



Snowy 2.0 Recreational Fishing Management Plan



Version: Rev A

Date: 31 October 2023

Certificate of Approval

Title: Snowy 2.0 Recreational Fishing Management Plan

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Date of issue: 31 October 2023

Approval Record

	Name	Title
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Approved By:	Scott Hansen (NSW DPI)	Director-General of NSW DPI

Document Revision Table

Rev.	Date	Description of modifications
		N/A

Ms Kiersten Fishburn
Secretary
Department of Planning & Environment
4 Parramatta Square
Parramatta NSW 2150

kiersten.fishburn@dpi.nsw.gov.au

Re: Snowy Hydro 2.0 project – DPI endorsement of Recreational Fishing and Threatened Fish Management Plans in line with conditions of consent

Dear Ms Fishburn,

As you are aware, Snowy Hydro 2.0 is a large-scale pumped hydro project that seeks to link the existing Talbingo and Tantangara storages within the Snowy Hydro scheme.

The development has been classified as Critical State Significant Infrastructure (CSSI) and was granted planning approval in October 2021 subject to various conditions of consent.

Conditions 22, 24 and 26 of the Snowy 2.0 Infrastructure Approval (CSSI: 9687) provided by the NSW Department of Planning requires Snowy Hydro Limited (SHL) to submit a series of Management Plans to mitigate the potential impacts of the development.

SHL have submitted the Recreational Fishing and Threatened Fish Management Plans to the Department for consideration. These plans have been reviewed and advice has been sought from our Advisory Bodies, namely Recreational Fishing NSW and the NSW Fisheries Scientific Committee.

Based on these reviews, and in accordance with the planning approval and in my capacity as Director General Primary Industries, I am pleased to advise the Management Plans have been developed to the Department's satisfaction, and provide endorsement of both the Recreational Fishing Management Plan and the Threatened Fish Management Plan.

If you have any enquiries, please contact Mr Anthony Townsend, A/Director Freshwater Environment at anthony.townsend@dpi.nsw.gov.au or 0427 782 701.

Yours sincerely,



Scott Hansen
Director General
Department of Primary Industries

Acronyms and Definitions

Approval	Infrastructure Approval for Snowy 2.0 Main Works issued under Section 5.19 of the <i>Environmental Planning and Assessment Act 1979</i> (Dated: 20th May 2020) (SSI 9687)
Biosecurity Act	<i>Biosecurity Act 2015</i> (NSW)
Biosecurity Regulation	<i>Biosecurity Regulation 2017</i> (NSW)
BRMP	Biosecurity Risk Management Plan
DAWE	Commonwealth Department of Agriculture Water and the Environment (formerly Department of Environment and Energy, now the Department of Climate Change, Energy, the Environment and Water (DCCEEW))
DPI	Department of Primary Industries, formerly part of the Department of Planning, Industry and Environment, now part of Regional NSW.
DPIE	Department of Planning, Industry and Environment, now known as the Department of Planning and Environment
EIS	SHL's Environmental Impact Statement for Snowy 2.0 Main Works
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
FM Act	Fisheries Management Act 1994
Gaden	Gaden Trout Hatchery
MAS	Monaro Acclimatisation Society
NPWS	National Parks and Wildlife Service
NSW	New South Wales
PHES	Pumped Hydroelectric Station
TARP	Trigger, action and response plan
RFMP	Recreational Fishing Management Plan

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1. Introduction

This document is known as the Recreational Fishing Management Plan (**RFMP**) for Snowy 2.0 Main Works.

This RFMP has been prepared to meet the requirements of Schedule 3 conditions 26 and 27 of the Infrastructure Approval for Snowy 2.0 Main Works issued under Section 5.19 of the Environmental Planning and Assessment Act 1979 (EP&A Act) (Dated: 20 May 2020) (CSSI 9687) (**the NSW Approval**) and under sections 130(1) and 133(1) of the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (Snowy 2.0 Main Works, NSW (EPBC 2018/8322)).

In accordance with this Plan, Snowy Hydro are committed to minimising the impact of Snowy 2.0 on recreational fishing in Tantangara Reservoir and Lake Eucumbene.

1.1. Project Overview

Snowy Hydro owns, manages, and maintains the Snowy Mountains Hydroelectric Scheme (**the Scheme**). The Scheme currently includes 16 major dams, nine power stations, one pumped power station, 145 km of interconnected tunnels and pipelines, and 80 km of aqueducts. The Scheme, principally located within the Kosciusko National Park (**KNP**), is one of the largest and most complex hydro-electric schemes in the world.

The pumped hydro-electric expansion of the Scheme (**Snowy 2.0**) will link the existing Tantangara and Talbingo reservoirs via a new underground tunnel and a pumped hydro-electric power station (**PHES**). Snowy 2.0 will provide an additional 2,000 MW of dispatchable generating capacity, along with approximately 350,000 MWh of large-scale energy storage that will be available on demand as quick-start electricity generation at critical times of peak demand.

1.2. Approvals

Snowy 2.0 was designated critical State significant infrastructure (CSSI 9687) and assessed under Part 5 sections 5.23 and 5.24 of the Environmental Planning and Assessment Act 1979 (**EP&A Act**). The project was approved by the NSW Minister for Planning and Public Spaces under Section 5.19 of the EP&A Act on 20 May 2020.

A referral was also prepared and lodged with the Commonwealth Minister for the Environment (**DAWE**) under the Environment and Biodiversity Conservation Act 1999 (**EPBC Act**) and the project was subsequently determined to be a controlled action under that Act. The project was approved by DAWE under sections 130(1) and 133(1) of the EPBC Act on 29 June 2020.

Transferring water between Talbingo Reservoir and Tantangara Reservoir through the PHES requires authorisation under the NSW Biosecurity Act 2015 and NSW Fisheries Management Act 1994 (FM Act). Appropriate authorisation instruments will be issued to Snowy Hydro once the following management plans have been approved by the Director General of the NSW Department of Primary Industries (**NSW DPI**):

- The Recreational Fishing Management Plan (**RFMP**) (this plan)
- The Threatened Fish Management Plan (**TFMP**)
- The Biosecurity Risk Management Plan (**BRMP**).

Conditions that relate to aquatic species and recreational fisheries were included within the Main Works Infrastructure Approval in Schedule 3, from condition 20 to 27 (SSI 9687). Full details of the Conditions of Approval (**CoA**) and supporting information can be found at: <https://www.planningportal.nsw.gov.au/major-projects/project/12891>.

1.3. Scope of RFMP

This RFMP addresses the relevant CoA associated with Snowy 2.0 (**Table 1**). The structure of the RFMP reflects the CoA requirements.

Table 1 Condition of approval relevant to the Recreational Fishing Management Plan

Condition	Requirement	Where addressed
Infrastructure Approval for Snowy 2.0 Main Works (CSSI 9687)		
Schedule 3 Condition 20(c)	Minimise impact of the development on recreational fishing in Tantangara Reservoir and Lake Eucumbene	This plan
Schedule 3 Condition 26(a)	Be prepared by suitably qualified and experienced person in consultation with DPIE, NPWS and relevant recreational fishing groups	Section 1.4; Certificate of Approval
Schedule 3 Condition 26(b)	Describe the detailed measures that would be implemented to comply with Condition 20(c) above including: <ul style="list-style-type: none"> • A program involving the spending of \$5 million over 5 years from the commencement of the program to develop the capability to restock and restock, the Tantangara Reservoir and Lake Eucumbene with salmonid fish • A program to monitor the impacts of the development on recreational fishing in Tantangara Reservoir and Lake Eucumbene • A review after 5 years of the commencement of the restocking program and detail the trigger, action, response plan for the continuation of the restocking of Tantangara Reservoir and/or Lake Eucumbene salmonid fish 	Section 2 Section 3 Section 2.11
Schedule 3 Condition 26(c)	Include a program to monitor and publicly report on the effectiveness of these measures	Section 4
Schedule 3 Condition 27	The proponent must implement the approved Recreational Fishing Management Plan for the development	Section 3.5
Schedule 4 Condition 4	Within 3 months of the following, unless the Planning Secretary agrees otherwise, the Proponent must review and (if necessary) update the approved strategies, plans and programs for the development to the satisfaction of the Planning Secretary: <p>(a) the submission of an incident report under condition 6 below;</p> <p>(b) the submission of an independent environmental audit report under condition 10 below; and</p> <p>(c) any modification to the conditions of this approval; or</p> <p>(d) a direction of the Planning Secretary under condition 4 of schedule 2.</p> <p>Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the development.</p>	Section 6
Schedule 4 Condition 7	Within 7 days of becoming aware of any non-compliance with the conditions of this approval, the Proponent must notify the Department via the Major Projects portal of the non-compliance. This notice must set out the non-compliance, the reasons for the non-compliance (if known) and what actions have been taken, or will be taken, to address the non-compliance.	Section 5
Schedule 4 Condition 8	The Proponent must provide regular reporting on the environmental performance of the development on its website in accordance with the requirements in any approved strategies, plans or programs.	Section 4

Condition	Requirement	Where addressed
Schedule 4 Condition 12	<p>From the commencement of the development of the Main Works until the completion of the ecological rehabilitation of the areas used for operations, the Proponent must:</p> <p>(a) make copies of the following information publicly available on its website:</p> <ul style="list-style-type: none"> • the documents referred to in the definition of the Exploratory Works and Main Works; • current statutory approvals for the development; • approved strategies, plans or programs; • a comprehensive summary of the monitoring results of the development, reported in accordance with the requirements in the conditions of this approval, or any approved strategies, plans and programs; • a monthly summary of complaints; • a record of all incidents and non-compliances; • any independent environmental audit, and the Proponent’s response to the recommendations in any audit; • any approved audit action plan; • any other matter required by the Planning Secretary; <p>(b) keep this information up to date.</p>	Section 1.4
Snowy 2.0 Main Works (EPBC 2018/8322)		
Condition 12	To minimise impacts to the aquatic environment, the approval holder must comply with conditions 20 – 25 of the NSW approval relating to biosecurity and fish management	Fish management - This plan

1.4. Preparation and consultation

This RFMP was prepared by suitably qualified and experienced persons in consultation with DPIE, NSW DPI, National Parks and Wildlife Service (NPWS) and relevant recreational fishing groups and stakeholders. A technical working group and steering committee was established and regularly discussed elements of and provided input into the development of the RFMP. This plan has been issued to these stakeholder agencies for review and comment, with comments incorporated, where appropriate.

An overview of the consultation that was undertaken to develop the RFMP is provided in **Appendix A**.

Once approved, the current version of the RFMP will be made available on Snowy Hydro’s website: www.snowyhydro.com.au.

2. Captive breeding and restocking

This section describes Snowy Hydro's commitment to spend \$5 million over 5 years from the commencement of the program to develop the capability to restock, and to restock, Tantangara Reservoir and Lake Eucumbene with salmonid fish - addressing Schedule 3 Condition 26(b(i)) of the CoA.

2.1. Background

Snowy 2.0 PHES will establish a new novel two-way hydrologic connection pathway for water to enter Tantangara Reservoir from Talbingo Reservoir. This transfer of water could potentially move pest species of fish, including redbfin perch (*Perca fluviatilis*), from Talbingo Reservoir to Tantangara Reservoir (Cardno 2020). Whilst no threatened species are known to occur in Tantangara Reservoir, if pest fish are transferred and subsequently establish, the incursion may affect recreationally important populations of non-native species such as rainbow trout (*Oncorhynchus mykiss*) and brown trout (*Salmo trutta*). Project control measures including the screening of the Murrumbidgee-Eucumbene tunnel means that is less likely that any pest fish could be subsequently transferred from Tantangara Reservoir to Lake Eucumbene however actions in this plan are intended to accommodate this possibility¹.

To mitigate potential impacts of pest fish species on salmonid populations in Tantangara Reservoir and Lake Eucumbene, Snowy Hydro will develop the capability to produce salmonids for release as part of the NSW DPI salmonid stocking program. Should impacts of pest fish species in Tantangara Reservoir and Lake Eucumbene be detected, appropriate captive breeding and restocking activities to mitigate potential impacts on populations of various salmonid species will be initiated and managed by NSW DPI.

2.2. Species to be produced and stocked

In response to impacts to salmonids in Tantangara Reservoir and Lake Eucumbene a range of potential salmonid species including but not limited to the following may be produced and released as part of a restocking program²:

- Rainbow trout (*Oncorhynchus mykiss*)
- Brown trout (*Salmo trutta*)
- Tiger trout (hybrid of *Salmo trutta* x *Salvelinus fontinalis*).

2.3. Number of salmonids to be produced and stocked

Sufficient capacity to produce up to 20 tonnes of additional fish will be established, with the total number produced and stocked as part of the captive breeding and restocking activities to be determined by NSW DPI³.

As part of the NSW DPI trout stocking program, no salmonids are currently released into Tantangara Reservoir. The NSW DPI management objective for the area is that it remains a predominantly wild brown trout fishery and to allow average sizes of fish to fluctuate according to natural recruitment levels and lake productivity (NSW DPI 2018). Accordingly, no salmonids will be released into Tantangara Reservoir as part of the RFMP stocking commitment unless there is an impact detected or should NSW DPI managers determine it to be appropriate⁴.

The numbers of salmonids produced and stocked each year as part of the captive breeding and restocking activities under this Plan are to be documented and reported by NSW DPI once stocking commences.

¹ Details associated with the proposed control measures are outlined in the BRMP

² The species of salmonids to be produced and released will be determined by NSW DPI.

³ The number of fish to be produced is based on input received from NSW DPI, and Monaro Acclimatisation Society (MAS) representatives.

⁴ The allocation of salmonids within Tantangara Reservoir and Lake Eucumbene in response to an impact associated with the establishment of redbfin perch due to Snowy 2.0 activities will be determined by NSW DPI managers in associated with input received by the Trout Stocking Allocation Committee.

2.4. Size of fish to be produced and stocked

It is expected that advanced fingerlings (typically 160 to 170 mm in length and weighing ~120 g) will be produced and released as part of the RFMP stocking program although this will be at the discretion of NSW DPI. If redfin perch are present, stocking with advanced fingerlings will likely reduce or eliminate the impact of predation following release (Baxter et al 1985, Molony et al 2004).

Releasing fry and fingerlings (typically 50 mm in length and weighing ~20 g) may occur as part of the RFMP stocking activities should NSW DPI managers determine it to be appropriate.

2.5. Frequency of release

Captively bred salmonids, at a density determined by NSW DPI, will initially be released into the affected waterbody annually. If required, changes to the frequency salmonids are released will be determined and made by NSW DPI.

2.5.1. Release timing

The timing of fish releases will be determined by NSW DPI. Fish will be released once they have grown to the required size for stocking. Following fertilisation, it takes approximately eight months to produce advanced fingerlings⁵.

2.6. Captive breeding facility

The Gaden Trout Hatchery (**Gaden**) serves as a hatchery, grow out and research facility for NSW DPI as well as a tourist destination that is visited by over 5,000 people annually. Salmonids produced at Gaden include rainbow trout, brown trout, Atlantic salmon, brook trout and tiger trout. These species are bred from captive broodstock as well as from wild caught broodstock that are collected from the Thredbo River. Salmonids produced at Gaden are released into public waterways primarily in the Snowy Mountains Region (**SMR**) although they are also released at some locations in the southern highlands, central tablelands, and New England areas.

As Gaden currently has the permits required to release salmonids into NSW waterways, is certified free from notifiable diseases, has biosecurity protocols in place to facilitate the transport and release of salmonids into the SMR, can source broodstock from within the SMR, and has staff with extensive experience captively breeding and producing salmonids, this facility will be used to produce salmonids required for stocking activities as part of the RFMP.

2.7. Gaden modifications

To enable the production of up to 20 tonnes of additional salmonids as part of the RFMP captive breeding and stocking commitment, the following modifications have been identified⁶ as being required at Gaden:

- Installation of additional grow out tanks and associated support infrastructure (e.g., production shed, pumping equipment, lighting, and walkways).
- Improving security of water supply (volume and temperature).

2.7.1. Installation of additional grow out tanks

Gaden currently has the capability to grow out salmonids to a variety of sizes. Typically, as part of the current NSW stocking program most salmonids produced are released as fingerlings although some are released as advanced fingerlings⁷. The current outdoor grow out facility has the capacity to produce approximately 1.1 million fingerlings per year. There is limited to no capacity to increase the production of fingerlings or hold them until advanced fingerling stage using the existing outdoor grow out facility based on current and ongoing NSW DPI stocking requirements.

⁵ Release of fingerlings as part of the NSW DPI stocking program typically occurs between March and April each year.

⁶ Identification of the upgrades required at Gaden to produce up to 200,000 advanced fingerlings has been determined with input from NSW DPI, and MAS representatives.

⁷ NSW DPI is assessing the benefits of releasing a smaller number of advanced fingerlings compared to larger numbers of fingerlings as part of the NSW stocking program.

To facilitate the production of up to 20 tonnes of salmonids, additional grow out facilities will need to be installed and integrated into the operations at Gaden. It is anticipated that there is enough space within the grounds at Gaden to accommodate the installation of additional grow out facilities.

The Wedge Group (2023) were commissioned to undertake an options analysis and determine the optimal modifications to meet the additional capacity at Gaden. This study determined that the installation of a recirculating aquaculture system (RAS) at Gaden would be appropriate for growing trout to the size required for stocking.

The following are advantages of using a RAS for growing trout at Gaden:

- Controlled environment – water quality and temperature can be precisely controlled
- Water conservation – by continuously filtering and recirculating water less water is required for production
- Disease control – Having contained and controlled grow out facility enables quick treatment of any disease or parasites that may be detected in addition to tanks being independent of each other further reducing the potential for the spread of disease
- Year-round production – RAS enables year round production of trout regardless of environmental conditions enabling a reduction in production time and more individuals can be produced over a given period of time
- Improved growth rates – Optimising water conditions and reducing the potential for disease trout can grow faster in a RAS compared to a traditional pond based facility (Wedge Group, 2023).

Further detailed design and the subsequent construction of the system will be managed by NSW DPI.

2.7.2. Improving security of water supply

Water used at Gaden is sourced exclusively from the Thredbo River permitted with a licence to extract water for the purpose of pisciculture under Section 12 of the *Water Act 2014*. To ensure water quality is maintained, water is regularly exchanged and turned over within the facility. The rate of water exchange is managed based on the conditions and fish husbandry requirements. Peak demand occurs between November and February, which coincides with when water temperatures in the Thredbo River and throughout Gaden are often elevated. Water temperatures of between 4°C and 19°C are considered suitable for maintaining brown trout while temperatures between 10°C and 22°C are considered suitable for maintaining rainbow trout.

Periods of elevated water temperatures within the Thredbo River and throughout Gaden have resulted in the need to actively and closely manage, as well as destock salmonids earlier than anticipated to reduce the chance of fish becoming stressed which can result in mortality. Higher water temperatures coupled with limited inflows were determined to be the cause of a one-off mass mortality event that resulted in the death of fingerlings as well as broodstock at Gaden between January and February 2019 (NSW DPI 2019).

The installation of a RAS grow out facility would significantly reduce the overall demand for water throughout Gaden from between approximately 1200-1400 ML annually to between approximately 10-14 ML annually. This coupled with the ability to actively manage the temperature of water within a RAS would reduce the likelihood of sub-optimal and potential lethal impacts of elevated water temperatures to the trout produced and broodstock maintained at Gaden (Wedge Group, 2023).

2.7.3. Optioneering, feasibility, detailed design, planning and installation

Optioneering to identify suitable trout growing facilities and improvements to water security and supply were completed by The Wedge Group (2023). Further assessments, detailed design, planning and installation of modifications to Gaden will be undertaken by NSW DPI during the implementation phase of the RFMP (see **Section 2.9**). Snowy Hydro's funding commitments for these activities will be outlined in a MoU (see **Section 2.8.1**).

2.8. Heading agreements

2.8.1. Memorandum of understanding

Snowy Hydro will enter into a Memorandum of Understanding (**MoU**) with NSW DPI to outline how the two parties will work together to enable the production of up to 20 tonnes of salmonids for stocking of Tantangara Reservoir and/or Lake Eucumbene in response to an impact associated with Snowy 2.0. The MoU will outline but not necessarily be limited to including the following:

- Stating the purpose and duration of the agreement
- Governance arrangements for how expenditure will be managed and spent to upgrade facilities at Gaden to produce salmonid species for stocking into Tantangara Reservoir and Lake Eucumbene and monitor impacts to recreational fishing (see **Section 3**)
- Roles and responsibilities of the signatories or other named parties
- Meeting schedule and indicative timeframe to complete augmentation tasks and commissioning of infrastructure required to produce up to 20 tonnes of salmonids (see **Section 2.9**)
- Equipment and plant maintenance and replacement arrangements
- Dispute resolutions arrangements
- Record keeping requirements
- Intellectual property rights
- Terms of termination provisions for breaches of arrangement
- Details of mechanisms of how the MoU may be extended
- Reporting arrangements.

2.8.2. Contractual arrangements

Binding contracts will be developed throughout the implementation of the RFMP to outline how parties will undertake specific scopes of work (e.g., construction and installation of salmonid production facility) within but not limited to a stated timeframe, sum of monies and quality of deliverable. Contracts will be legally binding and contain enforceable conditions.

2.9. Implementation

Impacts to trout populations, if they occur at all, in Tantangara Reservoir and/or Lake Eucumbene associated with Snowy 2.0 activities would not be expected to materialise for some time following the commissioning. To ensure the production of salmonids required for stocking activities and stocking into Tantangara Reservoir and Lake Eucumbene the following tasks are envisaged to be completed following the approval of the RFMP:

- Formalising and signing the MoU
- Completing detailed designs and obtain required environmental approvals to undertake identified modifications to Gaden
- Drafting and signing of construction contracts
- Undertaking required works to complete identified upgrades to the production capacity and future proofing of Gaden
- Testing and commissioning upgrades and produce advanced fingerlings for stocking.

An indicative timeframe for implementing the identified captive breeding and restocking tasks following the approval of the RFMP is provided in **Table 2**.

Following the commissioning of production facilities at Gaden, NSW DPI will be responsible for ongoing activities and decisions associated with any salmonid stocking activities in Tantangara Reservoir and Lake Eucumbene as well as maintaining the required facility capacity following the conclusion of any upgrades or modifications.

Table 2 Indicative timeline for Plan development and implementation

Activity	RFMP Approved	Year 1	Year 2	Year 3	Ongoing post Snowy 2.0 commissioning
Sign MoU					
Commission feasibility study of the potential options to upgrade Gaden (Complete)					
Complete detailed designs and obtain required environmental approvals to undertake identified upgrade works					
Undertake required works to complete identified upgrades to the production capacity and future proofing of Gaden ⁸					
Test upgrades and produce advanced fingerlings for stocking to develop and refine techniques.					
Maintain capacity to produce advanced salmonid fingerlings for stocking into Tantangara Reservoir and Lake Eucumbene as required.					

2.10. Reporting

Activities undertaken as part of Snowy Hydro’s captive breeding capability, capacity and stocking commitments in the 12 months prior to 30 June each year (or later date as agreed by NSW DPI), following the approval of the RFMP, will be summarised and provided in a report that will be made available to the public on Snowy Hydro’s website (see **Section 4**). Annual reporting will cease once the facilities at Gaden are commissioned and produce salmonids.

2.11. Review

A review of captive breeding capability, capacity and stocking commitments and any restocking activities undertaken at Tantangara Reservoir and Lake Eucumbene as part of the RFMP will be completed 5 years after the commencement of stocking activities in response to impacts associated with the introduction of redfin perch on trout populations attributable to Snowy 2.0 activities.

Table 3 details the Trigger Action Response Plan (**TARP**) that will guide this review.

⁸ NSW DPI will manage and be responsible for the delivery of works associated with the upgrades to Gaden within the contractual arrangements specified for each scope of work to be completed (see **Section 2.8**).

Table 3 Trigger, action, response plan to guide the review of the stocking program after 5 years

Performance criteria	Trigger	Action	Response
MoU and contractual obligations	Parties not meeting commitments or obligations agreed in heading agreements (see Section 2.8).	Investigate source of non-compliance and address issue. Report non-compliance to DPE	Implement measures to address non-compliance.
Production and stocking of salmonids	Facilities are not (or no longer) suitable to produce up to 20 tonnes of salmonids for stocking in response to impacts of redfin perch due to Snowy 2.0 activities.	Review reason facilities are not suitable for production of salmonids.	Snowy Hydro and NSW DPI to develop strategy and list of actions within 6 months of notification to ensure facilities can produce salmonids as required for stocking into Tantangara Reservoir and Lake Eucumbene in response to impacts of redfin perch due to Snowy 2.0 activities.
	Stocking of 20 tonnes of salmonids are insufficient to mitigate impact from redfin perch introduced by Snowy 2.0 activities in Tantangara Reservoir or Lake Eucumbene.	Review quantum of production required to mitigate impact of redfin perch. Determine whether augmenting existing production facilities is required to provide the additional salmonids required for stocking	Snowy Hydro and NSW DPI to identify and undertake works appropriate to facilitate sufficient production of salmonids to mitigate impacts of redfin perch due to Snowy 2.0 activities at Tantangara Reservoir and/ or Lake Eucumbene.

3. Monitoring impacts to recreational fishing

This section describes how Snowy Hydro will monitor the impacts of Snowy 2.0 development on recreational fishing in Tantangara Reservoir and Lake Eucumbene addressing Schedule 3 Condition 26(b(ii)) of the CoA.

3.1. Recreational fishing

The SMR is a premier tourist destination and world renowned as a fishing destination. Fishing effort is generally concentrated around the major waterbodies (Lake Eucumbene, Lake Jindabyne and Tantangara Reservoir) and rivers (Eucumbene, Snowy, Murrumbidgee and Thredbo), as well as in smaller streams and tributaries (Aither 2019). Estimates of annual expenditure by recreational fishers in the SMR range from AUD\$12.2 million to AUD\$46.5 million⁹ (Dominion Consulting 2001, Aither 2019).

Aither (2019) reported that improvements in fish stocks and fishing experience could contribute to an estimated 38% increase in visitation to the area and an associated economic benefit to the SMR region of approximately AUD\$4.9 million per year. Conversely, when a selection of people within the SMR were asked “*What do people dislike about fishing in the SMR?*”, the most frequent response was ‘poor quality and quantity of fish’, with some respondents indicating that poor quality fishing would substantially reduce their visitations (Aither 2019).

3.2. Identified risks to recreational fishing

Should redfin perch establish a viable population in Tantangara Reservoir due to Snowy 2.0 activities, the potential impacts may include competition with and/or predation on the existing self-replenishing¹⁰ populations of rainbow trout and brown trout (Cardno 2020). It is not anticipated that complete displacement of rainbow trout or brown trout from Tantangara Reservoir would result, however a reduction in the size of the populations and/or changes in the demographics may occur (Cardno 2020). Such shifts may have an impact on the quality and quantity of recreational fishing in the reservoir. Indirect impacts may also occur if there is a transfer of recreational fishing effort amongst fishing locations.

3.3. Monitoring program

To monitor the potential impacts of Snowy 2.0 activities on recreational fishers in Tantangara Reservoir and Lake Eucumbene Snowy Hydro will use on-site access point survey (APS) techniques involving researchers directly interviewing fishers upon return to a boat ramp to collect data associated with the fisher activity / catch profile and social aspects of the fishery. This would exclusively sample boat-based fishers within the fishery which, in consultation with stakeholders, was considered an acceptable and cost-effective means to gather the data required to assess potential impacts due to Snowy 2.0.

3.3.1. Monitoring objectives

The objectives of the recreational fishers monitoring program will be to collect data focused on the fisher activity / catch profile aspect of the fishery as well as the social aspect of the fishery.

Table 4 outlines the identified objectives and associated metrics that could be used to assess potential negative impacts on these aspects that may be attributable to Snowy 2.0 activities.

Table 5 outlines additional metrics that may be monitored although not used to assess impacts to recreational fishers.

⁹ Estimates were derived from non-probability samples and cover a relatively limited temporal and spatial scale. Care should be taken when using these figures as it is highly likely that they are not representative of the target population of recreational fishers.

¹⁰ Populations are not stocked but are maintained by trout spawning in the reservoir’s inflowing streams.

Table 4 List of objectives and metrics of the monitoring program to assess impacts to recreational fishing at Tantangara Reservoir and Lake Eucumbene

Aspect	Objective	Metric
Fisher activity / catch profile	No negative change to fisher activities and catch profiles	Catch rates
		Length frequency distribution of catches
		Proportion of trips that have non-zero catch days (or the distribution of catch frequency days within the fishery)
		Usage of boat ramps
Social	No negative change to fishers' perception of the fishery and trip enjoyment.	Fisher participation levels – time spent fishing
		Level of fishing enjoyment
		Fisher attitudes within the fishery

Table 5 Additional metrics to be monitoring as part of the RFMP

Aspect	Metric
Fisher activity / catch profile	Spatial distribution of fishers
	Ratio of natural and stocked fish caught
Social	Species targeting preferences
	Demographics (e.g., age grouping, local vs resident)

3.3.2. Sampling framework

The monitoring program will objectively collect data that will enable appropriate interpretation of the results obtained from the fishery-dependent samples. This sampling approach will also provide a logical framework and guidance for resolving any survey design issues, sampling issues, as well as data analysis and interpretation issues that may arise during the monitoring program.

3.3.3. Spatial and temporal sampling design

The monitoring program will incorporate broad-scale temporal and spatial sampling activities. It will include sampling the recreational fishery twice prior to the commissioning of Snowy 2.0 (Before) and up to four times in the years following commissioning (After) to facilitate the assessment of potential impacts to the fishery that may be attributable to Snowy 2.0 activities. Sampling will be undertaken within Tantangara Reservoir and Lake Eucumbene by Snowy Hydro or suitably qualified contractors.

Sampling will be completed at the Tantangara boat ramp. The sheer size and better access of Lake Eucumbene means that it likely accommodates more recreational fishing effort than Tantangara Reservoir. To account for these differences in terms of 1) attempting to balance the levels of interview coverage for boat-based fishing effort amongst locations and 2) planning and management of resource logistics around on-site sampling effort, the monitoring program will focus exclusively on the recreational fishing effort that is surveyed at the southern portion of Lake Eucumbene. This partitioning will also allow for comparisons to be made between results obtained against those from a previous recreational fishing survey done in the 'south sector' by Forbes et al. (2017). Tributary-based fishing effort will be excluded from this monitoring program.

3.3.4. Design summary

Overall, the monitoring program will incorporate the following:

- Sampling at Tantangara Reservoir and Lake Eucumbene (south sector) twice before and twice after the commissioning of Snowy 2.0
- An additional two sampling rounds will also occur after the commencement of restocking, if this occurs in response to an incursion of redfin into Tantangara Reservoir as a result of Snowy 2.0
- APS interviews at the following locations:
- The public access boat ramp at Tantangara Reservoir
- Buckenderra boat ramps at Lake Eucumbene (south sector).
- Sampling during a single season (between 1 December and 28 February)
- Random process used to allocate sampling effort.

The level of effort and budget allocated to the above monitoring program will be dependent on the partitioning of the quantum of funding specified in Schedule 3 Condition 26(b) between activities undertaken as part of the captive breeding and restocking program and those outlined here. The partitioning of funding will be determined in consultation between Snowy Hydro and NSW DPI.

The timing of each sampling period would be determined in consultation with NSW DPI.

3.3.5. Statistical analysis

Data collected as part of the monitoring program will provide a range of descriptive statistics including means, standard errors, coefficients of variation and, where appropriate, calculation of confidence limits associated with means (**Table 6**). The interpretation of data analyses will then be used to inform management decisions required to address any impacts detected or as triggers to initiate stocking activities should they be required (see **Section 2**).

3.4. Reporting

The results of APS interviews will be collated and reported on after each survey period. Where appropriate the report will incorporate analyses of data at various temporal and spatial scales to enable assessment of potential impacts to recreational fishers associated with Snowy 2.0 activities. Each report will be made available to the public on Snowy Hydro's website within 3 months of the completion of the survey (see **Section 4**).

Table 6 Provisional quantitative data collected per replicate primary sampling unit as part of the proposed monitoring program.

Variable	Description/Comment
Ramp utilisation	Number of trailers present per ramp visit
Number of interviews	Number of boats-based fishers for which interviews were able to be obtained
Boat and fisher details	Boat length, size of outboard motor, number of fishers, age categories of fishers
Fishing locations	Number of places fished, time spent at each location, sites visited (spatial grid map) – low resolution spatial distribution of sampling effort.
CPUE – interview	Estimate of number of fish caught, retained and released per angler hour (CPUE)
Fish abundance – retained	Total number of fish returned to the ramp
Fish abundance – discarded	Estimate of total number of fish caught but returned to the water
Fish diversity – retained	Total number of species caught and retained (list species)
Fish diversity – discarded	Estimate of total number of species caught and returned to the water (list species)
Fish size	Lengths of retained fish (LCF – length to caudal fork, TL – total length)
External lesions	Any observed or reported evidence of fish ill-health

Variable	Description/Comment
Attitudinal Responses	Quality of the fishing amenity; interference related to Snowy 2.0 activities; preferred times of fishing; perceived change in catch rate compared with fishing before Snowy 2.0, visitation frequency, etc.

3.5. Implementation

Table 7 outlines the indicative recreational fishing monitoring program implementation schedule. The timing of each survey will be determined in consultation with NSW DPI and is dependent on the timing of construction and commissioning for Snowy 2.0.

Table 7 Indicative monitoring impacts to recreational fishing implementation schedule

Activity	Post RFMP Approval	Pre-commissioning survey 1	Pre-commissioning survey 2	Snowy 2.0 commissioning	Post-commissioning survey 1	Post-commissioning survey 2	Post-commissioning survey 3*	Post-commissioning survey 4*
Finalise sampling design, develop survey materials (including questionnaires), and allocate sampling effort								
1st pre-commissioning recreational fishing survey								
2nd pre-commissioning recreational fishing survey								
Snowy 2.0 commissioning								
1st post-commissioning recreational fishing survey								
2nd post-commissioning recreational fishing survey								

* Up to 2 additional surveys will occur if redfin establish and restocking of Tantangara reservoir commences after the completion of post-commissioning survey 2.

4. Publicly report on RFMP

Snowy Hydro will provide the following reports on its website:

- Annual report describing the activities planned and undertaken as part of Snowy Hydro's captive breeding capability, capacity, and stocking commitments and details associated with restocking activities that are implemented by NSW DPI in Tantangara Reservoir and Lake Eucumbene (see **Section 2**). Annual reporting will cease once the facilities at Gaden are commissioned and produce salmonids¹¹.
- Results of each Recreational Fishing Monitoring Program survey (see **Section 3**) within 3 months of the completion of the survey.

Where relevant, reports will include an assessment of the effectiveness of the measures taken.

5. Reporting noncompliance

Within 7 days of becoming aware of any non-compliance with the conditions of approval related to the RFMP, Snowy Hydro will notify the Department of Planning via the Major Projects portal of the non-compliance. This notice will set out the non-compliance, the reasons for the non-compliance (if known) and what actions have been taken, or will be taken, to address the non-compliance.

6. Plan Review

Changes to or review of the RFMP will be submitted for approval as required to the Director-General of NSW DPI.

As per Schedule 4, Condition 4, within 3 months of the following, unless the Planning Secretary agrees otherwise, Snowy Hydro will review and (if necessary) update the RFMP for Snowy 2.0:

- a) the submission of an incident report related to activities associated with this RFMP;
- b) the submission of an independent environmental audit report related to activities associated with the RFMP;
- c) any modification to the relevant conditions of approval; or
- d) a direction of the Planning Secretary under condition 4 of schedule 2 of the approval.

The RFMP will remain in place for 5 years after being approved unless an extension is triggered by the TARP described in **Section 2.11**.

¹¹ Any stocking activities will subsequently be published by NSW DPI as part of their reporting for the existing trout stocking program.

7. References

- Aither (2019). Recreational fishing in the Snowy Monaro Region. An assessment of trends, drivers and economic benefits. Prepared for Snowy Monaro Regional Council.
- Baxter, A.F.; Vallis, S.L.; Hume, D. (1985). The predation of recently released rainbow trout fingerlings, *Salmo gairdneri*, by redfin perch *Perca fluviatilis* in Lake Burrumbeet, October-December 1983. Arthur Rylah Institute for Environmental Research Technical Report Series No. 16. Arthur Rylah Institute, Melbourne, Australia.
- Cardno (2020). Aquatic Ecology Assessment – Snowy 2.0 Main Works. Prepared for EMM Consulting Pty Ltd.
- Dominion Consulting (2001). An economic survey of the Snowy Mountains recreational trout fishery. Prepared for NSW Fisheries – Recreational trust fund.
- Forbes, J.P., Steffe, A.S., Baumgartner, L.J. and Westaway, C. (2017). Preliminary assessment of the Lake Eucumbene summer recreational fishery 2015/2016. NSW Department of Primary Industries – Fisheries Final Report Series No. 156.
- NSW DPI (2018). The Snowy Lakes Trout Strategy 2018-23. A strategy to promote recreational angling, regional economic development and eco-tourism opportunities.
- NSW DPI (2019). Report on Gaden Hatchery Fish Kill.
- Molony, B.W., Bird, C. and Nguyen, V.P. (2004). The relative efficacy of stocking fry or yearling rainbow trout (*Oncorhynchus mykiss*) into a large impoundment dominated by redfin perch (*Perca fluviatilis*) in south-western Australia. Marine and Freshwater Research Vol 55:781-785.
- Underwood, A.J. (1992). Beyond BACI: the detection of environmental impacts on populations in the real, but variable, world. Journal of Experimental Marine Biology and Ecology 161, 145-178.
- Underwood, A. J. (1994). On beyond BACI - sampling designs that might reliably detect environmental disturbances. Ecological Applications 4, pp. 3-15.
- Wedge Group (2020). Gaden Trout Hatchery – Weir and Offtake. Prepared for DPI Fisheries NSW.
- Wedge Group (2023). Snowy 2.0 – Gaden Hatchery Augmentation Investigations and Findings. Prepared for Snowy Hydro Limited.

APPENDIX A

Overview of consultation activities

Table A-1 Overview of consultation activities undertaken to develop the RFMP

Working Group Meetings	Steering Committee Meetings	Other Correspondence/Meetings
11/08/2020; 24/09/2020; 10/11/2020; 04/12/2020; 10/02/2021; 10/03/2021; 05/05/2021; 09/06/2021; 14/07/2021; 17/08/2021; 08/09/2021; 13/10/2021; 10/11/2021; 14/12/2021; 22/02/2022; 17/03/2022; 04/05/2022; 29/07/2022; 01/09/2022; 31/10/2022; 01/12/2022; 16/02/2023; 16/03/2023; 26/04/2023; 18/05/2023; 15/06/2023	14/12/2020; 12/04/2021; 13/09/2021; 03/02/2022 (Including Fieldtrip to Snowy 2.0); 25/10/2022; 16/12/2022	31/08/2021 – Letter from SHL to NSW DPI to endorse delay of RFMP 15/09/2021 – Letter from NSW DPI to SHL endorsing proposal to extend the submission date of the RFMP 05/10/2021 – Notification provided to DPIE from SHL regarding delay in submission of RFMP 23/12/2021 - Draft v0.1 submitted to NSW DPI for review and comment 02/03/2022 - Draft v0.2 submitted to NPWS for review and comment 29/11/2022 - Workshop held by Wedge Group to present options assessment for Gaden Upgrade to NSW DPI and MAS 16/12/22 - Updated draft v0.3 provided to NSW DPI 31/01/2023 – Meeting with DCCEEW to provide an overview of the RFMP and other aquatic Plans 31/05/2023 – Final Wedge Group Report submitted to NSW DPI and MAS 12/07/2023 – Draft RFMP sent to the Recreational Fishing NSW Advisory Council

Table A-2 Steering Committee and Working Group participants (listed participants did not necessarily attend each meeting)

Person	Organisation Represented	Steering Committee	Working Group
Kieran Cusack	Project Director – Snowy 2.0	Snowy Hydro Limited	✓
Dave Evans	Director of Engineering – Snowy 2.0	Snowy Hydro Limited	✓
Andrew Nolan	Manager Water and Environment	Snowy Hydro Limited	✓
Charlie Litchfield	Head of Environment and Lands	Snowy Hydro Limited	✓
Elizabeth Pope	Senior Environmental Scientist	Snowy Hydro Limited	✓
Lachlan Barnes	Principal Consultant	Snowy Hydro Limited (SLR Consulting)	✓
Jonathan Carroll	Project Engineer – Snowy 2.0	Snowy Hydro Limited (SMEC)	✓
Sean Sloane	Deputy Director General Fisheries	NSW DPI	✓
John Tracey	Deputy Director General Biosecurity & Food Safety	NSW DPI	✓
Andrew Sanger	Director Biosecurity Projects	NSW DPI	✓

Person		Organisation Represented	Steering Committee	Working Group
Cameron Lay	Director Freshwater Environment	NSW DPI	✓	✓
Sarah Fairfull	Director Aquatic Environment	NSW DPI	✓	✓
Marcel Green	Program Leader Shark Strategy & Threatened Species	NSW DPI		✓
Peter Turnell	Director Recreational and Aboriginal Fisheries	NSW DPI		✓
Luke Pearce	Senior Fisheries Manager	NSW DPI		✓
Trevor Daly	Senior Fisheries Manager	NSW DPI		✓
Melissa Walker	Manager Aquatic Biosecurity	NSW DPI		✓
Cameron Westaway	Senior Fisheries Manager Inland	NSW DPI		✓
Jim Harnwell	Program Leader Fish Stocking & Enhancement Operations	NSW DPI		✓
Christina Bos	Policy and Projects Officer	NSW DPI		✓
Matthew McLellan	Senior Fisheries Manager Inland	NSW DPI		✓

Table A-3 Overview of stakeholder engagement activities

Stakeholder	Company/department	Key Dates contacted
Steve Samuels	Monaro Acclimatisation Society	20 April 2021 28 April 2021 29 November 2022 5 May 2023 31 May 2023
Brian	Lakeside lures	6 May 2021
Richard Burton	Snowy Mountains Sports	10 May 2021
Michael	The Alpine Angler	10 May 2021
Cole Sinclair	The Adaminaby Angler	10 May 2021
Andrew and Joyce	Anglers Reach Tackle Shop	10 May 2021
Brett	Snowy Mountains Fishing	11 May 2021
Dr Nathan Miles	NSW DPI	11 May 2021
Professor Johann Bell (Chair)	Recreational Fishing NSW Advisory Council	12 July 2023