



Cloud Seeding Program

2024 Operations Report

Published January 2026

snowyhydro

Snowy Hydro celebrates and acknowledges the traditional custodians of the many lands and waters on which we live and work. We pay our respects to Elders past, present and emerging for their custodianship of Country over centuries throughout Australia. We recognise and honour the ongoing connection and deep spiritual relationship that Aboriginal and Torres Strait Islander peoples have to Mother earth and acknowledge the unique role they play in caring for and protecting her for future generations. In line with the Snowy Hydro values of Safety, Teamwork, Ownership, Agility, Decency and Courage, we demonstrate our respect for First Nations peoples through our commitments to environmentally sustainable and ethical business practices and commit to working with Aboriginal people to grow and prosper communities while protecting our natural resources and ecosystems.

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Introduction

Snowy Hydro Limited (Snowy Hydro) relies on precipitation falling over the catchments of the Snowy Mountains to supply water for the production of hydroelectricity. Between 2004 to 2023, cloud seeding was used to enhance snowfall over the Snowy Mountains during the cold months.

Cloud seeding operations undertaken by Snowy Hydro are authorised by the Snowy Mountains Cloud Seeding Act 2004 (NSW) (SMCS Act). The SMCS Act mandates that cloud seeding operations may only be carried out in accordance with an Environmental Management Plan (EMP) approved by the Minister administering the Environmental Planning and Assessment Act 1979, and the Minister administering Part 4 of the National Parks and Wildlife Act 1974 (the ‘relevant Ministers’). The current cloud seeding EMP was approved by the NSW Environment Protection Authority (EPA) in 2023 following consultation with Snowy Hydro, the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW, formally NSW Department of Planning and Environment) and a range of stakeholders.

The SMCS Act requires Snowy Hydro, by 31 March in each year, to report on cloud seeding operations during the previous year to the relevant Ministers and to the EPA. The report must include details of compliance with the EMP and details of research monitoring the impact of seeding agents on the environment. The EPA is appointed to review each report on cloud seeding operations, and report the findings of the review and any resulting recommendations to the Board of the EPA and the relevant Ministers.

Snowy Hydro paused cloud seeding operations in 2024 for a comprehensive program review. In 2025, Snowy Hydro made the decision to cease cloud seeding operations permanently due to escalating costs to resource the program. Snowy Hydro submitted the Cloud Seeding Program 2024 Annual Compliance Report to the relevant Ministers and the EPA in March 2025. With no cloud seeding operations conducted in 2024, the report highlights environmental chemistry monitoring conducted in 2024 while addressing all

reporting obligations. This report demonstrates that Snowy Hydro has complied with all of its obligations in the EMP. Importantly, the 2024 Annual Compliance Report confirmed that there is no evidence of adverse environmental impacts associated with cloud seeding activities.

The subsequent EPA review¹, published in December 2025, supported these findings.

The key points of the 2024 Annual Compliance Report which are described fully in the following sections of this report:

- Operations, including operational incidents;
- Meteorological monitoring, including assessment of downwind impacts; and
- Environmental monitoring, including summary statistics of the monitoring program and details of research monitoring the impact of seeding agents on the environment.

Finally, the findings and recommendations of the EPA review are provided.

¹Report on the findings of the NSW Environment Protection Authority’s review of Snowy Hydro Cloud Seeding Program. 2024 Annual Compliance Report; received December 2025. Available from <https://www.epa.nsw.gov.au/Licensing-and-Regulation/Legislation-and-compliance/other-nsw-environmental-legislation/snowy-mountains-cloud-seeding-act-2004/annual-compliance-report-2024>

Operations

Target area and hours of operation

No cloud seeding operations were undertaken in 2024 and therefore no cloud seeding agent was dispersed over the Target Area (Figure 1).

Operational incidents

There were no accidents or breakdowns resulting in spillage of cloud seeding agents, cloud seeding fuel, or failure of controls specified in the EMP.

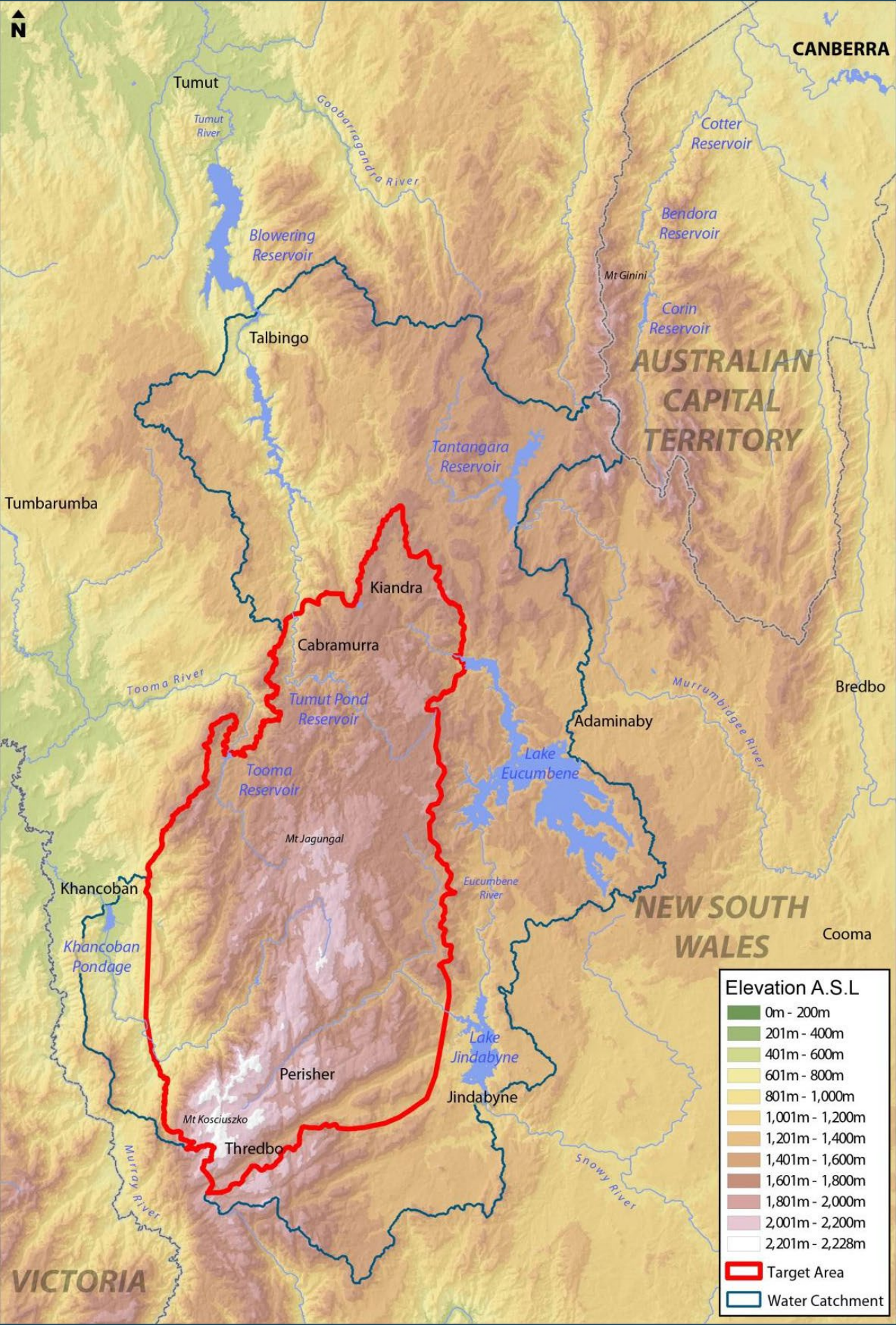


Figure 1: Map showing the Snowy water catchment (the area approved for cloud seeding) and the area which is primarily targeted for increased precipitation from cloud seeding operations (approximately 2,110 km²).

Meteorological Monitoring

Snow level criterion

The SMCS Act mandates that the discharge of the seeding agent is to be carried out at a time when increased precipitation is likely to fall as snow to at least 1,400 metres above sea level.

No cloud seeding operations were conducted in 2024, and no meteorological monitoring observations are reported in respect to compliance against the SMCS Act (s.4.2h).

Potential downwind impact

The Cloud Seeding Program was designed so that additional precipitation from cloud seeding falls over the target area. A component of the design was routine monitoring of precipitation to identify any possible effects of cloud seeding extending outside the target area.

Data from the Bureau of Meteorology and Snowy Hydro weather stations provided the basis for comparison of the temporal and spatial variability of precipitation across the region during the winter months, both before and after cloud seeding operations commenced in 2004.

Analyses of precipitation amounts over 1990-2024 continue to show no evidence of an effect from cloud seeding on precipitation downwind of the target area. This supports the results of previous, independent analyses by the Natural Resources Commission (NRC)².

²NRC Review of SPERP Annual Report 2011 (July 2012), available from <https://www.nrc.nsw.gov.au/completed/cloud-seeding>.

Environmental Monitoring

Environmental chemistry

Snowy Hydro has monitored silver concentrations in a range of environmental matrices at potential accumulation zones within and around the target area since the commencement of cloud seeding over the Snowy Mountains in 2004. Analyses of silver concentrations from samples collected prior to the commencement of cloud seeding in 2004 through to 2024 continues to show no evidence of any significant adverse environmental impacts associated with cloud seeding activities.

The objectives of the monitoring program are to detect increases in the concentrations of silver compared with baseline concentrations, and to assess concentrations of silver compared with agreed guideline values of 0.1 mg/L for potable water and 1 mg/kg for all other matrices.

The EMP prescribes the number of sampling sites for each matrix and area, the replicates collected and analysed for each site and the sampling frequency. Once environmental samples are collected, they are sent to an independent laboratory for chemical analysis. The results are independently audited and analysed statistically.

In accordance with the EMP and the outcomes of the environmental chemistry analyses reported in the 2023 Annual Compliance Report (Snowy Hydro 2024), all potable water sites and two generator soil sites were required to be sampled following the 2024 winter season. Although not required by the EMP, an additional generator soil site, that recorded one sample above the Guideline Trigger Value (GTV) in 2023, was also sampled and analysed in 2024.

The silver concentrations in the 2024 potable water samples (unfiltered) were similar to those from previous years, with a mean concentration 0.00030% of the GTV (0.1 mg/L). Mean silver concentrations in the filtered potable water samples were 0.81% of the ANZG toxicant default guideline value for 99% species protection (0.02 µg/L, equivalent to 0.00002 mg/L).

Due to the extremely low values observed in 2024 and in the previous surveys, no statistical analyses were undertaken for the potable water matrix.

Analysis of silver concentrations from samples collected through the environmental monitoring program prior to the commencement of cloud seeding in 2004 through to 2024 show no evidence that cloud seeding is contributing to broadscale increases in silver in any area or in any environmental matrix monitored. Concentrations of silver continue to show significant spatial and temporal variation between sites and years.

The average total silver concentration across the 36 generator soil samples analysed in 2024 was 0.229 mg/kg, well below the GTV of 1 mg/kg. Concentrations of total silver in two soil samples (out of 36 soil samples analysed in 2024) were above the GTV. This is suspected to be related to fire activity from the 2019/2020 bushfires as these samples were all collected in fire affected locations. Bioavailable analysis of samples from these sites showed that bioavailable volumes of silver in these locations remains extremely low, orders of magnitude below the GTV (i.e. 0.012% and 0.009% of the GTV), indicating the risk of toxicity in the environment or biological systems is extremely low.

Based on the results and the Decision Tools of the EMP, no further resampling of the selected generator sites is required.

Summary statistics of silver concentrations are shown in Table 1a and 1b for potable water samples, and Table 2 for the Generator Soil samples.

Table 1a: Summary of silver concentrations in 2024 potable water samples (mg/L). The guideline value for silver in potable water is 0.1 mg/L

Matrix	Number of samples	Minimum	Mean	Maximum	Guideline value
Potable Water	30	0.000000155	0.000000299	0.00000155	0.1

Table 1b: Summary of silver concentrations in 2024 filtered potable water samples (µg/L). The Australian and New Zealand Guidelines (ANZG) default guideline value for 99% species protection is 0.02 µg/L

Matrix	Number of samples	Minimum	Mean	Maximum	Guideline value
Potable Water	30	0.000086	0.000162	0.000266	0.02

Table 2: Summary of silver concentrations in 2024 soil samples (mg/kg). The guideline value for silver in these matrices is 1 mg/kg

Area	Matrix	Number of samples	Minimum	Mean	Maximum	Guideline value
Generator	Soil	36	0.043	0.229	1.635	1

Aquatic ecology

Statistical analyses of data collected following the 2023 season showed no evidence of any difference over time in the impairment of the macroinvertebrate assemblages or multivariate structure of edge or riffle assemblages which could be related to cloud seeding. No aquatic ecology monitoring was undertaken in 2024.

EPA Review

The EPA has undertaken a review of the Cloud Seeding Program 2024 Annual Compliance Report, in accordance with the SMCS Act and the EMP. In completing the review, the EPA consulted with the Department of Climate Change, Energy, the Environment and Water (DCCEEW) for the review of the report, and National Parks and Wildlife Service (NPWS) in respect to cloud seeding operations that took place within Kosciuszko National Park.

The EPA concluded:

- Snowy Hydro has complied with all obligations as detailed in the Act.
- Snowy Hydro has complied with all obligations as detailed in the EMP for cloud seeding operations approved by the relevant Ministers in July 2023.
- Snowy Hydro has complied with all its obligations as detailed in the Protection of the Environment Operations Act 1997.

The recommendations were:

- Monitoring be continued as per the schedule of the EMP, and data compared over time to identify trends.
- Future reviews are also undertaken in consultation with input from partner agencies of the NPWS and DCCEEW.
- The outcomes of this review are communicated to the relevant ministers.
- Snowy Hydro continues to liaise with the EPA regarding the future intentions for cloud seeding operations.
- Comments from DCCEEW and NPWS will be communicated to Snowy Hydro for consideration.

→ Snowy Hydro will consult with the EPA on these recommendations



Cloud Seeding Program End

Following the end of the 2023 cloud seeding season, Snowy Hydro began a comprehensive economic review of the Cloud Seeding Program, including resourcing and infrastructure requirements and ongoing return on investment. Snowy Hydro paused cloud seeding operations for the 2024 cloud seeding season to undertake the review. In 2025, Snowy Hydro made the decision to cease cloud seeding operations permanently due to escalating costs to resource the program.

Snowy Hydro is committed to ensuring a smooth end to the Cloud Seeding Program and meeting all regulatory obligations associated with decommissioning. Snowy Hydro is working with stakeholders, including the EPA, NPWS and private landowners to decommission cloud seeding related infrastructure and undertake site rehabilitation where required. As per the EMP and the SMCS Act, Snowy Hydro will continue to meet annual reporting obligations with the main purpose of providing an update on the decommissioning progress. Given no further cloud seeding operations will occur, no further environmental chemistry or meteorological monitoring will be undertaken.

Conclusion

The Cloud Seeding Program 2024 Annual Compliance Report detailing cloud seeding related activities through 2024 was submitted to the relevant Ministers and EPA in March 2025. With no cloud seeding operations conducted in 2024, the report highlights the continued environmental monitoring efforts while addressing all reporting obligations. The EPA reviewed the report and confirmed Snowy Hydro has complied with all obligations set out in the SMCS Act and detailed within the EMP through the reporting period. There continues to be no evidence of any significant adverse environmental impacts associated with cloud seeding activities.

For more information about Snowy Hydro's Cloud Seeding Program please refer to our website, <https://www.snowyhydro.com.au/generation/cloud-seeding/>.

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