 and 4A of the of MTADA, which are attached to this evidence as Appendix 1.

19. Section 4 of MTADA authorises the operator of the MPS to "…erect, construct, provide, use, and operate all works, appliances, and conveniences which may be necessary or requisite…" to the operation of the MPS.

20. In addition, the Lake Operating Guidelines for Lake Te Anau and Lake Manapōuri (**the Guidelines**) were first developed in 1973 and subsequently legislatively mandated under MTADA and promulgated by way of Gazette Notice. Section 4A of MTADA identifies that the purpose of the Guidelines is: "… to protect the existing patterns, ecological stability, and recreational values of [Lakes Te Anau and Manapōuri's] vulnerable shorelines and to optimise the energy output of the Manapōuri power station." A copy of the current Guidelines is attached as Appendix 2 to this evidence.

21. The dual objective of the Guidelines establishes a lake management regime which is centred on meeting environmental and recreational outcomes **and** optimising electricity generation within the parameters set out within this instrument. The Guidelines provide a robust operating regime for the MPS and protect against potential impacts on the shorelines of the lakes in the Fiordland National Park.

22. The Guidelines are based on Lakes Manapōuri and Lake Te Anau each having three operational ranges, i.e., High, Main and Low Operating Ranges. Each range with its own set of operating requirements established to protect the values identified in the Guidelines. These values and the operational requirements to protect them are

represented in Appendix 3 as extracted from “The Lake Manager’s Handbook” (2002) produced by the Ministry for the Environment.

23. In simple terms, the Main Operating Range requires continuous variation while achieving annual mean lake levels within that range. The High Operating Range and Low Operating Range each have set maximum duration and interval ratios which need to be complied with to protect both aquatic and terrestrial vegetation. In addition, the Low Operating Range sets maximum daily drawdown rates (for the purpose of maintaining a stable shoreline), and absolute minimum lake levels (including higher minimum lake levels that operate for set equinoxial periods of the year when higher wind speeds are likely to result in increased wave action).

24. The Guidelines require Meridian to meet these standards on a “best endeavours basis” in the High and Low Operating Ranges. In the Main Operating Range Meridian must “endeavour” and aim to achieve the lake level variations and means set out in this range.

25. Meridian is required to operate the MPS in accordance with the Guidelines. Oversight of Meridian’s application and adherence to the Guidelines is undertaken by the Guardians of Lakes Manapōuri, Monowai, and Te Anau (**Guardians**). The Guardians are mandated to undertake this task by section 6X of the Conservation Act 1987. A copy of this section is attached as Appendix 4 to this evidence.

26. Any departure from the Guidelines is required to be reported by Meridian to the Minister of Energy and Minister of Conservation at the time of occurrence. In turn this is required to be reported in the Annual Report of the Department of Conservation as the Department responsible for the administration of MTADA.

27. Meridian and the Southland District Council jointly sought a High Court declaration regarding the relationship between MTADA and the RMA, in 2014[1]. The High Court held that MTADA still applied, and the provisions of section 9(3) of the RMA do not apply to land uses ‘necessary or requisite’ to the operation of the MPS – such activities are authorised by MTADA.

28. Following that declaratory judgement, Meridian discussed with the Southland Regional Council the relationship between MTADA, and the various resource consent activity types managed by regional councils under the RMA. This has

[1] *Meridian Energy Limited* v *Southland District Council* [2014] NZHC 3178

resulted in agreement between Meridian and the Southland Regional Council about the legal basis for RMA and MTADA regulated activities associated with the MPS.

29. The Southland Regional Council and Meridian agree that the following sections of the RMA do not apply to the MPS operations where the works are necessary or requisite to the operation of the MPS, and that the equivalent activities are regulated and authorised by MTADA:

    (a) Section 9 – Restrictions on the use of land;

    (b) Section 12 – Restrictions on use of coastal marine area (only as it applies to temporary activities that do not include occupation);

    (c) Section 13 – Restriction on certain use of beds of lakes and rivers; and

    (d) Sections 15(1)(c) and (d), 15(2), and 15(2A) – Discharge of contaminants to the environment.

30. On this basis, the existing structures associated with the MPS in the Waiau Catchment are regulated under the MTADA rather than the requirements of the RMA. These are the Te Anau Lake Control structure, the Power Station at West Arm (inclusive of the tailraces used as part of the primary discharge) and the Manapōuri Lake Control structure.

31. While aspects of the MPS operations are regulated and authorised under MTADA, Meridian proceeds on a prudent basis that it is required to meet the general duty set out in section 17 of the RMA with respect to avoiding, remedying, and mitigating any unforeseen adverse effects arising from the result of the MPS operations.

32. The application for the MLC:IP has been prepared and lodged with the Southland Regional Council on the basis that the works are “necessary or requisite” to the operation of the MPS and that all existing requirements of the Operating Guidelines will continue to be met.

SCHEME AUTHORISATION TO OPERATE UNDER RESOURCE MANAGEMENT ACT 1991

33. In light of the High Court declaration, it is an accepted position between Meridian and the Southland Regional Council that in relation to the MPS the RMA (not MTADA) regulates the following activities:

    (a) Section 12 – Restrictions on use of the coastal marine area (other than in relation to temporary activities that do not include occupation);

    (b) Section 14 – Restrictions relating to water; and

    (c) Section 15 – Discharges (other than section 15(1)(c) and (d), 15(2) and 15(2A).

34. Meridian's operational resource consents issued by the Southland Regional Council are consistent with this approach. The primary resource consents for the MPS operations authorise the following activities:

    (a) To take and use for the purposes of the MPS the waters of Lake Manapōuri, through intake gates at the Manapōuri Power Station at West Arm;

    (b) To discharge up to 550 cumecs of water at the Manapōuri Power Station into Deep Cove at Doubtful Sound;

    (c) To dam and divert water from Lake Te Anau by means of a control structure at the lake outlet and to discharge the waters of Lake Te Anau to the bed of the Upper Waiau River immediately downstream of the Lake Te Anau Lake Control structure; and

    (d) To dam and divert the waters of Lake Manapōuri and the Waiau and Mararoa Rivers by means of a control structure, and to dam and divert the water from the Mararoa to an artificial diversion channel and to discharge the waters of Lake Manapōuri and the Waiau and Mararoa Rivers to the bed of the Waiau River below the Manapōuri Lake Control structure (MLC).

35. The major operational resource consents for the MPS were granted under the Resource Management Act in 1996. The process for consenting in 1996 involved all stakeholders with an interest in the Waiau Catchment being brought together into a

single forum sponsored by the Electricity Corporation of New Zealand, the then owner of the MPS. This forum became known as the Waiau Working Party (**WWP**). The consent application, mitigation agreements and a set of consent conditions were agreed in the WWP process. Key features of the agreed consents, conditions and mitigations are described below:

(a) A range of minimum flows between 12 and 16 cumecs to the Lower Waiau River for migratory fish flows and river health purposes. The amount of minimum flow is tied to specific times of the year.

(b) Monitoring programmes associated with identifying any unintended adverse effects associated with the operation of the MPS on the coastal marine environment at Doubtful Sound, the Lake Te Anau and Manapōuri environments, and both the Upper and Lower Waiau River.

(c) Recreational flows in specified circumstances and times.

(d) An ongoing role for the WWP under the 1996 consents to make recommendations to the Regional Council to review conditions under section 128 of the Resource Management Act where any unexpected or unforeseen adverse effects were identified from the exercising of the primary consents relating to the MPS.

(e) Establishment and capital funding of three mitigation trusts – Te Waiau Mahika Kai Trust, Tuatapere Amenities Trust and Waiau Fisheries & Habitat Enhancement Trust. A further agreement for rate funding for river works and erosion was agreed with Federated Farmers and Environment Southland. These trusts and the agreement remain in place today.

36. In 2010 Meridian applied for and was granted by the Southland Regional Council a suite of additional resource consents that enabled the discharge of freshwater to Doubtful Sound to be increased to a maximum of 550 cumecs. The consent conditions relating to the increased discharge by and large mirror the consents issued in 1996.

37. Following the issuing of the 2010 consent, Meridian in consultation with key stakeholders varied Consent No 206156 in 2012. This consent provides for the damming and diversion of waters of Lake Manapōuri and the Waiau and Mararoa Rivers at the Manapōuri Lake Control structure. The purpose of the variation was to

introduce a formal mechanism to provide for controlled releases of supplementary flows from the Manapōuri Lake Control structure to the Lower Waiau River (**flushing flows**) via an agreed protocol to enable the management of nuisance periphyton including didymo in the Lower Waiau River.

38. The objective of providing more regular flushing flows to the Lower Waiau River was focused on improving overall river ecosystem health in the Lower Waiau River. A copy of Consent No 204160 and the current Flushing Flow Protocol, which was last updated in 2018, are attached to this evidence, Appendix 5 and Appendix 6 respectively.

39. The MLC:IP application has been prepared on the basis of consents being applied for under the Resource Management Act and the PSWLP for those activities not covered by MTADA. For completeness, assessments have been undertaken to ensure all potential adverse effects of the project are appropriately managed, including dust, noise, and landscape effects.

MANAGEMENT OF NUISANCE PERIPHYTON AND GENERAL FLOW IN LOWER WAIAU RIVER

40. Didymo is a nuisance periphyton which was introduced from the northern hemisphere into the Waiau Catchment in 2004. This introduced organism rapidly colonised itself throughout the Waiau Catchment.

41. Didymo and other nuisance periphyton such as cyanobacteria have colonised and smothered large areas of macro invertebrate habitat throughout the Waiau Catchment. This is particularly pronounced in the Lower Waiau Catchment which has a highly moderated flow regime. This along with contaminant loading has led to an overall reduction in ecosystem health in this waterbody as measured by the Macroinvertebrate Community Index (**MCI**)[2]. This becomes more pronounced from the months of November through to the end of May.

42. As indicated in paragraph 37 of my evidence, Consent No 206156 was varied by amending condition 7 to require Meridian to prepare and implement a protocol for flushing flows to manage nuisance periphyton with a focus on didymo biomass.

[2] The Macroinvertebrate Community Index is used as an indicator of stream ecological health. Higher MCI scores indicate better stream conditions

43. The Protocol was subsequently developed by Meridian and the key stakeholders identified by the consent condition. It provides for between four and five flushing flows each season. The delivery of such flows is based on using the Standing Crop Index[3] and a decision support matrix and traffic light system[4] to trigger the desirability of delivering a flushing flow.

44. It has transpired that to provide flushing flows of the type and duration provided for in the Protocol, Lake Manapōuri needs to be in the middle of the Main Operating Range or above. This equates to a lake level of 177.69 m. The target flow and duration of a flushing flow[5] is set with the objective of dislodging nuisance periphyton and, through sediment entrainment, breaking up the associated periphyton mats and flushing them through the river system.

45. Since the establishment of the Protocol, the delivery of flows has been suboptimal with the actual delivery being less than 30% of the flows anticipated when the Protocol was agreed. This equates to on average one flushing flow per season since the inception of the flushing flow programme. In 2020 Meridian initiated an investigation to identify what primary constraints were limiting the provision of the flushing flows as outlined above.

46. In 2021 Damwatch Engineering Limited (Damwatch) was engaged to provide technical advice in this matter. Meridian completed a bathymetric survey of the channel in the Waiau Arm in 2020. Damwatch then conducted hydraulic modelling of the current channel utilising the bathymetric survey.

47. The combined analysis of this work confirmed that for a distance of 900 metres above the Manapōuri Lake Control structure, the depth and width of the channel was insufficient to convey the agreed flushing flows with a consistent frequency. The nature of the constraint is visually apparent in the bathymetric survey undertaken in 2020 and shown in Figure 3 below.

[3] The relationship between the extent of cover and thickness of the periphyton mat

[4] Appendix 1 and Appendix 2 Protocol for Controlled Releases of Voluntary Supplementary Flows from the MLC Structure to the Lower Waiau River 16 November 2018

[5] Specified within the Protocol as flows peaking between 160 and 250 cumecs with a mean flow of 120 cumecs over 24 hours

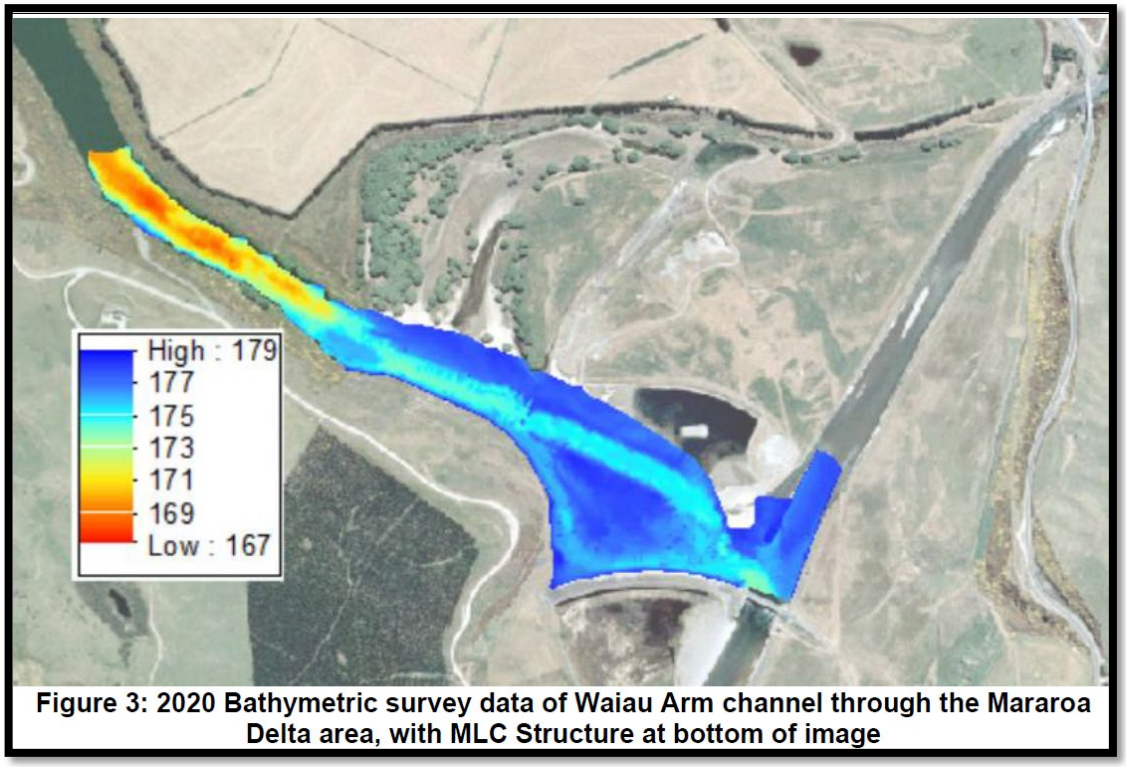


Figure 3: 2020 Bathymetric survey data of Waiau Arm channel through the Mararoa Delta area, with MLC Structure at bottom of image

Figure 3: Bathymetric Survey 2020 of the Waiau Arm Channel Upstream of the Waiau Arm

48. The area with the constrained bathymetry is the former delta where the Mararoa River historically joined the Waiau Arm. The former alignment of the Mararoa River is evident in the Figure 3, north of the Waiau Arm and west of the current Mararoa alignment.

49. After completion of its analysis, Damwatch recommended that the primary channel be widened to 25 metres and deepened RL172 m. Damwatch estimated through its modelling that if this work was undertaken, the reliability of delivering flushing flows would improve. In addition, the channel would improve overall conveyance for other consented flows including recreational flows and minimum flows.

50. It will not be possible to always meet 100% of the agreed flushing flows. When there are extended sequences of dry hydrology in the Waiau Catchment, the level of Lake Manapōuri will be too low to achieve this outcome as well as meeting compliance obligations associated with the Operating Guidelines.

DESCRIPTION OF MANAPŌURI LAKE CONTROL IMPROVEMENT PROJECT

51. The project by its nature is wholly an environmental enhancement project. Since identifying the nature of the constraint, significant analysis has occurred to identify the best construction methodology to use to improve flow management behind the Manapōuri Lake Control structure.

52. Option development and selection occurred via a series of workshops with internal and external experts to evaluate identified scenarios. Details of the options identified, and selection of the preferred methodologies are summarised below:

Option 1:	Instream option using excavators working from constructed bunds and diversions was ruled out because of hydrology risk and likely significant adverse effects arising from effects associated with suspended and deposited sediments.
Option 2:	Instream option using cutter suction dredging – discounted due to the range of bed materials found in the Lower Waiau Arm which is unsuitable for this methodology.
Option 3:	Instream option dragline excavation – ruled out due to limited operators and equipment available.
Option 4:	Instream option using excavation from barges – ruled out due to the confined work area and potential safety issues, complex set up and ability to disestablish if flooding forecast.
Option 5:	Instream option using temporary damming structures – ruled out due to constructability, cost and potential safety issues.
Option 6:	Parallel channel created adjacent to the current Waiau Arm for which most works could be undertaken outside the existing active channel.

53. The preferred construction methodology option, option 6, is the subject of this consent process. It proposes construction of a parallel channel in three stages. The channel will be approximately 50 metres wide (comprising a 16-metre wide base and 3:1 side slopes) and one kilometre long (approximately 850 metres off-line

through the existing left bank and 150 metres in the river, connecting to and within the existing channel). Excavation depths will range from zero to 12 metres. The channel excavation area is shown in Figure 4 as the yellow hashed area.

54. Option 6 has been fully developed for consenting and construction purposes. Its key features are described below:

(a) 85% of the works would be undertaken outside the existing channel alignment.

(b) Sediment control would be managed where required via onsite detention ponds and dewatering.

(c) Sediment management risk would be primarily confined to periods when the channel is opened at both ends of the works (likely short duration impact with a maximum exposure and risk period of five weeks).

(d) The amount of material requiring excavation is estimated at 220,000 cubic metres. The material extracted from the riverbed would be redistributed and contoured into Meridian-owned land adjacent the works.

(e) Approximately 100,000 cubic metres of the above excavated material is estimated to have a commercial value for use in road construction or concrete production and will be stored separately for removal over a 10-year period.

(f) The work under this methodology is estimated to take four months on a six-day/24-hour working week.

(g) Adverse hydrology risk is minimised through this option given most of the work would be outside the existing channel, although if Lake Manapōuri was in the high range, works would be stopped.

(h) Seasonally, from a hydrology perspective, the best time of year to undertake the work is February–October.

(i) The preferred work window is February 2025 to 30 June 2025. Ideally, the work would be undertaken when lake levels are low.

(j) Once constructed, maintenance of the channel is expected to be minimal although gravel build up around the gates may need ongoing management, as

is currently the case. This project is not expected to increase the requirement for maintenance.

55. The channel excavation area and site location are shown in Figure 4. The new channel alignment is shown as the yellow hashed area.

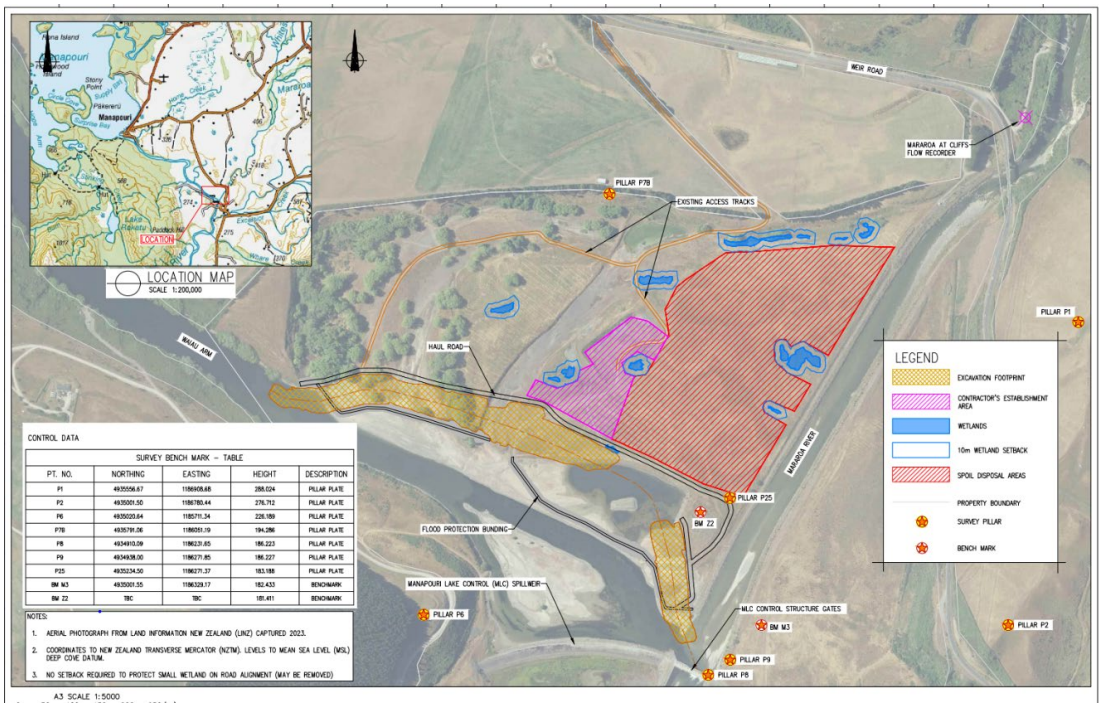


Figure 4: Option 6 Proposed Channel Excavation Alignment

MAINTENANCE

56. Sands and gravels are transported by the Mararoa River and have historically deposited near the Mararoa confluence with the Waiau River. In the recent years, Meridian has undertaken periodic removal of relatively small volumes of gravels from the area of the Waiau Arm immediately upstream of the MLC gates and confluence with the Mararoa River under the existing consent 204160. I am advised that from 2013 until present, gravel and bed material excavation has occurred on three occasions. On one occasion, no gravel or bed material was removed as the works were disrupted by high flows. On two occasions, small quantities of material of up to approximately 2,000 m^3 were removed. On each occasion, the works were of short duration of between 2 and 4.5 days.

57. It is anticipated that similar future maintenance will be required in the area from immediately upstream of the MLC gates, including from the downstream end of the newly excavated channel and areas around the Waiau Arm confluence with the

Mararoa River, following the completion of the new parallel channel as outlined in Dr Clunie's evidence and provided for in the draft conditions attached to Mr Murray's evidence.

CONSULTATION AND STAKEHOLDER ENGAGEMENT

58. Since 2022 Meridian has undertaken extensive consultation with stakeholder interest groups in the Waiau Catchment. This has included engagement with Te Ao Marama Incorporated (which is ongoing); Waiau Working Party; the Southland Fish and Game Council; Waiau River Care Group Inc; Guardians of Lakes Manapōuri, Monowai and Te Anau; Pamu (Landcorp); Department of Conservation; Real Journeys Limited; and the Jet Boating NZ (Southland Branch).

59. The nature and extent of engagement with each stakeholder group is described in detail in section 10 of the Assessment of Environmental Effects on the Environment. In essence the feedback from stakeholders has been positive towards the project and the methodology proposed, subject to suitable conditions being imposed on the consent for managing identified effects.

RESPONSES TO ISSUES IN SUBMISSIONS

60. Fourteen submissions were received on the application. Of the submissions received three are neutral, six are opposed to issuing consent, and five support the construction of the new channel as proposed subject to suitable conditions being imposed to manage potential adverse effects associated with the works. Many of issues identified are common between submitters.

61. Since the closure of the submission process, Meridian has participated in two facilitated prehearing meetings to discuss submitter issues and where possible agree on suitably framed conditions to manage the anticipated effects of the proposed works. Agreed conditions have been reached on the following matters:

    (a) stonecrop and management of spread risk from the site

    (b) sediment management, both suspended and deposited

    (c) remediation works associated with the loss of a small low valued wetland

    (d) translocation of Buchanan sedge, and

(e) avifauna and fish management responses required for the duration of the works and post construction.

62. Submissions received from residents of the Bluecliffs area are concerned about the impact of erosion on their coastal community. Meridian's view is that the channel project does not create any effects with respect to coastal erosion given that the existing flow regime for the Lower Waiau River is not changing as a consequence of this project. Meridian's view is that this group of submissions raise issues outside of the scope of this application.

63. Some submitters[6] have requested a condition seeking financial redress if flushing flows are not provided. As previously indicated in this evidence, there will be times when such flows will not be available because of the level of Lake Manapōuri. Meridian does not support the provision of such a condition and is not promoting it in the context of compensation for offsetting adverse effects as set out in Section 104 of the Resource Management Act. Any adverse effects associated directly with this application are of a short duration during the construction of the works.

64. Another issue arising from submissions is the length of the consent term being applied for (35 years). Some[7] submitters are requesting the duration of the consent be aligned to when the operating consents of the MPS are renewed in 2031. Meridian's position is that this is unnecessary given that future flow regime and allocation decisions will be determined through Plan Change Tuatahi and/or reconsenting. The MLC:IP is intended to be permanent. The modified (improved) bathymetry of the new channel will be an enduring positive outcome of the project. If the duration of the consent was to expire in 2031, Meridian would not proceed with the project given the level of uncertainty a short-term consent would provide, and the multi-million-dollar investment required to implement the work. If the MLC:IP was implemented at the earliest opportunity in 2025 and expired in 2031, it would be operational for 6 years.

[6] Waiau Rivercare Group, Waiau Working Party and the Waiau Fisheries and Wildlife Habitat Enhancement Trust.
[7] Bluecliffs Landowners Group, Waiau Rivercare Group, Waiau Working Party, Waiau Fisheries and Wildlife Habitat Enhancement Trust, Ian and Joan Redpath, Guardians of Lakes Manapōuri, Monowai and Te Anau.

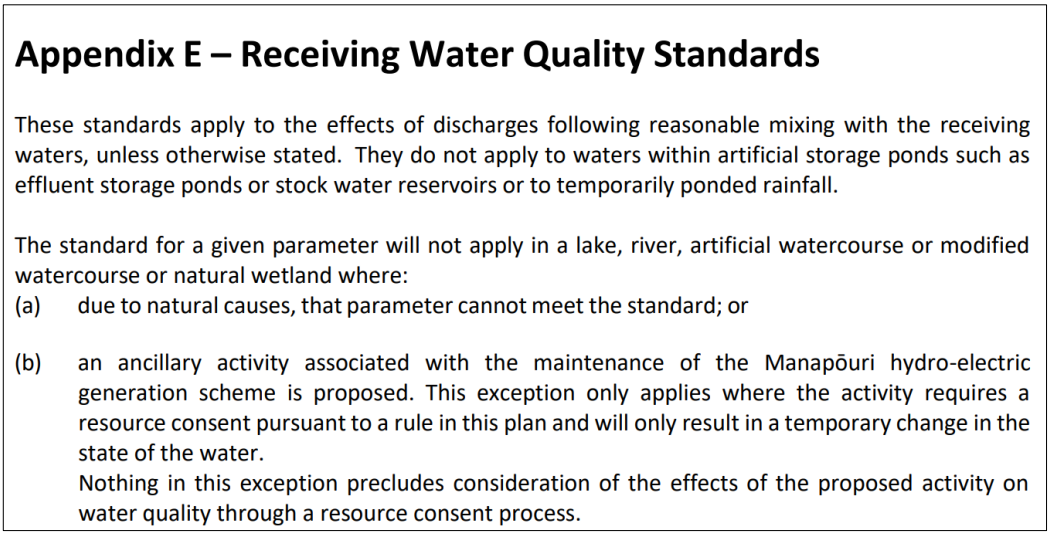
SOUTHLAND WATER AND LAND PLAN – APPENDIX E – RECEIVING WATER QUALITY STANDARDS

65. Rule 5 and Rule 6 of the Proposed Southland Water and Land Plan (**PSWLP**) regulate discharges to surface water bodies of contaminants or water into a lake or river, artificial watercourse, modified watercourse, or natural artificial wetland. They also regulate discharges of contaminants onto or into land in circumstances where it may enter a lake, river, artificial watercourse, modified watercourse, or natural wetland.

66. Where the conditions are met under Rule 5 such discharges are a discretionary activity; where they are not met the activity status becomes non-complying. The conditions of Rule 5 are as follows:

Condition 1:	Where the water quality upstream of the discharge meets the standards set for the relevant water body in Appendix E "Water Quality Standards", the discharge does not reduce the water quality below those standards at the downstream edge of the reasonable mixing zone; or
Condition 2:	Where the water quality upstream of the discharge does not meet the standards set for the relevant water body in Appendix E "Water Quality Standards", the discharge must not further reduce the water quality below those standards at the downstream edge of the reasonable mixing zone; and
Condition 3:	The discharge does not contain any raw sewage.

67. In the development of the PSWLP, I on behalf of Meridian, advocated for and the plan now contains an agreed exception to the application of the receiving water quality standards in Appendix E as set out below. The exception applies where an ancillary activity associated with the maintenance of the MPS triggers a resource consent and the activity results in a temporary change in the state of the water.



Appendix E – Receiving Water Quality Standards

These standards apply to the effects of discharges following reasonable mixing with the receiving waters, unless otherwise stated. They do not apply to waters within artificial storage ponds such as effluent storage ponds or stock water reservoirs or to temporarily ponded rainfall.

The standard for a given parameter will not apply in a lake, river, artificial watercourse or modified watercourse or natural wetland where:

(a) due to natural causes, that parameter cannot meet the standard; or

(b) an ancillary activity associated with the maintenance of the Manapōuri hydro-electric generation scheme is proposed. This exception only applies where the activity requires a resource consent pursuant to a rule in this plan and will only result in a temporary change in the state of the water.
Nothing in this exception precludes consideration of the effects of the proposed activity on water quality through a resource consent process.

Figure 5: Appendix E of the Receiving Water Quality Standards

68. As part of my evidence that I provided to the Environment Court on the above provision, I used the MLC:IP example to demonstrate and justify the rationale for the exception. Some submitters party to the agreement to the above exception are also submitters to this application. In essence, in my view, the surface water discharges associated with this consent fall under Rule 5 of the PSWLP.

RESPONSE TO SECTION 42A REPORT

69. I have reviewed the section 42A Officer's Report prepared by Bianca Sullivan, Resource Management Consultant with Environment Matters Limited, on behalf of Environment Southland, and the supporting technical reports. There are no issues raised in the Officer's Report relating to matters in this evidence that need addressing.

CONCLUSIONS

70. The MPS is authorised and operated under MTADA and the RMA.

71. The MLC:IP project is an environmental improvement project that will enable more efficient and reliable provision of consented flows to the LWR including flushing flows to the agreed Protocol. Better flow conveyance delivered by the MLC:IP is designed to improve aquatic ecosystem health in the LWR as a result.

72. The project during the construction phase will have environmental effects which will be managed in accordance with best practice and a range of conditions offered as

part of the consenting process. The effects identified are temporary in nature except for the loss of one discrete and low value wetland which will be offset.

73. Some submitters are seeking a consent duration that matches 2031 when the existing main operating consents of the MPS expire. Given the multi-million-dollar costs of the work such a condition would mean the work would not be progressed by Meridian given the uncertainty and risk to investment.

74. An exception is provided under Appendix E of the PSWLP for ancillary activities associated with the maintenance of MPS that require a consent under the Plan. The exception can only be relied on where there is only a temporary change in the state of water. Rule 5 of the Plan should therefore apply to any discharges to surface water associated with the MLC:IP as a discretionary activity under this exception.

Andrew Feierabend

Statutory and Compliance Strategy Manager, Meridian Energy

3 September 2024

APPENDIX 1 – MANAPŌURI – TE ANAU DEVELOPMENT ACT 1963, SECTIONS 4 & 4A

4 Authorising corporation to construct and use works

(1) The corporation shall have, and shall be deemed since the making of the agreement to have had, full power and authority—

(a) to erect, construct, provide, use, and operate all works, appliances, and conveniences which may be necessary or requisite for or in relation to—

(i) the utilisation of water power from the said water resources for the generation of electrical power; and

(ii) the generation, transmission, use, supply, and sale of electrical power required from time to time to be supplied pursuant to the agreement; and

(iii) the transmission, use, supply, and sale of any other electrical power generated from the said water resources:

(b) to use electrical power when so generated in the construction, working, or maintenance of any public work:

(c) to raise or lower the levels of—

(i) Lakes Manapouri and Te Anau; and

(ii) the Waiau and Mararoa Rivers and their tributaries; and

(iii) all other rivers flowing into the said lakes and their tributaries; and

(iv) such other rivers and streams as the Governor-General may from time to time specify for the purposes of this paragraph by Order in Council made pursuant to section 311 of the Public Works Act 1928:

(d) for the purposes of this Act, to construct tunnels under private land, or aqueducts and flumes over the same, and to erect electric lines as defined in section 319 of the Public Works Act 1928 over or along any such land, without being bound to acquire the same, and with right of way to and along any such works and erections:

(e) to supply and sell electrical power generated from the said water resources, and recover money due for the same.

(2) *[Repealed]*

(3) Except as otherwise provided in this Act or in the agreement all the provisions of the Public Works Act 1928 shall operate as if the powers conferred on the corporation by this section were conferred on it by an Order in Council made under section 311 of that Act.

Section 4 heading: amended, on 14 May 1999, pursuant to section 100 of the Electricity Industry Reform Act 1998 (1998 No 88).

Section 4(1): amended, on 14 May 1999, by section 100 of the Electricity Industry Reform Act 1998 (1998 No 88).

Section 4(1)(c) provisos: repealed, on 23 October 1981, by section 2(2) of the Manapouri–Te Anau Development Amendment Act 1981 (1981 No 129).

Section 4(2): repealed, on 23 October 1981, by section 2(2) of the Manapouri–Te Anau Development Amendment Act 1981 (1981 No 129).

Section 4(3): amended, on 14 May 1999, by section 100 of the Electricity Industry Reform Act 1998 (1998 No 88).

4A Operating guidelines for levels of Lakes Manapouri and Te Anau

(1) The Minister shall from time to time promulgate, by notice in the *Gazette*, operating guidelines, based on recommendations submitted to him or her by the Guardians of Lakes Manapouri and Te Anau and the corporation, for the levels of those lakes aimed to protect the existing patterns, ecological stability, and recreational values of their vulnerable shorelines and to optimise the energy output of the Manapouri power station.

(2) Notwithstanding anything in section 4, anything operated, used, constructed, or provided pursuant to that section shall, except in exceptional natural circumstances or where life or structures are endangered, comply with the operating guidelines promulgated by the Minister under subsection (1).

(3) Details of any departure from the operating guidelines shall be reported as soon as practicable to the Minister and the Minister of Conservation, and shall be included in the annual report of the department of State for the time being responsible for the administration of this Act made under section 43 of the Public Finance Act 1989.

Section 4A: inserted, on 23 October 1981, by section 2(1) of the Manapouri–Te Anau Development Amendment Act 1981 (1981 No 129).

Section 4A(1): amended, on 14 May 1999, by section 100 of the Electricity Industry Reform Act 1998 (1998 No 88).

Section 4A(1): amended, on 1 January 1988, by section 3(4)(b) of the Electricity Operators Act 1987 (1987 No 109).

Section 4A(3): replaced, on 2 January 1990, by section 5 of the Energy (Fuels, Levies, and References) Act 1989 (1989 No 140).

Section 4A(3): amended, on 25 January 2005, by section 37(1) of the Public Finance Amendment Act 2004 (2004 No 113).

APPENDIX 2 – OPERATING GUIDELINES FOR LEVELS OF LAKES MANAPŌURI & TE ANAU

Source: NZ Gazette, 21 November 2002

Manapouri-Te Anau Development Act 1963

Operating Guidelines for Levels of Lakes Manapouri and Te Anau

Pursuant to section 4A of the Manapouri-Te Anau Development Act 1963, I, Pete Hodgson, Minister of Energy, based upon the recommendations of the Guardians of Lakes Manapouri and Te Anau and of Meridian Energy Limited, hereby give the following notice of the operating guidelines for the levels of Lakes Manapouri and Te Anau aimed to protect the existing patterns, ecological stability, and recreational values of their vulnerable shorelines and to optimise the energy output of Manapouri power station.

Notice

1. Title and commencement—(1) This notice may be cited as the Manapouri-Te Anau Development Act (Operating Guidelines) Notice 2002.

(2) This notice shall come into force on its publication in the *New Zealand Gazette*.

2. Application and interpretation—(1) This notice applies to Lakes Manapouri and Te Anau.

(2) In this notice, unless the context otherwise requires:

"Duration" means the number of continuous days any of the Lakes were within a particular range of level specified within the High or Low Operating Ranges.

"High Operating Ranges" are those set out in clause 5 of this notice.

"Interval" means, in relation to either of the Lakes, the number of continuous days that a Lake was below a particular range of level specified for the High Operating Ranges for that Lake.

"Lakes" means Lakes Manapouri and Te Anau.

"Level" means height, in metres, above mean sea level.

"Low Operating Ranges" are those set out in clause 6 of this notice.

"Main Operating Ranges" are those set out in clause 4 of this notice.

"Maximum duration" means, in relation to any of the Lakes, the number of continuous days that a Lake may be within a particular range of level specified for the High or Low Operating Ranges, and in relation to the High Operating Ranges, subject to the specified minimum interval.

"Minimum interval" means the number of continuous days that should elapse from either of the Lakes moving below a particular range of level, until that Lake returns within that range of level.

"Parties" means the Guardians of the Lakes and Meridian Energy Limited.

"Specified ratio" means the ratio derived from dividing the minimum interval by the maximum duration, and applies only to the High Operating Ranges.

3. Lakes management—The parties recognise three separate operating ranges of levels for each of the Lakes within which Meridian Energy Limited may operate, being Main, High and Low, as set out in clauses 4, 5 and 6 of this notice.

4. The Main Operating Ranges—(1) The Main Operating Ranges, within which Meridian Energy Limited shall endeavour to maintain continuous variation, are:

(a) for Lake Manapouri, levels from 176.8m to 178.6m; and

(b) for Lake Te Anau, levels from 201.5m to 202.7m.

(2) Meridian Energy Limited shall, for each of the lakes, aim to achieve annual mean levels within the applicable Main Operating Ranges as specified in this notice.

5. The High Operating Ranges—(1) Meridian Energy Limited shall use its best endeavours to:

(a) not exceed the maximum durations; and

(b) achieve the specified ratio in relation to the ranges of level set out in subclause (2) of this clause, where the actual interval (in days) between the Lake moving below a particular range of level and returning to within that range of level is divided by the actual duration (in days) that the Lake was originally within that range of level.

(2) Subject to subclause (3) of this clause, the High Operating Ranges are:

(a) for Lake Manapouri, above 178.6m, in accordance with the following maximum durations, minimum intervals, and specified ratios for the ranges of level set out:

Level (m)	*Maximum Duration*	*Minimum Interval*	*Specified Ratio*
At 180.5	1	100	100.00
Above 180.4	3	100	33.33
Above 180.1	9	100	11.11
Above 179.8	22	80	3.64
Above 179.5	35	40	1.14
Above 179.2	44	40	0.91
Above 178.9	99	20	0.20
Above 178.6	119	20	0.17

(b) for Lake Te Anau, above 202.7m, in accordance with the following maximum durations, minimum intervals, and specified ratios for the ranges of levels set out:

Level (m)	*Maximum Duration*	*Minimum Interval*	*Specified Ratio*
At 204.3	7	100	14.29
Above 204.2	10	100	10.00
Above 203.9	15	60	4.00
Above 203.6	22	30	1.36
Above 203.3	39	30	0.77
Above 203.0	65	30	0.46
Above 202.7	125	20	0.16

(3) Where the ratio derived from dividing the interval between the lake level moving below a particular range of level and returning to that range of level by the duration that the lake was in that range of level immediately prior to the interval:

(a) results in a ratio greater than or equal to the specified ratio, then the guidelines are deemed to be complied with.

(b) results in a ratio less than the specified ratio, then subject to subclause (4) of this clause, the interval occurring after a particular duration shall be added to that duration along with the duration occurring after that interval, in order to determine the duration for which the specified ratio must be achieved.

(4) The period of duration within any range of level, including accumulations as provided for in paragraph (b) of subclause (3) of this clause, shall not exceed the relevant maximum duration.

(5) The parties record that:

(a) High Operating Range guidelines were reviewed in 2001 and are based on the mean of the three extreme events during the period of natural and synthetic record from 1933 to 2000.

(b) the 1988 flood was excluded from this review because of its damaging high levels and extended duration. Extreme natural floods have occurred historically, e.g. 1988: Lake Te Anau 205.41m, Lake Manapouri 182.15m. It is accepted that guideline breaches may occur on rare occasions despite the best endeavours of the power station operator.

6. The Low Operating Ranges—(1) Subject to subclause (2) of this clause, the Low Operating Ranges are:

(a) for Lake Manapouri levels from 175.86m to 176.8m, with an absolute minimum level of 175.86:

Level (m)	*Maximum Duration*
Below 176.8	107
Below 176.5	66
Below 176.2	20
At or below 175.9	5

(b) for Lake Te Anau from 200.86m to 201.5m, with an absolute minimum level of 200.86m:

Level (m)	*Maximum Duration*
Below 201.5	88
Below 201.3	46
Below 201.1	21

(2) For the purposes of the Low Operating Ranges outlined in subclause (1) of this clause, Meridian Energy Limited shall use its best endeavours to:

(a) not exceed the maximum durations for the individual ranges of levels specified;

(b) avoid lake levels below 201.1m for Lake Te Anau and below 176.2m for Lake Manapouri during the equinoxial periods (March, April, October and November);

(c) not exceed, in any continuous period of 365 days, twice the maximum duration specified for any particular range of level; and

(d) ensure the rates of drawdown do not exceed the natural rates of drawdown averaged over four days, being 0.05m per day for Lake Manapouri and 0.03m per day for Lake Te Anau.

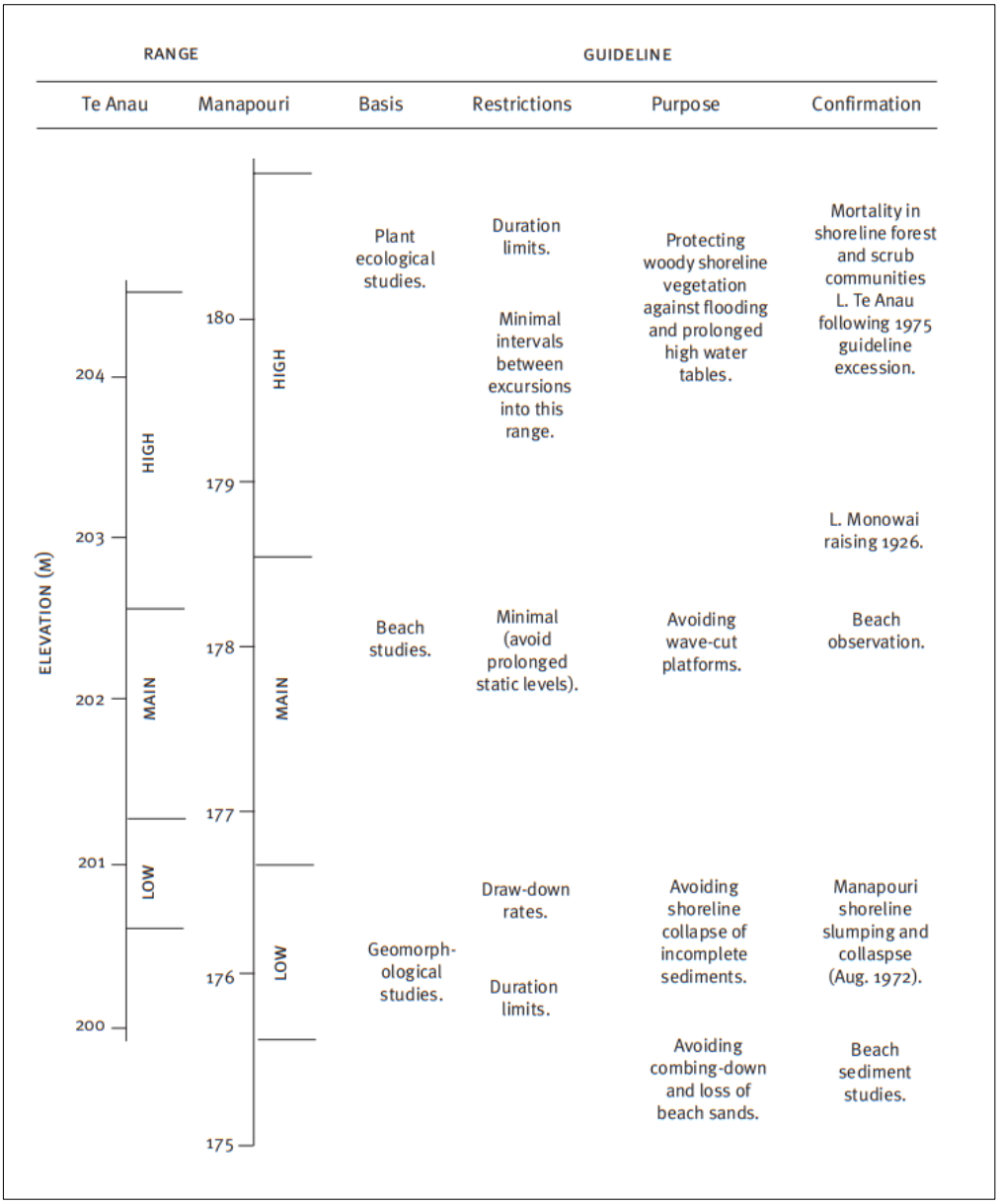
(3) The parties record that:

(a) in the period of natural record, the level of Lake Manapouri has been below the absolute minimum level of 175.86m; and

(b) these guidelines are based on the mean of three extreme events during the period of natural record and may result in low ranges of level being experienced more often than would have occurred naturally.

APPENDIX 3 – DESCRIPTION OF VALUES & MANAGEMENT INTERVENTIONS REQUIRED FOR ENVIRONMENTAL PROTECTION WITHIN LAKES OPERATING GUIDELINES FOR LAKES MANAPŌURI & TE ANAU

Source: Lake Managers' Handbook Lake Level Management, Ministry for the Environment 2002 (Original Source: Reprinted from Mark et al 2001)



APPENDIX 4 – SECTION 6X OF CONSERVATION ACT 1987

Part 2B

Guardians of Lakes Manapouri, Monowai, and Te Anau

Part 2B: inserted, on 10 April 1990, by section 5 of the Conservation Law Reform Act 1990 (1990 No 31).

6X Guardians of Lakes Manapouri, Monowai, and Te Anau

(1) The Minister may, on such terms and conditions as the Minister may from time to time specify, appoint suitable persons to be the Guardians of Lakes Manapouri, Monowai, and Te Anau.

(1A) The persons appointed to be Guardians must include at least 1 person nominated by Te Rūnanga o Ngāi Tahu (as established by Te Runanga o Ngai Tahu Act 1996).

(2) The functions of the Guardians shall be—

(a) to make recommendations to the Minister on any matters arising from the environmental, ecological, and social effects of the operation of the Manapouri-Te Anau hydroelectric power scheme on the townships of Manapouri and Te Anau, Lakes Manapouri and Te Anau and their shorelines, and on the rivers flowing in and out of those lakes, having particular regard to the effects of the operation on social values, conservation, recreation, tourism, and related activities and amenities:

(b) to make recommendations to the Minister on any matters arising from the environmental, ecological, and social effects of the operation of the Monowai Power Scheme on Lake Monowai, its shoreline, and on the rivers flowing in and out of Lake Monowai, having particular regard to the effects of the operation on social values, conservation, recreation, tourism, and related activities and amenities:

(c) to make to the Minister, and to the Minister responsible for the administration of the Manapouri-Te Anau Development Act 1963, recommendations on the operating guidelines for the levels of Lakes Manapouri and Te Anau, for the purposes of section 4A of that Act:

(d) *[Repealed]*

(3) The Guardians shall in each year make a report to the Minister on their meetings and recommendations.

(4) Except as otherwise expressly provided, every reference in any other Act to the Guardians of Lakes Manapouri and Te Anau shall be read as a reference to the Guardians appointed under subsection (1).

Section 6X: inserted, on 10 April 1990, by section 5 of the Conservation Law Reform Act 1990 (1990 No 31).

Section 6X(1): amended, on 22 October 1998, by section 274(1) of the Ngāi Tahu Claims Settlement Act 1998 (1998 No 97).

Section 6X(1A): inserted, on 22 October 1998, by section 274(2) of the Ngāi Tahu Claims Settlement Act 1998 (1998 No 97).

Section 6X(2)(d): repealed, on 23 December 2023, by section 6 of the Resource Management (Natural and Built Environment and Spatial Planning Repeal and Interim Fast-track Consenting) Act 2023 (2023 No 68).

APPENDIX 5 – COPY OF CONSENT NO 204160

environment SOUTHLAND

Logged

COPY

Application No: M289-020
Consent No:204160

Cnr North Road and Price Street
(Private Bag 90116)
Invercargill

Telephone (03) 211 5115
Fax No. (03) 211 5252
Southland Freephone No. 0800 76 88 45

ENTERED Mayos

Land Use Consent & Water Permit & Discharge Permit

Pursuant to Sections 104B and 104E of the Resource Management Act 1991, a resource consent is hereby granted by the Southland Regional Council (the "Council") to **Meridian Energy Ltd** (the "consent holder") of **P O Box 2454, Christchurch** from **11 December 2006**.

Please read this Consent carefully, and ensure that any staff or contractors carrying out activities under this Consent on your behalf are aware of all the conditions of the Consent.

Details of Permit

Purpose for which permit is granted:		To carry out various bed disturbance and other activities for maintenance of the Manapouri Lake Control Structure
Location	- site locality	Manapouri Lake Control Sructure
	- map reference	D44:960-971
	- receiving environment	Waiau River and Mavora River
	- catchment	Waiau
Legal description of land at the site:		Riverbed
Expiry date:		11 December 2021

Schedule of Conditions

1. The consent period is 15 years.
(Note: Pursuant to Sections 123 and 124 of the Resource Management Act 1991, a new consent will be required at the expiration of this consent. The application will be considered in accordance with the plans in effect at that time, and the adverse effects of the proposed activity).

2. This consent authorises the following activities at or about map reference NZMS 260 D44:960-971, as detailed in the application to this consent:

   (a) the reclamation of Mararoa Diversion Cut, including use of bunds, to narrow the channel to an average width of 50 m;
   (b) placement of riprap revetment, up to the average annual flood level, along both banks of the Mararoa Diversion Cut;
   (c) construction of a 150 m long rock groyne out from the true right bank of the Mararoa Diversion Cut;
   (d) excavation of gravel and other sediments from the bed of the Waiau River[1];
   (e) construction and maintenance of a gravel island in the bed of the Waiau River and Mararoa Diversion Cut;
   (f) placement of rock armouring along the upstream face of the spillway of the Manapouri Lake Control Structure;
   (g) repair of the Manapouri Lake Control Structure, including placement of temporary bunds and excavation of gravel;
   (h) discharge of gravel and other sediments, excavated from the beds of the Mararoa Diversion Cut or Waiau River in accordance with this resource consent, to the former channel of the Mararoa River;
   (i) planting of vegetation along the banks of the Waiau and Mararoa Rivers;
   (j) diversion of water around areas being actively worked in accordance with this resource consent;
   (k) the discharge of sediments to water during the riverbed disturbance works authorised by this consent; and
   (l) the discharge of contaminants to air, namely particulate (dust), from gravel extraction.

3. The consent holder shall ensure that:

   (a) cement and oil are prevented from entering the river during the construction works;
   (b) gravel excavations shall not extend into bedrock;
   (c) all construction equipment, machinery, plant, and debris are removed from the site on completion of each period of active works;
   (d) silt disturbance and instream works are kept to a minimum;
   (e) no washing of equipment occurs in the river;
   (f) large rocks are placed at approximately 50 m intervals on the riverbed adjacent to the rock riprap revetment and groyne at the Mararoa Diversion Cut,
   (g) the site is kept tidy, and left in a safe and aesthetically acceptable state between each period of active works so that the natural character of the riverbed is not adversely affected.

4. (a) The discharge of sediments shall not result in a reduction in water clarity of more than 20%, as measured by clarity tube, upstream of the works and downstream of the Duncraigen Road bridge, except for one hour/day or on two occasions of up to three hours during bund construction.

[1] Conditions 2(d) and 2(e) refer to the section of the Waiau River upstream of the control structure referred to in the application as the Waiau Arm.

(b) In the event of any contamination (other than by sediment) of the watercourse the consent holder shall remove the contaminants immediately from the site and notify, without undue delay, the Council's Compliance Manager.

5. Any stream banks disturbed or eroded during the construction works are to be restored and resown or replanted, preferably with native plants, upon completion of the works. This condition does not include the gravel island constructed under Condition 2(e).

6. In the event of a discovery, or suspected discovery, of a site of cultural importance (Waahi Taonga/Tapu), the consent holder shall immediately cease operations in that location and inform the local Iwi authority (Te Ao Marama Inc, phone (03) 931 1242). Operations may recommence with the written permission of the Council's Director of Environmental Management. The discovery of Koiwi (human skeletal remains) or Taonga or artefact material (e.g. pounamu/greenstone) would indicate a site of cultural importance. Appendix 1 outlines the process in the event of such a discovery.

7. [2](a) To avoid disturbance of the roosting and nesting areas of the black fronted tern, black billed gull, the works specified in Conditions 2(a), 2(b) and 2(c) shall not occur during the period 15 September to 30 January, if that works would disturb any colonies of the above birds.

(b) Other than the works specified in Conditions 2(a), 2(b), 2(c) and 2(d), there shall be no disturbance of the roosting and nesting areas of the black fronted tern, black billed gull, and banded and black fronted dotterel, or the feeding areas of the banded and black fronted dotterel, during the excavation works.

8. Approximately 15,000 m^3 of gravel and sediments may be excavated in accordance with condition 2(d) initially. Further excavations may occur during the consent period to maintain waterway capacity of the river established by the initial excavation.

9. The consent holder shall keep a record of all gravel excavated from the riverbed under the terms of this consent. A copy of each month's record shall be submitted to the Council by the tenth working day of the following month.

10. Gravel excavation shall not occur on weekends or public holidays.[3]

11. Any works specified in Condition 2 that will result in the closure of the Manapouri Lake Control Structure fish ladder shall not occur during the period 1 April to 30 September.[4]

12. The works specified in Condition 2(f) shall not occur during the period 1 May to 30 September.[5]

13. The discharge of particulate matter to air, shall not be noxious, offensive or objectionable, at a distance of more than 50m from the excavation area, to such an extent that it has an adverse effect on the environment.

14. The consent holder shall notify the Council's Compliance Manager in writing, on commencement and upon completion of the works.

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[2] See condition 15
[3] See condition 15
[4] See condition 15
[5] See condition 15

15. In the event that the operation of the Manapouri Lake Control Structure is compromised, as outlined in Section 7.7 of the resource consent application dated 25 September 2006, conditions 7, 10, 11 and 12 of this resource consent will not apply to any works authorised by this resource consent which are necessary to make the structure operational again.

16. Charges, set in accordance with section 36(1) of the Resource Management Act 1991, shall be paid by the consent holder to the Southland Regional Council for the carrying out of its functions in relation to the administration, monitoring and supervision of resource consents and for the carrying out of its functions under Section 35 of the Resource Management Act 1991.

17. The Council may, in accordance with section 128 and 129 of the Act, serve notice, during the period May to July each year, of its intention to review conditions for the purpose of:

    (i) dealing with any adverse effects on the environment which may arise from the exercise of this consent;
    (ii) requiring a monitoring on the gravel excavation; and/or
    (iii) complying with the requirements of a regional plan.

18. The consent holder shall take all reasonable precautions to minimise the spread of pest plants and aquatic weeds. In particular, the consent holder shall:

    - remove any vegetation caught on the machinery;
    - where necessary, clear vegetation from the site before gravel is extracted;
    - avoid working in areas where aquatic weeds such as *lagarosiphon major* are known to be present (for information, contact Environment Southland); and
    - any person carrying out work in accordance with this consent, minimise the risk of spreading *didymosphenia geminate* by adopting as a minimum, the "Check, clean, dry" management approach as devised by Biosecurity New Zealand
    - to avoid the spread of the *didymosphenia geminate* or any other pest plant, do not use machinery in the berm or bed of the river that has been used in any area where the pest plant(s) are known to be present in the previous 20 working days, unless it has been thoroughly cleansed.

for the **Southland Regional Council**

W J Tuckey
Director of Environmental Management

Note: *Avoid spreading Didymo – Environment Southland strongly recommends that the consent holder, and any person or contractor engaged by the consent holder to carry out the works authorised by this consent, use the "check, clean, dry" management approach as set out in the Biosecurity Management Guidelines (available at www.biosecurity.govt.nz or from Environment Southland) when entering and leaving the river environs.*

Appendix 1
Protocol in the event of a discovery, or suspected discovery, of a site of cultural importance (Waahi Taonga/Tapu)

1. ***Koiwi accidental discovery***
If Koiwi (human skeletal remains) are discovered, then work shall stop immediately and Te Ao Marama Inc (Ngai Tahu (Murihiku) Resource Management Consultants) will be advised.
Contact details for Te Ao Marama Inc are as follows:

Te Ao Marama Inc
Murihiku Marae
408 Tramway Road
P O Box 7078, South Invercargill
Phone: (03) 931 1242

It will arrange a site inspection by the appropriate Tangata Whenua and their advisers, including statutory agencies, who will determine whether the discovery is likely to be extensive and whether a thorough site investigation is required.

Materials discovered will be handled and removed by Iwi responsible for the tikanga appropriate to their removal or preservation.

2. ***Taonga or artefact accidental discovery***
Taonga or artefact material (e.g. pounamu/greenstone artefacts) other than Koiwi will be treated in a similar manner so that their importance can be determined and the environment recorded by qualified archaeologists alongside the appropriate Tangata Whenua.

3. ***In-situ (natural state) pounamu/greenstone accidental discovery***
Pursuant to the Ngai Tahu (Pounamu Vesting) Act 1997, all natural state pounamu/greenstone in the Ngai Tahu tribal area is owned by Te Runanga o Ngai Tahu. The Ngai Tahu Pounamu Resource Management Plan provides for the following measure:

- any *in-situ* (natural state) pounamu/greenstone accidentally discovered should be reported to the Pounamu Management Officer of Te Runanga o Ngai Tahu as soon as is reasonably practicable. The Pounamu Management Officer of Te Runanga o Ngai Tahu will in turn contact the appropriate Kaitiaki Papatipu Runanga;
- in the event that the finder considers the pounamu is at immediate risk if loss such as erosion, animal damage to the site or theft, the pounamu/greenstone should be carefully covered over and/or relocated to the nearest safe ground.

The find should then be notified immediately to the Pounamu Management Officer. Contact details for the Pounamu Management Officer are as follows:

Te Runanga o Ngai Tahu
Level 7, Te Waipounamu House
158 Hereford Street
P O Box 13-046
Otautahi/Christchurch
Phone: (03) 366 4344
Fax: (03) 365 4424
Web: www.ngaitahu.iwi.nz
Pounamu Management Officer
Kaiwhakarite Tiaki Pounamu
Te Runanga o Ngai Tahu

APPENDIX 6 – CURRENT FLUSHING FLOW PROTOCOL

MANAPOURI TAILRACE AMENDED DISCHARGE (MTAD)

WATER PERMIT TO DAM AND DIVERT THE WATERS OF LAKE MANAPOURI AND THE WAIAU AND MARAROA RIVERS

(RESOURCE CONSENT NO. 206156)

PROTOCOL FOR:

CONTROLLED RELEASES OF VOLUNTARY[1] SUPPLEMENTARY FLOWS FROM THE MANAPOURI LAKE CONTROL (MLC) STRUCTURE TO THE LOWER WAIAU RIVER

FINAL 9 APRIL 2013

AMENDED 7 NOVEMBER 2014

AMENDED 12 FEBRUARY 2016

AMENDED 16 NOVEMBER 2018

1. INTRODUCTION

This Protocol satisfies Condition 7[2] of Resource Consent No. 206156 held by Meridian Energy Limited (Meridian) to dam and divert the waters of Lake Manapouri and the Waiau and Mararoa Rivers with respect to the Manapouri Tailrace Amended Discharge Project (MTAD).

The Protocol provides for the controlled releases of supplementary flows from the Manapouri Lake Control (MLC) structure to the Lower Waiau River. This is to assist in managing periphyton biomass primarily didymo which has been introduced to the Waiau Catchment since the establishment and operation of the Manapouri Power Scheme. It is accepted by all parties that didymo is not an environmental effect that can be attributed to the establishment and operation of the Manapouri Power Scheme. The use of supplementary flows can assist mitigate the adverse effects of didymo. The parties recognise Meridian is not legally required to provide the supplementary flows but that these will have benefits to overall river health which includes sediment transport, eel migration and general ecosystem health.

Meridian has consulted the Waiau Working Party and the Guardians of Lakes Manapouri, Monowai and Te Anau and Te Ao Marama Inc during the development of this Protocol.

2. CONDITION 7

Condition 7 to Resource Consent 206156 states:

Lower Waiau River Voluntary Supplementary Flows

[1] For ease of reference the Protocol shall refer to 'supplementary flows' to avoid repetition of 'voluntary' as stated in condition 7 and the title of the Protocol.

[2] Condition 7 was inserted into this MTAD Water Permit (Consent No. 206156) in 2012 by way of a change of consent conditions, to replace Conditions 7 to 13 of the consent originally granted to MTAD in 2010.

The consent holder shall prepare and implement a protocol relating to controlled releases of voluntary supplementary flows from the Manapouri Lake Control (MLC) structure to the Lower Waiau River, in order to assist in managing periphyton biomass. The protocol shall include the following:

(a) Any monitoring to be undertaken to assess periphyton biomass;

(b) The size, duration, frequency and timing of the supplementary flows considered useful to assist in managing periphyton biomass;

(c) The circumstances, relating to periphyton biomass and natural flow occurrences, under which controlled releases of supplementary flows will be considered by the consent holder;

(d) The circumstances, relating to lake levels and security of electricity supply, under which controlled releases of supplementary flows may not be able to be provided by the consent holder;

(e) The procedures to be followed by the consent holder in considering and deciding upon the provision of a controlled release of a supplementary flow, in terms of the circumstances in (c) and (d) above.

The consent holder shall consult the Waiau Working Party the Guardians of Lakes Manapouri, Monowai and Te Anau and Te Ao Marama during the development of the initial protocol and any subsequent changes to the protocol.

The protocol shall be forwarded to Environment Southland for its certification as to compliance with this condition, prior to the 1st of December following the grant of consent to this condition. Any changes to the protocol shall also require certification from Environment Southland prior to implementation. The results of any monitoring undertaken in terms of this protocol shall be forwarded to Environment Southland annually, in conjunction with the monitoring results provided under Condition 7. This shall include the dates and flow parameters of all controlled releases of supplementary flows provided under this protocol by the consent holder in the preceding year.

3. BACKGROUND

Meridian has funded extensive monitoring of periphyton biomass in the Lower Waiau River for the last 10 years. As a result, a basic understanding of biomass and flow relationships has been developed, including the ecology and seasonality of didymo growth and biomass. This information is intended to be used to underpin decisions relating to the provision of supplementary flows to assist in managing periphyton biomass set out in this Protocol. In the event better science becomes available the outcomes of this research will be used to promote changes to the Protocol.

At this time, the primary indicator of periphyton biomass is the Standing Crop Index (SCI). NIWA has related the SCI to the periphyton guidelines and suggested indices to guide the management of periphyton biomass which are approximate to the levels in the New Zealand Periphyton Guidelines[3] (Biggs 2000) .

In general, the main impacts of periphyton biomass as understood at this time are the aesthetic impact, the effect on recreational activities and the effect on river health. As stated above, periphyton biomass is measured as the Standing Crop Index. This is a relationship between the extent of cover and thickness of the periphyton mat.

An SCI of 220 is a similar amount of periphyton to the 35 g ash free dry matter Periphyton Guideline limits for the protection of trout habitat and angling values. An SCI of 600 corresponds approximately to the guideline (120 mg/m^2 Chl α) for aesthetics and trout habitat for visual cover

[3] **Biggs, B.J F., (2000) New Zealand Periphyton Guidelines: Detecting Monitoring and Managing Enrichment of Streams. Report to MFE.**

by filamentous algae. The SCI is used in preference to the exact Guideline values due to the ease of field measurement and production of data, as it does not involve laboratory methods.

"Traffic light" indices for periphyton management have been developed by NIWA specifically for the Lower Waiau River[4]. These are green (all is well), amber (a supplementary flow response should be considered) and red (a supplementary flow response is required). This is based on the SCI index of periphyton biomass which is described from an application perspective later in this Protocol.

The purpose of the Protocol is to provide clarification around when the consent holder will consider providing controlled releases of supplementary flows from the Manapouri Lake Control (MLC) to the Lower Waiau River. It is acknowledged the primary purpose of providing such flows is to assist in the management of the effects of periphyton biomass particularly didymo.

4. REVIEW OF OPTIONS FOR MONITORING 2014

In late 2013 Meridian requested NIWA review options for amending the survey procedure to increase efficiency while still providing the data required by the protocol for decision making over the release of voluntary supplementary flows. Cathy Kilroy of NIWA prepared the report "Managing nuisance periphyton in the Lower Waiau River - review of options for monitoring November 2013 updated July 2014". The report options were discussion at a WWP meeting on 25 July 2014 and subsequently circulated to the parties to the protocol – the Guardians of Lakes Manapouri, Monowai and Te Anau, and Te Ao Marama Inc. The outcome of consultation on this matter was that the options of using existing flow data to guide decision making on the timing of surveys and reduced survey effort (reduced monitoring sites and frequency) based on the existing monitoring protocols would be trialled for a year commencing in November 2014.

Monitoring of periphyton biomass will be undertaken by appropriately qualified, experienced personnel under the direction of the consent holder. The monitoring set out in sections 4.1 to 4.4 below amended the monitoring regime implemented under the Protocol effective from 9 April 2013 and was undertaken as a trial for a year beginning 1 November 2014 through to the end of May 2015. At the completion of this period the efficacy of the amended monitoring was to be reviewed. Subject to confirmation from the parties to this Protocol that the amended monitoring is appropriate, it will be adopted and continued for the following monitoring seasons/years.

4.1. Monitoring sites

The monitoring sites will be:

Lower Waiau River (from downstream): Clifden, Monowai, Excelsior; (three sites in total); and Mararoa River Station Bridge (reinstated November 2015).

The amended monitoring for the trial period removed two sites from the Lower Waiau River (Tuatapere and Jericho) and all the sites on the Mararoa River (Whitestone, The Key, Station Bridge, Normans and Kiwi Burn swing bridge.

The Station Bridge site on the Mararoa River was re-instated following the review of the trial period of the amended monitoring) as a comparison site in an unmanaged river and is not included in decision making under this Protocol.

The timing and frequency for monitoring will be: determined in accordance with the decision support matrix[5] set out in Appendix 1 commencing at the beginning of November through to the

[4] Kilroy, C., Wech, J. (2011) Five Years of an adaptive management programme to mitigate excess periphyton in the Lower Waiau River. NIWA client Report CHC 2011-056. 45p.

[5] Kilroy, C. (2014) Managing nuisance periphyton in the Lower Waiau River – Review of options for monitoring, prepared for Meridian Energy, November 2013, updated July 2014. NIWA Client Report No: CHC2013-151. 50p.

end of May. Antecedent flow data will be checked every two weeks during this period by NIWA who shall advise Fish and Game of the need to survey (with best endeavours of adequate lead in time). The aim is to reduce surveys while the river is in green status while ensuring that periods in the red status are detected and considered for voluntary supplementary flow releases as set out in Appendix 2.

All monitoring will be at times of minimum flow or as close to, (i.e 16 m^3/s measured at the MLC or 50 m^3/s at Sunnyside). If there is a flood[6], monitoring will be undertaken as soon as possible after flows return to minimum flow, and the 2-weekly schedule restarts from the post flood sampling date.

4.2. Monitoring methods

All monitoring will:

- Undertake visual assessments, using the underwater viewer (see Kilroy and Biggs 2008).[7]
- Measure water clarity at each site, using the black disk method (mean of two readings, one per person).

4.3. Post-monitoring procedure

Once monitoring is completed:

- Data sheets from all three monitoring sites will be forwarded for processing after the survey is completed (normally within 24 hours).
- The data will be processed and results (SCI at each site) reported back to Meridian normally within one working day of receipt of the data sheets.
- SCI results will be reported for individual sites, including the assigned collective status according to their traffic light indices provided by NIWA.
- Reporting will include a commentary on growth in the Lower Waiau River (from the SCI results, and from field observations). This will be made available on a monthly basis to the Chairman of the Waiau Working Party and the Chairman of the Guardians of Lakes Manapouri, Monowai and Te Anau;

The traffic light index to be used by the consent holder to determine the timing of supplementary flows is as follows:

Green – all is well: SCI at all sites < 220; or the mean SCI < 200;

Amber – alert- response considered: at least one site with SCI > 220 and the mean SCI >200<300; or the mean SCI is between 200 – 600;

Red – response required: at least two sites with a SCI > 220 and the mean SCI >300, or the mean SCI is > 600.

4.4. Duration of monitoring

Amended monitoring trial 1 November 2014 to May 2015

The amended monitoring programme was undertaken for a trial period of a year commencing in November 2014 until the end of May in the following year (2015). The frequency and number of surveys was determined in accordance with the Decision Support Matrix set out in Appendix 1. A

[6] "Flood" is defined as any flow event greater than 50 m^3/s (daily mean flow) at MLC

[7] **Kilroy, C., Biggs B.J.F (2008). Management of periphyton (didymo) blooms in the Lower Waiau River: an adaptive Management trial 2006 - 2008. NIWA client Report CHC 2008-054. 45p.**

review of the amended monitoring was to occur at the completion of the trial period (end of May 2015).

Review of the amended monitoring trial

NIWA reviewed the implementation of the amended monitoring regime following completion of the trial period at the end of May 2015. The review considered the practicalities of the amended monitoring methodology and whether useful information was lost by reducing the number of surveys and the number of sites surveyed. The review and its findings is in section 3 of the NIWA report "Managing nuisance periphyton in the Lower Waiau River - results for 2014 -15 and review of an amended monitoring protocol"[8]. The review concluded that the amended monitoring methodology is an appropriate approach and recommended that it continue for future monitoring seasons since the trial period had demonstrated that it successfully met the requirements of the consent and the amended Protocol (7 November 2014). The review also recommended re-instating one site on the Mararoa River (Station Bridge) to provide a comparison site in an unmanaged river. The site would not be included in the decision making under Appendix 2 of the Protocol.

The NIWA Report and review findings were presented to the parties to the Protocol, at the Waiau Working Party meeting on 27 November 2015, the Guardians of Lakes Manapouri Te Anau and Monowai meeting on 18 November 2015, and to Te Ao Marama. The parties to the Protocol supported the Review findings and recommendations to continue the amended monitoring methodology and to re-instate one survey site on the Mararoa River at Station Bridge in the monitoring programme.

4.5. Variable Flow Releases

A recommendation regarding more variable flow releases was in made in the NIWA reports on the annual nuisance periphyton program carried out in 2015-16, 2016 17 and 2017-18 seasons under the protocol. The purpose of the recommendation was to promote and investigate the flows releases to assist in managing nuisance periphyton. The recommendation involved a trial based on a more variable flow release by modifying the shape of the flushing flow hydrograph from that typically made under the protocol. To date the flow releases made under the protocol have met its definition specified as "flows peaking between 160 m^3/s and 250 m^3/s with a mean flow of 120 m^3/s over 24 hours." (see section 5.1 below).

Analyses of the effects of nine previous supplementary flow releases in the NIWA annual reports (Kilroy and Wech 2016 and Kilroy 17a) led to the recommendation for trials of supplementary releases that varied from the current specification of the protocol. The NIWA 2018 annual report further recommended the trials and considered that varying the length and/or recession of the flow release hydrograph may assist in dislodging loose didymo remnants that maybe left after a more rapid recession.

The NIWA report "Review of Options for Periphyton Management in the Lower Waiau River" October 2017[9] was commissioned by Meridian following discussions at the Waiau Working Party meetings of 27 November 2015 and 13 December 2016 regarding alternative options to assist in the management of nuisance periphyton. The report discussed three categories of control - higher flows (the current method under this protocol), manipulation of low flows and using chemicals. In regard to the option of high flows, the report reviewed all flow releases made since 2007-08 including releases made under this protocol. It recommended the current programme under the protocol continue to accumulate more data that could help improve the relationships for predicting the effects of supplementary flow releases and other high flows. In conjunction with this option, the WWP meeting further discussed the implementation of the more variable flow releases in the

[8] Kilroy C, (October 2015) Managing nuisance periphyton in the Lower Waiau River – Results for the 2014 – 15 and reiew of an amended protocol. NIWA Client Report CHC 2015-079

[9] Kilroy C, (October 2017) Review of options for periphyton management Lower Waiau River NIWA Client Report 2017112CH)

2017-18 season as recommended by the previous annual reports. However, no flow releases were able to be made in 2017-18 season due to lake levels and water availability.

A further presentation on trialling the variable flow releases was made by Cathy Kilroy of NIWA to the Waiau Working Party (WWP) on 5 June 2018. The meeting resolved to support the trials commencing in the 2018-19 season noting that the trial releases may not meet the protocols specifications for flows peaking between 160 m^3/s and 250 m^3/s with a mean flow of 120 m^3/s over 24 hours and that the water available for releases each season is 15GWh as currently provided for by the protocol.

The NIWA reports and WWP recommendations regarding the trials of the variable flow releases have been provided to the other parties to the protocol. Each party (the Waiau Working Party, Guardians of Lakes Manapouri, Monowai and Te Anau, Te Ao Marama and Southland Fish and Game) has supported and agreed to the amendment of the protocol to enable the trials of the more variable flow releases. The trials are to commence in the 2018-19 season (1 November to 31 May) subject to water availability (as currently occurs under the protocol) for up to a 10 year period to enable the accumulation of sufficient data on the more variable releases to analyse their effectiveness. A conclusion regarding the effectiveness of the variable releases will be made a soon as practically possible given that in previous years 2015-16, 2016 17 and 2017-18, seasons only 1 or 2 releases are often possible, and occasionally no flow releases, due to lake levels and water availability. A short report following each release is provided to the Chairs of the parties to the protocol and the seasons results are analysed the annual report for that season, as currently occurs under the protocol.

5. SUPPLEMENTARY FLOWS CONSIDERED USEFUL TO ASSIST IN MANAGING PERIPHYTON BIOMASS

5.1. Flow size and duration

Based on current knowledge, NIWA has recommended that flows with peaks above 160 m^3/s and a mean of 120 m^3/s are useful to assist in managing periphyton biomass, including didymo (Kilroy 2010)[10]. Flows at or above this magnitude already occur naturally and, under certain conditions, can be released as controlled supplementary flows.

Flows above 250 m^3/s are unable to be generated whilst adhering to the Manapouri lake level guidelines (constrained by the MLC structure capacity) and are entirely reliant on naturally occurring rainfall inflow events that raise the Lake Manapouri level to a height that triggers the flood rules, or raise the Mararoa River flow to high levels.

Controlled releases of supplementary flows with the aim of assisting in managing periphyton biomass are, therefore, defined as flows peaking between 160 and 250 m^3/s and with a mean flow of 120 m^3/s over 24 hours.

Meridian will provide a maximum of 15 GWh of storage water released (i.e. water which otherwise would be retained for optimal energy generation) for all supplementary flows between December and the end of May. This is the equivalent of approximately 4 full artificial supplementary flows per summer of the type described in clause 5.1 of this protocol. More than 4 flows may be provided if releases are in part an augmentation of natural events and the storage flows released overall are provided within the maximum GWh provided[11].

For the purposes of the trials of the more variable flow releases beginning in the 2018-19 season, the releases may not reach the above flows peaking between 160 and 250 m^3/s and with a mean flow of 120 m^3/s over 24 hours. This is due to the variable shape of the release hydrograph which may be over a longer duration than 24 hours and have a different rate of

[10] **Kilroy, C, (2010) Management of nuisance periphyton growths in the Lower Waiau River using flushing flows: an update 2009 – 10. NIWA Client Report CHC 2010-083. 44p.**

[11] 1 GWh equates to 2351020 cubic meters of storage water from Lake Manapouri. Hence 15 GWh equals 35265300 m^3

recession. The maximum of 15 GWh of storage water released (i.e. water which otherwise would be retained for optimal energy generation) for each season remains.

5.2. Flow frequency and timing

Based on current knowledge, NIWA has recommended that supplementary flows may be useful to assist in managing periphyton biomass during the months of December to May. From previous monitoring undertaken, it is considered that natural or artificial flows at or above the flow size presented above are required at approximately 4 week intervals, to maintain periphyton biomass at suitable levels.

To minimise impacts on recreational activities ramping up should generally not commence prior to 22:00 hours on a Sunday and ramping down will be completed by 12:00 hours on a Friday for artificial releases. Releases to augment a natural event will be released to maximise the benefit of the event being augmented.

6. CIRCUMSTANCES RELATING TO PERIPHYTON BIOMASS AND NATURAL FLOW OCCURRENCES

The period agreed by the parties to this Protocol for controlled releases for the management of periphyton biomass if required are generally between 1 December and 1 May in any year: Target dates for 4 supplementary flows will be agreed with Fish and Game New Zealand Southland Region prior to each season for this period. An additional provision is made for circumstances relating to a SCI reading of red in the month of May. For the purposes of this Protocol a natural flow event or an augmented flow within four weeks of the target date with flows peaking over 160 m^3/s and with a mean flow of 120 m^3/s over 24 hours will be considered to have met the requirements of this protocol. No additional controlled release during that time period will be considered necessary under the protocol. The naturally provided flow component of any event will not be considered part of the 15 GWh provision, but the provision of additional water above the operational requirements (e.g. Flood Rules) will be.

Where the SCI for periphyton biomass control is red and has extended into the first three weeks of May then an additional supplementary flow shall be provided by the consent holder unless constrained by matters relating to security of supply. The consent holder obligation to this requirement will only exist if the 15 GWh storage provided for under the Protocol has not been called upon in the preceding months to the degree that the required flow can be provided from this reserve.

7. CIRCUMSTANCES RELATING TO LAKE LEVELS AND SECURITY OF ELECTRICITY SUPPLY

7.1. Lake levels

The levels of Lakes Manapouri and Te Anau are primarily managed in accordance with the Lake Level Guidelines, which are a requirement of their current consent conditions. They set maximum durations for the lakes to be in each range and the minimum elapsed time between events which penetrate each range.

The operation in the main range is not constrained other than by the requirement to maintain continuous variation in lake levels so as to avoid impacts such as wave-cut platforms. The guidelines also require management of the mean lake level to ensure that this falls within the main range limits.

MLC was designed to allow for control of Lake Manapouri level for hydroelectricity generation and to manage flood flows from Lake Manapouri. The ability of MLC to discharge high flows while Lake Manapouri level is not in the flood range is limited by a number of factors, including

the level of Lake Manapouri and headwater level at MLC, Waiau Arm flows, and Mararoa River flows.

When Lake Manapouri is in the low range there is insufficient head to produce controlled releases of supplementary flows of the required size. When the Lake is in the high range, according to the flood rules, discharges from MLC above minimum flows are required and there is sufficient water to enable the provision of these flows.

Meridian will generally not build lake levels in anticipation of controlled releases of supplementary flows. There are a number of issues with pre-emptive attempts to build levels. These include:

Rainfall uncertainty: The lake catchments do not have a seasonal pattern to the rainfall. Significant events may occur at any time of the year. Maintaining lake levels in the upper portion of the main range will significantly reduce the ability to capture events and increase flood risks;

Variability of lake levels: Due to limited lake storage capacity and the variable nature of inflow patterns, the Manapouri Power Scheme (MPS) is regarded as a 'run-of-river' power scheme. Therefore, levels in Lakes Manapouri and Te Anau also generally reflect the variable nature of inflows and limited storage capacity. This variability is important for the maintenance of lakeshore vegetation, aquatic macrophytes and shoreline geomorphology.

Building and maintaining the lake levels in the upper portion of the main range is inconsistent with this approach to lake level management. As a result, building of Lake Manapouri levels would only be considered by Meridian in exceptional circumstances and in light of all relevant information regarding environmental and generation supply factors.

7.2. Electricity supply

There are 2 main areas of security of supply concern in relation to providing controlled releases of supplementary flows. These are risks to generation supply due to potential low water supplies and distribution constraints.

8. PROCEDURES FOR CONTROLLED RELEASES OF SUPPLEMENTARY FLOWS

The procedures outlined below will be followed when deciding upon the provision of a controlled release of supplementary flows for periphyton management.

8.1. Steps to be Followed

Four controlled releases of supplementary flows will be provided during 1 December to 1 May identified in Clause 6 of this Protocol if the SCI conditions fall within the amber or red indices specified in section 3.4 of the Protocol and if the lake levels and electricity supply security circumstances allow. A fifth flow on May will be considered if the circumstances described in paragraph 6 of this protocol exist.

Lake levels, catchment hydrology, hydro risk curves, distribution and line constraints including the likelihood of outages will be considered by the consent holder for each potential controlled release of a supplementary flow. A fifth flow in May will be considered if there is an SCI reading of red during the third week and if there are sufficient GWh remaining as set out in clause 6 of this protocol.

Prior to undertaking a supplementary flow release the consent holder will liaise with a nominated representative of Fish and Game Council and inform the Chairman of both the Waiau Working Party, the Guardians of Lakes Manapouri, Monowai and Te Anau and Te A O Marama of the timing of the supplementary flows.

All decisions made will be documented, giving the reasons for the decision. The decision will follow the process in **Appendix 2**.

If a flow cannot be provided, Meridian will, in exceptional circumstances, make endeavours to manage lake levels to provide the flow (in accordance with the responses set out in **Appendix 2**). Any such a flow will meet the 4 week lead-up to the subsequent flow release and consequently be considered to meet that flow requirement.

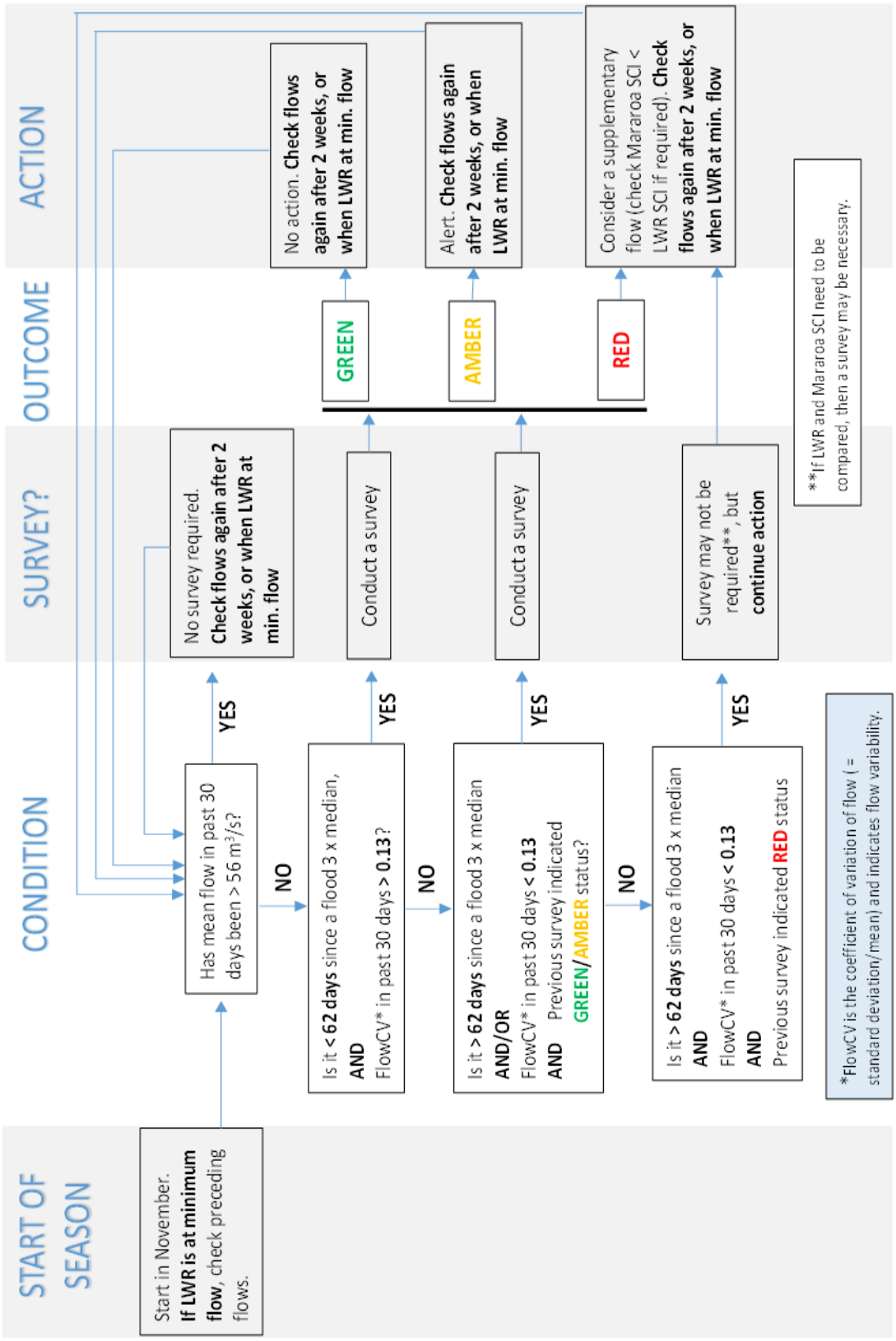
9. REPORTING

After each supplementary flow Meridian shall provide a report stating the number of GWh used and the remaining GWh left for the rest of the season. A copy of the report shall be forwarded to the nominated representative of Fish and Game Council, the Chairman of the Waiau Working Party, the Chairman of the Guardians of Lakes Manapouri, Monowai and Te Anau and Te Ao Marama.

The results of all monitoring undertaken in terms of this Protocol will be forwarded to Environment Southland annually[12], in conjunction with the results of other monitoring required by the conditions of consent for MTAD. A copy of the results shall also be forwarded to the Chairman of the Waiau Working Party and the Chairman of the Guardians of Lakes Manapouri, Monowai and Te Anau, and Te Ao Marama.

[12] NIWA Report entitled "Managing nuisance periphyton in the Lower Waiau River" prepared under MTAD consent 2061546 condition 7.

APPENDIX 1. DECISION SUPPORT MATRIX



APPENDIX 2. PROCEDURES FOR IMPLEMENTATION

Note to be read in conjunction with Appendix 1 – The consent holders' obligation under this protocol to provide supplementary flows equates to a maximum 15 GWh total storage for the season

Concern	Lower Waiau River Environmental Indices	Agreed Supplementary Flow Release	Electricity Supply Concerns	Agreed Response
Green	None SCI at all sites < 220; or mean SCI < 200	None	Not Applicable	None

Concern	Lower Waiau River Environmental Indices	Agreed Supplementary Flow Release	Electricity Supply Concerns	Agreed Response
Amber	Controlled releases of supplementary flows could assist in managing periphyton biomass. At least one site with SCI > 220 AND mean SCI >200<300, OR Mean SCI 200 - 600	Consideration of the release of a supplementary flow of 160-250 peak m^3/s with a mean flow of 120 m^3/s across 24 hours (*unless a flow of this peak and mean has occurred within the prior 4 weeks for any programmed flows)*	Manapouri lake levels above the level to produce flows of 160 m^3/s **and** no hydro risk curve concerns for the next 9 months.	**Either** release the flow on a timed basis (*The flow is to be commenced at 10pm during a week day avoiding week ends).* **Or** supplement a Lake Manapouri flood flow or a Mararoa River turbidity event with a controlled release (only *if Lake Manapouri at levels which achieve overall peak and mean needs*)
			Manapouri lake levels below level to produce flows of 160 m^3/s **and** no hydro risk concerns for the next 9 months.	Meridian to assess options for awaiting inflows sufficient to provide a controlled release of a supplementary flow
			Hydro risk for the next 9 months show security risks	None (*flow would only occur as a result of Mararoa River turbidity flows or Lake Manapouri flood flows and would not be supplemented with any controlled release)*

Concern	Lower Waiau River Environmental Indices	Agreed Supplementary Flow Release	Electricity Supply Concerns	Agreed Response
Red	Controlled releases of supplementary flows would assist in managing periphyton biomass. At least two sites with SCI > 220 AND mean SCI >300, OR Mean SCI > 600	Controlled release of a supplementary flow of 160-250 peak m^3/s with a mean flow of 120 m^3/s across 24 hours (*unless a flow of this peak and mean has occurred within the prior 4 weeks for any programmed flows)*	Manapouri lake levels above level to produce flows of 160 m^3/s **and** no hydro risk curve concerns for the next 9 months.	**Either** release the flow on a timed basis (*The flow is to be commenced at 10pm during a week day avoiding week ends).* **Or** supplement a Lake Manapouri flood flow or a Mararoa River turbidity event (*only if Lake Manapouri at levels which achieve overall peak and mean needs*)
			Manapouri lake levels below level to produce flows of 160 m3/s **and** no hydro risk concerns for the next 9 months	Meridian to consider reasonable endeavours (such as generation withdrawal) to conserve storage levels to provide a controlled release of a supplementary flow
			Hydro risk curves for the next 9 months show security risks	Meridian to assess options for awaiting inflows or conserving storage levels such as generation withdrawal) sufficient to provide a controlled release of a supplementary flow