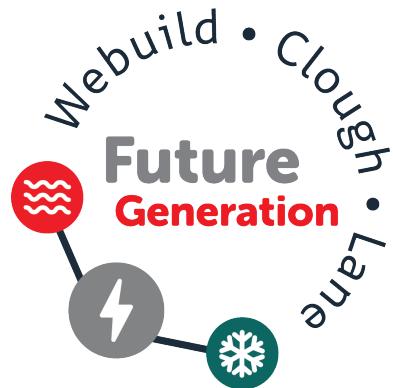




snowy 2.0



REPORT

QUARTERLY ENVIRONMENTAL WATER REPORT DECEMBER 2021 TO FEBRUARY 2022

S2-FGJV-ENV-REP-0062

Rev. A

JUNE 2022

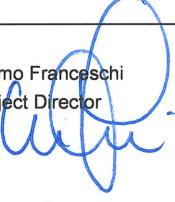
This Report has been prepared to satisfy the reporting requirements in the Main Works – Water Management Plan (WMP) and to meet Condition of Approval (CoA) 31(c)(d) of the Infrastructure Approval Schedule which requires publicly available reporting of the outcomes of the WMP. The Report provides commentary on the performance of the monitoring programs as part of the WMP. Exceedances of water quality criteria and observed variations for December 2021 to February 2022 are not considered to be caused or added to by the ongoing construction works of Snowy 2.0.

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Rev.	Date	Reason for Issue	Responsible	Accountable	Endorsed

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ABBREVIATIONS AND DEFINITIONS

Acronym	Definition
AWS	Automatic weather stations
BoM	Bureau of Meteorology
CoA	Condition of Approval
ECVT	Emergency Cable and Ventilation Tunnel
EPL	Environmental Protection Licence
Future Generation	Future Generation Joint Venture
MAT	Main Access Tunnel
MDB	Murray Darling Basin
NEM	National Electricity Market
Snowy Hydro	Snowy Hydro Limited
Snowy Scheme	Snowy Mountains Hydro-electric Scheme
SWMP	Surface Water Management Plan
TARP	Trigger Action Response Plan
TBM	Tunnel Boring Machine
WMP	Water Management Plan
WQO	Water Quality Objectives

1. INTRODUCTION

Snowy Hydro Limited (Snowy Hydro) is constructing a pumped hydro-electric expansion of the Snowy Mountains Hydro-electric Scheme (Snowy Scheme), called Snowy 2.0. Snowy 2.0 will be built by the delivery of two projects: Exploratory Works and Snowy 2.0 Main Works (which has commenced).

Snowy 2.0 is a pumped hydro-electric project that will link the existing Tantangara and Talbingo reservoirs through a series of new underground tunnels and a hydro-electric power station. Most of the project's facilities will be built underground, with approximately 27 kilometres of concrete-lined tunnels constructed to link the two reservoirs and a further 20 kilometres of tunnels required to support the facility. Intake and outlet structures will be built at both Tantangara and Talbingo Reservoirs.

Snowy 2.0 will increase the generation capacity of the Snowy Scheme by an additional 2,000 MW, and at full capacity will provide approximately 350,000 MWh of large-scale energy storage to the National Electricity Market (NEM). This will be enough to ensure the stability and reliability of the NEM, even during prolonged periods of adverse weather conditions.

WeBuild, Clough, and Lane have formed the Future Generation Joint Venture (Future Generation) and have been engaged to deliver both Stage 2 of Exploratory Works and Snowy 2.0 Main Works.

2. PURPOSE

This Environmental Water Report has been prepared to satisfy the reporting requirements in the Main Works – Water Management Plan (WMP) and to meet Condition of Approval (CoA) 31(c)(d) of the Infrastructure Approval Schedule which requires publicly available reporting of the outcomes of the WMP. The Environmental Water Report is intended to provide commentary on the performance of the monitoring programs as part of the WMP (identified in Table 2-1).

Table 2-1: Monitoring overview

Aspect	Objective
Surface Water Monitoring Program	
Routine receiving surface water quality monitoring	<ul style="list-style-type: none"> inform and assess the performance of management processes/measures that seek to minimise the Project's impact on surface water quality
Event based wet weather overtopping water quality monitoring	<ul style="list-style-type: none"> help determine source and extent of any water quality changes collect baseline data to characterise water quality and determine site specific values
Groundwater Monitoring Program	
Groundwater level monitoring	<ul style="list-style-type: none"> inform and assess the performance of management processes/measures that seek to minimise the Project's impact on regional and local (including alluvial) aquifers and GDEs
Groundwater quality monitoring	
Water extraction monitoring	<ul style="list-style-type: none"> inform and assess water consumption, site water balance and compliance with water access licenses

3. OVERVIEW

3.1. Reporting period

This Environmental Water Report covers the monitoring period from December 01 2021 to February 28 2022.

3.2. Construction progress

Table 3-1 summarises the key construction activities which have been undertaken during the reporting period.

Table 3-1: Key construction activities for 01 December 2021 to 28 February 2022

Location	Key construction activities
Lobs Hole Ravine Road	<ul style="list-style-type: none"> Ongoing maintenance of road, and erosion and sediment (ERSED) controls along Ravine Rd from R0-R15. Clearing for road widening works between R7-R15 Improvement and implementation of additional ERSED controls at R5 laydown area.
Lobs Hole	<ul style="list-style-type: none"> Tunnelling works continue Clearing carried out at Lick Hole Gully Installation of additional ERSED controls at the Explosives Storage Yard Concreting of ECVT Level Spreader and commencing works on the batter chute Continued construction of the Marica West HDD Pad
Marica	<ul style="list-style-type: none"> Marica Camp earthworks and underground utilities scope is completed. All structural footings/ foundations are completed and buildings on site. Currently in the process of constructing the ring road, access roads and the car park. All other common buildings are substantially completed. Marica Trail Road from Snowy Mountain Highway to CH2100 is being widened to the IFC design as it was initially constructed as a pioneer road. The remaining of Marica Trail from CH2100 to CH5300 is under construction and are currently working between CH2900 – CH3200 installing rock bolts and draped mesh Marica West from CH0 – CH1200 including the upper HDD Pad has been cleared. Bulk earthworks almost completed up to upper HDD Pad earthworks package. Marica West trail bulk earthworks has commenced and will require fill from the HDD pad to be constructed to the IFC design. Upstream Surge Shaft bulk earthworks are completed with the remaining fill being hauled from Marica Trail. Facility FRP works is well underway for all the facility to support the shaft excavation. Shaft spoil stockpile area C&G to commence once no-objection has been received.
Plateau	<ul style="list-style-type: none"> Trenching along the alignment ongoing Clearing carried out for drill pads Site rehabilitation progressing ERSED improvement actions and items largely complete Water Quality Monitoring ongoing
Rock Forest	<ul style="list-style-type: none"> Laydown area construction complete with associated drainage
Talbingo	<ul style="list-style-type: none"> Clearing and grubbing works completed. ERSED controls in place Commenced drill and blast activities Earthworks ongoing. TBM cradle is under construction. TBM / facilities U/G services substantially completed. Plants to support TBM excavation are getting assembled from WTP.

Location	Key construction activities
Tantangara	<ul style="list-style-type: none"> Excavation of the ADIT is completed; cradle has been completed. TBM#3 assembly completed, excavation started, commissioning in progress.. Batch Plant commissioning completed and in operation. Cofferdam earthworks is completed. Installation of the liner completed. Rock fill to be completed. Camp Earthworks ongoing complete. Services and concrete ongoing as well as the installation of the rooms. 120 beds opened. Tantangara road and Quarry trail pioneering road maintenance ongoing with regular repairs throughout the month. Works ongoing on Tantangara Spoil Road. The earthworks are almost completed up to the spoil area. Pavement to be installed after the intake blasting

4. WEATHER CONDITIONS

There are several weather stations along the alignment of the project that report real-time data. These include:

- “Lobs Hole” - which is an Automatic Weather Station managed by Future Generation in Lobs Hole construction site.
- “Cabramurra” - an Automatic Weather Station located near the lookout in the Cabramurra township managed by the Bureau of Meteorology
- “Tantangara” - an Automatic Weather Station managed by Future Generation in Tantangara construction site.

The Tantangara and Cabramurra gauges are in sub-alpine environments, with elevations of approximately 1220 m and 1475 m, respectively. Cabramurra records substantially higher annual rainfall amount than the lower-elevation gauges at Lobs Hole and Tantangara. Tantangara and Lobs Hole weather stations record actual onsite conditions at the respective construction sites, while Cabramurra weather station, at 1470 m is representative of conditions at Marica – which has an elevation of 1480 m and is approximately 15 km north of the Cabramurra Station.

A summary of climate data for the ravine and plateau areas is provided in Table 4.1.

Table 4-1: Weather conditions for December 01 2021 to February 28 2022.

Parameter	Lobs Hole ¹			Marica (Cabramurra)			Tantangara ²		
	Dec	Jan	Feb	Dec	Jan	Feb	Dec	Jan	Feb
Temperature									
Mean maximum	26.58	29.02	26.70	18.07	20.73	18.89	21.73	25.18	23.03
Mean minimum	9.47	14.33	12.93	9.09	12.14	10.20	7.64	10.26	9.41
Rainfall									
Monthly	100.20	194.00	43.20	107.40	236.00	50.20	69.00	150.80	67.40
Long Term Average	69.0	63.7	54.4	97.3	73.9	79.5	59.4	58.8	52.4

1. Lobs Hole long term average rainfall is taken from the Tumbarumba weather station

2. Tantangara long term average rainfall is taken from the Adaminaby Alpine Tourist Park weather station

During the months of summer, higher than average rainfall was experienced across the region, with January precipitation being significantly higher than the long-term average across all sites (**Table 4-1**). The ongoing influence of La Nina across Eastern Australia caused local impacts within the snowy 2.0 construction works. Temperature data gathered shows consistent warming in temperatures during summer.

5. SURFACE WATER MONITORING PROGRAM

5.1. Routine surface water quality monitoring

Routine surface water quality monitoring is undertaken in accordance with CoA 31 and the Environment Protection Licence No. 21266 (EPL - 21266) to determine if the project is resulting in any impacts to receiving water quality against the Water Quality Objectives (WQO). The WQOs are specified in Table 2-2 of the Main Works – Surface Water Monitoring Program.

Publicly available surface water quality monitoring results undertaken in accordance with EPL - 21266 can be accessed [here](#).

In general, the surface water monitoring results are consistent with those observed during the previous reporting period. On several occasions, EPL monitoring results exceeded the Water Quality Objectives, however results are consistent with the baseline monitoring and upstream of the Snowy 2.0 construction activities.

For the reporting period, the quarterly monitoring results demonstrate that the water quality is relatively consistent across multiple EPL monitoring locations with the exceedances not shown to have increased since the onset of the proximal construction of Snowy 2.0. Increased metals and nutrients are likely to be a by-product of the 2020 bushfires.

In addition, no discharge was occurring at the time the samples at EPL41 were collected in January 2022. Elevated nitrogen, nitrates and faecal coliform presence are likely due to the algae blooms in the reservoir which can effect the results. An EPL variation was issued on 14 January which include an increase discharge from 1.66 ML/day to 4.32 ML/day with a flow rate of 50L/s.

An EPL variation was issued 4 February which covered the following:

- Written approval for commencement of scheduled development works
- Quarterly Spoil Monitoring Reporting
- Pollution Reduction Program

Exceedances to the water quality objectives within surface waters across the site are not considered to be caused or added to by the ongoing construction works of Snowy 2.0. The trigger action response plans included in the water management plan have been followed for all analytes with concentrations exceeding the respective water quality values. At this time, no further action is required.

5.2. Event based monitoring

Event based wet weather overtopping water quality monitoring is undertaken in accordance with the SWMP Trigger Action Response Plan (TARP 2) to monitor stormwater overtopping sediment basin discharges. Sediment basins for the Project have been designed to meet the design rainfalls depths identified in Table 5-1.

Table 5-1: Design rainfall depths (SWMP Section 5.1.1)

Catchment	Description	85 th percentile, 5-day rainfall (mm)	90 th percentile, 5-day rainfall (mm)	95 th percentile, 5-day rainfall (mm)
Yarrangobilly River	Surface works at Lobs Hole and Marica	28.1	35.6	49.0
Upper Eucumbene River	Surface works between Marica and the Snowy Mountain Highway	35.2	43.4	56.9
Tantangara construction compound	Surface works adjacent to the southern portion of Tantangara Reservoir	30.5	37.0	51.0
Goorudee Rivulet	Surface works at Rock Forest	20.0	25.7	36.1

During the reporting period, rainfall exceeded the design rainfall criteria numerous times, including:

- 7 – 11 December (34.8 mm Lobs Hole, 32.2 mm Tantangara, 41.2 mm Marica)
- 16 – 20 December (58.2 mm Lobs Hole, 31.8 mm Tantangara 66.2 mm Marica)
- 4 – 8 January (72.2 mm Lobs Hole, 42.6 mm Tantangara, 64.4 mm Marica)
- 12 – 16 January (42.2 mm Lobs Hole)
- 14 – 18 January (91.4 mm Marica)
- 27 – 1 February (86.6 mm Tantangara)
- 29 January – 2 February (90.2 mm Lobs Hole, 71.4 mm Marica)
- 24 – 28 February (54.6 mm Tantangara)

Across the sites, water quality upstream as well as downstream results were generally consistent. Water samples were collected for comprehensive water testing and the EPA were notified of the releases in accordance with R4.1 of EPL 21266.

The discharge is considered consistent with naturally occurring conditions and no material harm has been caused by the overtopping events. In addition, no harm to health or safety of human beings or the environment that is not trivial has occurred.

6. GROUNDWATER MONITORING PROGRAM

6.1. Groundwater quality

Groundwater quality monitoring is undertaken in accordance with EPL - 21266 to determine if the project is resulting in any impacts to groundwater. Groundwater quality trigger levels for the Project are outlined in Table C-1 of the Main Works – Groundwater Monitoring Program.

Publicly available groundwater quality monitoring results undertaken in accordance with EPL - 21266 can be accessed [here](#).

Between December 2021 and February 2022, several groundwater sample results exceeded the water quality objective values across some boreholes (Aluminium, Copper, Iron, Lead, Nickel, Zinc), however results were like those of previous quarters.

13 Level 1 designated locations were not sampled due to safety restrictions including a red alert for lightning on the day of monitoring and snake encounter.

6.2. Groundwater levels

Groundwater level monitoring is undertaken in accordance with the Groundwater monitoring program to determine groundwater drawdown as a result from the Project.

Site specific groundwater level triggers as outlined in Attachment B of the Main Works – Groundwater Monitoring Program have been established to monitor whether observed drawdown is greater than construction related predicted drawdown.

For the reporting period, the groundwater monitoring bores were categorised into three groups, each demonstrating a distinct natural response to rainfall and temperature as follows:

- Very shallow bores showed a seasonal response to temperature with elevated groundwater levels in winter and depressed levels in summer. Water level change is therefore considered to respond to evapo-transpiration effects (low vegetative activity and evaporation in winter; high ET in summer). Rainfall events can be observed as minor, secondary, perturbations to the overall trend
- Intermediate depth bores exhibited a groundwater level time-series consistent with a primary response to rainfall subdued with increasing depth. A weak secondary response to temperature is apparent at most bores. Two bores, however, do not show a strong rainfall signal and the signal is subordinate to the temperature response for conventional bores. Two other bores do not show a response to either rainfall or temperature.
- Deep vibrating wire piezometers showed mild fluctuations that correlate primarily with surface temperature. Two bores demonstrated a secondary response to precipitation events.

Rainfall and temperature corrected trends across the Project area generally flat. That is, no response is recorded at any bore that can be attributed to Project activities.

3 sites have been decommissioned due to encroaching construction. Alternate monitoring sites have been provisioned.

Across the Project, although data for 13 bore holes was not available, it is considered that all reliably recorded groundwater levels continue to monitor baseline conditions, with any observed level or pressure changes ascribed to natural causes.

No level 1 warnings were triggered for this period.

6.3. Groundwater inflows

Groundwater inflow into the tunnels is monitored during construction and compared to predicted inflows. This data is required to monitor the volume of extracted groundwater against water access licence limits (Table 6-1).

Table 6-1: Water access licence

Water Access Licence	Project	Water Source	Share (ML)
WAL42407 – Specific Purpose Access Licence	Exploratory Works	Upper Tumut water source	227
WAL42408 – Groundwater Licence	Exploratory Works	Lachlan Fold Belt MDB	0
WAL42960 – Groundwater Licence	Exploratory Works	Lachlan Fold Belt MDB	354
RO13-19-093 – via Controlled Allocation	Main Works	Lachlan Fold Belt MDB	3,375
RO1-19-092 – via Controlled Allocation	Main Works	Lachlan Fold Belt South Coast	1,722
Specific Purpose Access Licence	Main Works	Tantangara Water Source	532

Tunnelling commenced in June 2021. The monthly inflows for the Construction Water Treatment Plant (CWTP) at the Main Access Tunnel (MAT) Portal are as follows:

- December: 32.29 ML
- January: 10.18 ML
- February: 27.71 ML

7. CONCLUSION

Exceedances of water quality objectives recorded during routine monitoring between December 2021 and February 2022 did not trigger the need for further sampling, remedial actions, or TARPs.

Between December 2021 and February 2022, changes to the groundwater conditions and groundwater levels in the level 1 bores were identified as natural fluctuations.

Exceedances to the water quality objectives within surface and groundwater across the site during monthly water monitoring and event specific monitoring were generally consistent with recorded baseline and background ranges.

Exceedances are not considered to be caused or added to by the ongoing construction works of Snowy 2.0.