
To: NZ Ski Ltd
Cc: Mitchell Daysh
From: Alexandra Badenhop
Date: 25.08.2026
Subject: Doolans Creek Water Take: Response to key issues and information gaps identified in ORC reviews

The Doolans Creek Water Take Assessment of Effects (e3scientific, 2026a) (Water Take AEE) forms part of the NZSki fast track application to expand the existing Remarkables ski operation into the Doolans. The application requests a water take of 30 L/s totalling 38,872 m³/month and 41,240 m³/year from the Doolans Creek for snow making and potable water combined. The Otago Regional Council (ORC) have received the Water Take AEE and have provided feedback relating to hydrology and freshwater ecology. The concerns raised by the hydrology review, and the freshwater ecology review (where relevant to hydrology) are addressed in the respective sections of this Memo.

1 Hydrology review (SLR)

Charlotte Lockyer (SLR). Memo RM26.075 NZ Ski Ltd (FTA)Doolans Creek Water Take Technical Peer Review, 4 May 2026:

Q1. Location of Low Head Pump Chamber on part of the Doolans Creek floodplain.

This concern is addressed in Section 5.1.1 of the Stantec report 'Remarkables Ski Area Expansion Project Water Intake Concept Report' dated 29 April 2026:

The proposed intake structure, and associated training walls/flumes, will be designed to pass a 1:100year flood event. It is anticipated that 'super-design events' (an event greater than a 1:100 flood) will overflow the channel onto the existing floodplain, and the intake structure will be submerged. Some deposition of sediment is possible, or even likely, in a super design event and removal of excess sediment may be required following such an event. The intake structure will feature riprap protection installed both upstream and downstream of the weir to mitigate erosion and to protect the structure during flood events.

The Stantec report states that the low head pump would be exposed to flooding from channel overflow during an event greater than a 1:100 year flood. The site will be designed to ensure that it can withstand the event and sediment deposited during such an event may need to be removed after. Despite this the site was still considered the best location of the water intake and associated low head pump because:

- It was downstream of the flow monitoring site DC3,
- Could be accessed by a road with a practical gradient,
- Minimised disturbance to wetland vegetation,
- Had a wide bed to allow the below ground low-head pump chamber plus weir to be fitted,
- Had an adjacent terrace located beyond potential flooding for the high-head pump, and
- The area is also located out of potential avalanche terrain.

This information has been updated into Section 6.7 of the Water Take AEE.

Q2. It is unclear how the Tyrolean weir will maintain the minimum flow in the Doolans Creek downstream of the water take. Additionally, how the weir will be managed to prevent water being diverted to the low-head pump when only potable water is required or when the reservoir is full.

The Tyrolean Weir is described in the Section 6.1.3 of the Stantec report 'Remarkables Ski Area Expansion Project Water Intake Concept Report' dated 29 April 2026. The Tyrolean weir is a low height weir built across a stream. Water passes over a screen built into the weir crest, drops through the screen and is gravity fed via a pipe to the low head pump. The remaining water passes over the weir and continues downstream. The intake pipe is sized to meet the proposed rate of take including extra for a flushing line to remove sediment from the low head system. Water from the flushing line returns to the creek approximately 45 m downstream. The weir intake grating will be designed to accept a maximum flow of 30 L/s; and the abstraction will be throttled by the pipe size, and intake pumps will be sized for a maximum take of 30 L/s, with variable speed drives to enable flow reduction if required.

During the snow making season, when the low-head pump is not pumping due to the reservoir being full or snowmaking not being required, the abstraction will flow back to the creek via the flushing line.

To ensure the minimum flow of 33.5 L/s is maintained directly downgradient of the weir (prior to the re-entry of flushing line), water levels will continue to be monitored at the DC3 location. If flow reduces to 63.5 L/s, the abstraction rate will be reduced by partially shutting a gate installed at the intake pipe. Outside of the snow making season the intake pipe will be shut off to ensure that the minimum flow rate is maintained between the weir and the flushing line during the driest months.

This information has been updated into Section 6.2 of the Water Take AEE.

Q3. In addition, due to data limitations and high uncertainty regarding low flows in the Doolans Creek, I recommend a more conservative residual flow threshold be set. The residual flow should consider the minimum flow required to maintain aquatic ecosystems. The minimum flow is often set at 80-90% of MALF. A value not less than 50% of the MALF is recommended (no less than 33.5 L/s), though a higher value may be warranted.

Additional analysis of the effect on flows has been provided in Section 5 and Section 6.2 of the Water Take AEE. Extrapolation of the dataset using the Nevis River dataset is in agreement with the modelled MALF values provided. The proposed updated residual flow of 33.5 L/s considers the minimum flow required to maintain aquatic ecosystems and has been discussed in Section 6.2.2., and *Appendix C: Doolans (DC3) flow and physical habitat relationships* of e3Scientific (2026b).

This included an assessment of the potential impact of reduced flow on the habitat area of Rastus Burn downstream has been undertaken based on the information currently available. This assessment found that if flow was reduced below 30% of MALF significant stream habitat loss would occur at the DC3 site. To restrict potential habitat loss, particularly in riffle habitat, a minimum flow of 30 L/s (45 % of MALF) has been recommended (Appendix C). Maintaining 45% of MALF should retain 80% of the stream width during the short duration of the winter water abstraction. The proposed updated residual flow of 33.5 L/s is 50% MALF and provides additional flow above that recommended in the assessment.

Q4. The ORC reviewer noted that the potable water take volume was unclear.

The draft report submitted pre-application contained an inconsistency in potable water take volumes requested. This was updated in Section 6.3.1. of the Water Take AEE submitted with the substantive applications as follows: "Over the ski season (June-September), the potable water demand is expected to be 2,950 m³. With an additional amount for reduced crew (nominally 5 people) over summer months, the annual potable water requirements are expected to be ~2,986 m³/year."

Q5. The requested rate of take at 30 L/s has not been justified.

The ORC reviewer has provided some alternative calculations to suggest that the rate of take could be reduced to achieve the same outcomes, however these calculations were based on the following incorrect assumptions:

- The required rate of take from the reservoir is 98 L/s.
- Snow-making will only be required for 5.4 hours per night.

These were based on statements made in the draft report submitted pre-application that have been clarified in Section 6.3.4. of the Water Take AEE submitted with the substantive applications and are explained further below:

The reason for the requested 30 L/s is to enable snowmaking to occur at **104 L/s** for 102 hours to allow a 0.5 m base of snow to be produced and to allow for an additional 0.5 m of conditioning snow. The flow rate required for snow making on the Doolans main trail is 96 L/s and for the Doolans Learners slope an additional 8 L/s is required (104 L/s total). These required flow rates were provided in Appendix B (e3scientific, 2026a) and have been summarised in Table 1 of the Water Take AEE. A temperature of around -4°C is required to produce snow. The length of time it will take to build the trail depends on the temperature windows - as snow can be made faster at lower temperatures (i.e. -8) than you can at marginal temperatures (i.e. -2). An adverse rain/warm event may wash away snow depth requiring snow-making. Operationally, this means being prepared to be responsive to weather windows is very important.

The requested rate of take combined with the reservoir storage is designed to maximise flexibility around snow-making; if there was no snow forecast and temperature conditions allowed, production of the 0.5 m of base snow and conditioning snow could occur consecutively thus enabling the ski fields to operate. However, snow production may be spaced out over many days/nights with gaps in between. The suggestion of 10 nights of snow making from the reservoir was an example, not a specification of 5.4 hours of snowmaking occurring per night, and is not the only scenario to be considered. If water for snowmaking was taken continuously from the filled reservoir at 104 L/s, while the reservoir was being filled from the Creek at 30 L/s, snowmaking could occur for only 71 hours before the reservoir was empty, however snowmaking would need to cease prior to the reservoir being completely empty.

Q6. Length of water level data; at the time of submission only 9 months of water level data was available and did not include the March – May period.

It was only possible to include 9 months of water level data (June – February) in the final report at the time of submission, however since then additional data (March – May) has been downloaded and an additional flow measurement collected, as updated in Table 3 of Section 4.1 of the Water Take AEE (e3scientific, 2026a).

Q7. Proposed Consent Conditions

These have been updated in Section 7 of the Updated AEE.

- a) *The volume of water take permitted per year should be on a calendar year (January to December), not a drought year as proposed (July to June). As is currently proposed divides the snow-making season into different years.*

This was updated in the substantive application.

- b) *A higher residual flow be maintained in the Doolans Creek. This should be set in consultation with findings from the aquatic ecology review.*

The residual flow has been increased to 33.5 L/s in response to additional analysis completed (see response to Q3).

- c) *Additional stream gaugings be undertaken to improve the accuracy of the rating curve being used to convert water level data to stream flow.*

This is agreed. One additional gauging has been completed as of May 2026. Note that the site cannot currently be safely gauged during the winter months.

2 Freshwater ecology review (Torlesse Environmental)

Michael Greer (Torlesse Environmental Ltd) NZSki Remarkables Fast-track approvals application: Pre-lodgement review of aquatic ecology report. 29/04/2026:

Q8: *The assessment of abstraction effects would benefit from an estimate of the residual flow and allocation relative to MALF at multiple downstream locations, including reaches supporting fish populations.*

Additional analysis of the effect of the take on flows has been provided in Section 5 of the updated Water Take AEE. Further analysis of the downstream MALF relative to the proposed take has been provided in Section 6.2.2 of the Water Take AEE, with identified fish passage barriers and fish records shown for context.

The proposed updated residual flow of 33.5 L/s considers the minimum flow required to maintain aquatic ecosystems and has been discussed in Section 6.2.2., and

Appendix C: Doolans (DC3) flow and physical habitat relationships of e3Scientific (2026b).

This included an assessment of the potential impact of reduced flow on the habitat area of Rastus Burn downstream has been undertaken based on the information currently available. This assessment found that if flow was reduced below 30% of MALF significant stream habitat loss would occur at the DC3 site. To restrict potential habitat loss, particularly in riffle habitat, a minimum flow of 30 L/s (45 % of MALF) has been recommended (Appendix C). Maintaining 45% of MALF should retain 80% of the stream width during the short duration of the winter water abstraction. The proposed updated residual flow of 33.5 L/s is 50% MALF and provides additional flow above that recommended in the assessment.

Q9: Identifying the downstream location where the abstraction no longer has a meaningful effect on flow.

As per Section 6.2.2 of the Water Take AEE, the take is only 10% of modelled MALF 6.7 km downstream, at the location of the closest fish record. At 9.6 km downstream, the take is 8% of MALF, at which point the take rate is within the uncertainty bounds of high-quality flow measurements and can therefore be considered imperceptible, even at low flows. See also the response to Q8.

Q10: An assessment of whether the backwash discharge has the potential to result in a conspicuous change in visual clarity, and the likely duration of any such effect, is required.

The design of the Tyrolean weir promotes an increase in velocity across the face of the weir intake screen as the water overtops the weir crest. This promotes transport of finer suspended sediment past the intake, with bedload being the higher risk for ingress through the screen. This intake type was selected due to its sediment handling, low maintenance requirements and suitability for alpine environments. The backwash flushing is expected to be of short duration (1-3 minutes). The pulse of sediments is expected to have a low proportion of fines, which will settle quickly and disperse rapidly into the stream.

3 ORC compliance review regarding existing water takes

The ORC have indicated that there are two existing consented water takes (not one as originally identified) located on the Doolans Creek and one is for year-round abstraction. The application prepared to support the consent applications for these existing takes indicated that at the location of these takes the MALF in the Doolans Creek was estimated to be 613 L/s. Given there is no allocation limit specified for the Doolans Creek in Schedule 2A the primary allocation limit is the greater of either:

- 50% of the 7-day mean annual low flow (MALF); or
- The sum of the consented maximum instantaneous or consecutive 7-day takes.

From the estimated MALF at the point of the existing consented takes the estimated primary allocation limit is 306 L/s. The combined flow rates of the existing consented takes total 263.9 L/s. The additional 30 L/s requested by NZSki would take the total allocation to 293.9 L/s which remains below the estimated allocation limit.

ORC notes that while there are no other resource consents authorising the abstraction of surface water from the Doolans Creek there are likely several surface water takes operating as permitted activities under the Regional Plan. To be a permitted activity surface water takes on the Doolans Creek must not exceed 0.5 L/s. This means there is allocation for 24 permitted takes prior to the estimated primary allocation limit of 306 L/s. Given the number of dwellings and activities surrounding the Doolans Creek currently it is not expected that there would be close to 24 permitted takes. Furthermore, the take for snow-making will only be taken during the winter months, when irrigation takes are not operational (noting that only 24.6 L/s of the other resource consents are for purposes other than irrigation). Sections 6.1 Allocation and 6.4 Water use consents have been updated accordingly in the AEE.

4 References

- e3scientific. (2026a). *Doolans Creek Water Take Assessment of Effects*. Arrowtown: e3scientific Ltd.
- e3Scientific. (2026b). *Remarkables Ski Area Upgrade and Doolans Expansion - Doolans Basin Weir, Water Take and Reservoir Freshwater Ecological Impact Assessment*. May 2026.