Otago Regional Council

Appendix 2: Surface water ecology and water quality technical expert advice

Fast-track Approvals Act 2024 (FTAA) Technical Advice

Remarkables Ski Area Upgrade and Doolans Expansion Project Fast-track Application

s.53 Specialist Response – Substantive Application

1 Application Summary

Project Name	**Remarkables Ski Area Upgrade and Doolans Expansion Project**
Applicant	NZSki Limited
Site Address	Remarkables Ski Field Access Road, Queenstown
Fast-track Reference Number	FTAA- 2605-1236
Council reference numbers	RMFT26.004
Description of Proposal	The Remarkables Ski Area Upgrade and Doolans Expansion Project, proposed by NZSki, involves upgrading the existing Remarkables Ski Area and expanding into the adjacent Doolans Basin to provide approximately 262 hectares of additional skiable terrain. The project includes a new gondola connecting the two valleys, new ski trails and access roads, expansion of the existing base building, a new base building and learner facilities in Doolans Basin, and associated infrastructure including snowmaking, water supply, wastewater treatment and disposal, power and stormwater management. A new water take from Doolans Creek and a 19,000 m^3 snowmaking reservoir are also proposed.

2 Specialist Response Details

To	Ms Angela Fenemor
From	Dr Michael John Crawshaw Greer
Specialist Area	Surface water quality and ecology
Qualifications & Relevant Experience	I hold a PhD (2014) in Ecology and a Bachelor of Science in Zoology (2010) from the University of Otago. I have over 14 years of work experience in freshwater quality and ecology, and have worked for local government, the Department of Conservation (2012-2014) and NIWA (2014). Since June 2022, I have been the Principal Scientist and Director at Torlesse Environmental Limited.

	Prior to that I was employed by Aquanet Consulting Limited as a Senior Freshwater Scientist (2018–2022), Greater Wellington Regional Council as a Senior Environmental Scientist (2017-2018) and the Canterbury Regional Council as an Ecology Scientist (2014-2017).
	
	Since 2018 I have been engaged by at least 18 different regional, district or city councils; the Department of Conservation; and various industry bodies, private companies, and corporations to provide a variety of technical and scientific services in relation to water quality and aquatic ecology. My work routinely involves:
	
	• Providing assessments of effects on water quality and/or aquatic ecology;
	• Assessing compliance with resource consent conditions or providing recommendations on how compliance can be achieved;
	• Designing or implementing water quality/aquatic ecology monitoring programmes at the scale of a specific activity and at a wider catchment or regional scale; and
	• Advising regional councils on regional plan development and National Policy Statement for Freshwater Management implementation.
	
	A conservative estimate is that I have acted as a technical advisor on behalf of both consenting authorities and Applicants on over 500 resource consent applications, compliance assessments and/or prosecution cases. These applications have been for a wide range of activities, including stream reclamation, water abstraction and discharges to land and water.
	
	Below is a non-exhaustive list of my prior hearing experience:
	
	• I have drafted and/or presented evidence at council hearings on the following regional plans:
	  ○ Plan Change 4 to the Canterbury Land and Water Plan – Employer: Environment Canterbury (inanga spawning provisions);
	  ○ The Natural Resources Plan (NRP) for the Wellington Region – Client: Greater Wellington Regional Council (water quality and beds of lakes and rivers provisions);
	  ○ Plan Change 9 to the Hawke's Bay Regional Resource Management Plan – Client: Beef + Lamb NZ (water quality provisions); and
	  ○ Proposed Change 1 to the NRP – Client: Greater Wellington Regional Council.
	• I have participated in Environment Court mediation on:
	  ○ The Southland Land and Water Plan – Client: Environment Southland (stream clearance provisions);
	  ○ The NRP (multiple topics related to water quality, ecology, discharges and land-use);

	○ Proposed Waikato Regional Plan Change 1 – Client: Beef + Lamb NZ; and ○ Queenstown Lakes District Council's Shotover WWTP discharge to the Shotover River Client: Otago Regional Council (consenting authority). • I have engaged in expert conferencing for the following regional plans: ○ The NRP (multiple topics during council hearings, mediation and appeals); ○ Proposed Plan Change 9 to the Hawke's Bay Regional Resource Management Plan (council hearings); and ○ Plan Change 10 to the Bay of Plenty Regional Natural Resources Client: Federated Farmers (Environment court appeals on water quality and land-use provisions). • I have drafted and presented evidence and engaged in expert conferencing during council hearings for the following resource consents applications: ○ Queenstown Lakes District Council's accidental wastewater overflow discharges – Client: Otago Regional Council (consenting authority); ○ Oceana Gold Macraes mine expansion – Client: Otago Regional Council (consenting authority); ○ Woodville Wastewater Treatment Plant discharges – Client: Tararua District Council (Applicant); ○ Waihola Wastewater Treatment Plant discharge – Client: Otago Regional Council (consenting authority); ○ Woodstock Quarries Landfill – Client Woodstock Quarries (Applicant); and ○ Lake Heron Station farming landuse consent – Client: Lake Heron Station (Applicant). • I have provided written evidence for the following Environment Court hearings: ○ Appeals on the Woodville Wastewater Treatment Plant discharges – Client: Tararua District Council (Applicant); ○ Appeals on the NRP – Client: Client: Greater Wellington Regional Council; and ○ Queenstown Lakes District Council's Shotover WWTP discharge to the Shotover River – Client: Otago Regional Council (consenting authority). • I am working on behalf of the Otago Regional Council on the following Fast-track approvals ○ Bendigo–Ophir Gold Project; ○ Macraes Phase Four (MP4); and ○ This application.

Documents referred to	• B.08 – *Doolans Creek Water Take Assessment of Effects* (as updated 4th of September 2026) (e3S 2026a); • B.09 – *Freshwater Ecological Impact Assessment* (as updated 4th of September 2026) (e3S 2026b); • B.10 – *Rastus Burn wastewater freshwater ecological impact assessment* (as updated 4th of September 2026) (e3S 2026c); • B.11 – *Wastewater discharge impact assessment* (as updated 4th of September 2026) (e3S 2026d); • B.11 – *Tracks, Crossings, Stormwater Freshwater Ecological and Hydrological Impact Assessment* (as updated 4th of September 2026) (e3S 2026e); • B.16 – *Stormwater Concept Report* (as updated 4th of September 2026) (Stantec 2026a); • B.17 – *Doolans Creek Right Branch Wastewater Report* (as updated 4th of September 2026) (Stantec 2026b); • B.18 – *Wastewater Treatment and Disposal Feasibility Report* (as updated 4th of September 2026) (Stantec 2026c); • F.02 – *Construction environmental management plan* (enviroscope 2026) • H.02 – *Draft Resource Consent Conditions – 19 May 2026* (the Proposed Conditions). • *Response to DOC re B.08 Doolans Creek Water Take 26 Aug 26*; • *Response to ORC and DOC re B.09 Freshwater Ecological Impact Assessment 27 Aug 26*; • *Response to ORC re B.10 Rastus Burn Wastewater Freshwater Ecological Impact Assessment 28 Aug 26*; • *Response to ORC re B.11 Wastewater Discharge Impact Assessment 27 Aug 26*; • *Response to ORC re B.14 Tracks Crossings Stormwater Freshwater Ecological and Hydrological Impact Assessment 27 Aug 26*; and • *Response to ORC re B-08 Doolans Creek Water Take 26 Aug 26*.
Preparation in Accordance with the Code of Conduct	I confirm that I have read the Environment Court Practice Note 2023 – Code of Conduct for Expert Witnesses (Code), and have complied with it in the preparation of this memorandum. I also agree to follow the Code when participating in any subsequent processes, such as expert conferencing, directed by the Panel. I confirm that the opinions I have expressed are within my area of expertise and are my own, except where I have stated that I am relying on the work or evidence of others, which I have specified.

Conflict of Interest Declaration	I have no actual, perceived, or potential conflicts of interests to declare in relation to this application, the Applicant, the project site, or any other parties involved in the application. Should any matter arise, that may constitute a conflict, I would advise this immediately.
Signature	
Date	20/10/2026

3 Specialist Assessment

3.1 Executive summary

NZSki Limited (the Applicant) is seeking Fast-track Approval for the Remarkables Ski Area Upgrade and Doolans Expansion. Otago Regional Council (ORC) has asked me to undertake a technical review of the water quality and aquatic ecology components of the Applicant's substantive application. The key conclusions of this review are:

- Most of the key issues raised during pre-engagement regarding the Rastus Burn wastewater discharge have been resolved or partly resolved. However, uncertainty remains over whether the proposed total nitrogen (TN) load limit of 750 kg/year reflects historical discharges, and the effects of discharging at this load have not been adequately assessed. My own conservative mass-balance analysis indicates that the relevant Australian and New Zealand Guidelines (ANZG) for Fresh and Marine Water Quality (2018) Default Guideline Value (DGV) for ammonia could be exceeded under all discharge scenarios and flow conditions assessed. While this analysis is not intended to accurately predict future water quality, it indicates that the risk of adverse effects may be greater than suggested by the Applicant's assessment.
- I consider the existing evidence supports the conclusion that the current wastewater discharge is not causing significant adverse effects. Any load limits should therefore be informed by historical operations and should neither unnecessarily constrain the existing discharge nor permit materially greater loads without supporting evidence. This could be achieved by:
    - Scientifically confirming through the Fast-track Approval process that the proposed limit of 750 kg TN/year reflects historical operations, or providing an alternative limit that does;
    - Requiring the limit to be amended if subsequent investigations identify a discrepancy; or
    - Adopting an instream ammoniacal nitrogen limit based on the ANZG (2018) 99% species protection DGV, assessed against an annual 95th percentile.
- All previously identified issues relating to the Doolans Creek water take have been resolved. In my opinion, the technical reports provided with the substantive application represent a technically complete assessment of the aquatic ecology effects

of the proposed take, which is unlikely to cause significant adverse effects on aquatic life.

- All issues relating to the proposed tracks, stream crossings and stormwater discharges have been resolved. I consider the effects of these activities, including stream loss associated with culverts and splash crossings, will not be significant and are adequately described in the technical reports provided with the substantive application.
- The proposed consent conditions should be amended to:
    - Include total suspended solids (TSS) and turbidity triggers for sediment pond discharges;
    - Control flocculant use to avoid aluminium toxicity;
    - Require stream crossing performance to be certified by an engineer rather than an ecologist;
    - Replace conditions that include numerical sediment deposition triggers with narrative limits;
    - Require stormwater effects monitoring every five years over the consent term;
    - Revise the five-year rolling statistics for TSS and five-day biochemical oxygen demand (BOD_5);
    - Increase the specificity around the proposed wastewater ecological monitoring, including:
        - Requiring that the Quantitative Macroinvertebrate Community Index (QMCI) be measured;
        - Specifying that Surber sampling be undertaken; and
        - Listing ecological compliance limits.
- The draft Construction and Environmental Management Plan is fit for purpose in terms of managing surface water effects.

In summary, the key outstanding issue from a surface water perspective is whether the proposed TN load limit of 750 kg/year reflects historical operations. The existing effects assessment is based on the discharge under those operations, which the available evidence indicates has not caused significant adverse effects. In my opinion, the Applicant needs to resolve this uncertainty before approval is granted, either by confirming that the proposed limit reflects historical discharges or by proposing consent conditions that ensure the effects of the future discharge remain within those assessed in the application.

3.2 Background

NZSki Limited (the Applicant) is seeking Fast-track Approval for the Remarkables Ski Area Upgrade and Doolans Expansion. The Otago Regional Council (ORC) has asked me to undertake a technical review of the water quality and aquatic ecology components of their substantive application.

The purpose of this report is to provide a technical review of the relevant documents in the substantive application. Specifically:

- The key effects and issues identified through my previous reviews of the application are identified;
- Comments are made on whether these effects and issues have been resolved in the substantive application;
- Where the Applicant has committed to addressing an unresolved issue throughout or after the Fast track approvals process, an indication is given of whether this is adequately reflected in the current proposal and/or proposed conditions;
- Where it is identified that an issue is not resolved, or will not be resolved through the Fast-track Approvals process, technical analysis of the scale of the issue is undertaken and potential methods for managing effects are recommended; and
- A review of the proposed conditions and the Construction and Environmental Management Plan is provided.

To inform this assessment I have reviewed the relevant parts of the substantive application – *Fast-Track Approvals Act 2024 —- NZSki Limited - Substantive Application for the Remarkables Ski Area Upgrade and Doolans Expansion* document and the following attachments:

- B.08 – *Doolans Creek Water Take Assessment of Effects* (as updated 4th of September 2026) (e3S 2026a);
- B.09 – *Freshwater Ecological Impact Assessment* (as updated 4th of September 2026) (e3S 2026b);
- B.10 – *Rastus Burn wastewater freshwater ecological impact assessment* (as updated 4th of September 2026) (e3S 2026c);
- B.11 – *Wastewater discharge impact assessment* (as updated 4th of September 2026) (e3S 2026d);
- B.11 – *Tracks, Crossings, Stormwater Freshwater Ecological and Hydrological Impact Assessment* (as updated 4th of September 2026) (e3S 2026e);
- B.16 – *Stormwater Concept Report* (as updated 4th of September 2026) (Stantec 2026a);
- B.17 – *Doolans Creek Right Branch Wastewater Report* (as updated 4th of September 2026) (Stantec 2026b);
- B.18 – *Wastewater Treatment and Disposal Feasibility Report* (as updated 4th of September 2026) (Stantec 2026c);
- F.02 – *Construction environmental management plan* (enviroscope 2026); and
- H.02 – *Draft Resource Consent Conditions – 19 May 2026* (the Proposed Conditions).

I have also read the following responses to requests for additional information from ORC:

- *Response to DOC re B.08 Doolans Creek Water Take 26 Aug 26*;
- *Response to ORC and DOC re B.09 Freshwater Ecological Impact Assessment 27 Aug 26*;
- *Response to ORC re B.10 Rastus Burn Wastewater Freshwater Ecological Impact Assessment 28 Aug 26*;
- *Response to ORC re B.11 Wastewater Discharge Impact Assessment 27 Aug 26*;

- *Response to ORC re B.14 Tracks Crossings Stormwater Freshwater Ecological and Hydrological Impact Assessment 27 Aug 26*; and
- *Response to ORC re B-08 Doolans Creek Water Take 26 Aug 26*.

3.3 Scope and limitations.

This document does not record every issue identified with NZSki Limited's application during pre-engagement, but focuses on the key issues, whether resolved or unresolved. Some issues raised in previous ORC requests for further information may not be explicitly addressed in this statement. These are considered minor and resolved via the further information provided by the Applicant and/or their amendments to the substantive application and/or supporting documentation.

3.4 Topic 1 – Rastus Burn Wastewater Discharge

3.4.1 Key issues identified through pre-engagement

During my pre-engagement review of draft versions of E3s 2026c and E3s 2026d, I identified the following key issues with the Rastus Burn wastewater discharge component of the proposal:

1. I considered that insufficient evidence had been provided to support the conclusion in Section 4.3 of e3S 2026c that "*the current discharge of wastewater to land has been considered to maintain a low cover of periphyton near baseline levels*". In particular:
    a. The relevance of Figure 6 e3S 2026c to periphyton growth in an alpine river receiving a year-round wastewater discharge was unclear;
    b. The periphyton monitoring data presented in the report did not provide a complete picture of the risk of adverse effects, as monitoring had been undertaken during winter and spring, when the risk of excessive periphyton growth is lowest;
    c. In the absence of summer/autumn periphyton data, I considered that the report should have included a desktop assessment of the risk of periphyton growth during these seasons.
2. I considered that insufficient evidence had been provided to support the conclusion in Section 4.4 of e3S 2026c that "*the current discharge of wastewater to land is considered to maintain a macroinvertebrate community indicative of 'excellent' health*". In particular:
    a. No summertime macroinvertebrate monitoring data were available to confirm that macroinvertebrate communities were not adversely affected during periods when the risks of ammonia toxicity and periphyton growth were highest due to elevated temperatures and light conditions; and
    b. The assessment needed to be updated to incorporate the requested periphyton risk assessment.
3. The Executive Summary of e3S 2026c noted that there was some "*seasonal timing* [of the discharge] *that avoids sensitive low-flow periods*". I considered that additional context was needed to clarify this statement, as e3S 2026d indicated that discharges

do occur year-round, including during winter low-flow periods and autumn, when ecological sensitivity is likely to be highest;

4. The discussion of five-day biochemical oxygen demand (BOD_5) in e3S 2026c focused solely on deoxygenation effects. However, elevated BOD_5 can also contribute to sewage fungus growth, which also needed to be considered;
5. e3S 2026d did not include several assessment approaches commonly applied in water quality assessments of wastewater discharges, including mass-balance analyses and statistical analyses of receiving environment water quality data. In particular:
    a. Wilcoxon signed-rank tests should have been used to compare upstream and downstream water quality conditions; and
    b. The dilution ratios presented in Figure 20, considered alongside the discharge quality data in Table 8, suggested that the downstream monitoring programme might not have captured the full range of potential discharge effects under all conditions. For example, the reported dilution ratios indicated that ammonia concentrations could theoretically exceed 10 mg/L under some winter low-flow scenarios. I considered that this required further consideration by the Applicant, ideally through the presentation of predicted downstream ammonia concentrations based on the dilution ratios in Figure 20 of e3S 2026d and the measured discharge ammonia concentrations in Table 8 (i.e., on-season: 153 mg/L with a dilution ratio of 172:1; off-season: 8.23 mg/L with a dilution ratio of 21:1).
6. e3S 2026d did not present measured data to support the conclusion in Table 15 and Section 4.5.3.2 that there was no potential for BOD_5 to enter Rastus Burn from the wastewater discharge. While I agreed that the potential for particulate organic matter to reach the stream was likely limited, I considered that the assessment should more directly address whether soluble carbonaceous BOD_5 could enter surface waters. This information could then be considered in the ecological assessment when evaluating the potential for heterotrophic growths, such as sewage fungus;
7. A substantial portion of the assessment in e3S 2026d focused on describing the historical discharge regime. However, for the purposes of this process, the key issue was understanding the range of effects that could reasonably occur under the proposed consent conditions. Accordingly, I considered that modelling the proposed nutrient loads under a range of discharge and flow scenarios would assist in more fully characterising the effects of the proposed activity, particularly where historical monitoring might not have captured the full range of conditions or effects associated with the discharge; and
8. Given the Water Conservation Order (WCO) status of the Kawarau River, I considered that e3S 2026d needed to consider the potential risks to contact recreation. In particular, standard microbial assessment category grades (for example, the use of 260 E. coli/100 mL as a threshold for *Campylobacter* infection) were not appropriate as the sole basis for assessing risks associated with a wastewater discharge where the microbial characteristics of the effluent reflected those of raw wastewater. Accordingly, I considered that the assessment should explicitly address whether the nature and scale of the potential risk warranted a quantitative microbial risk

assessment (QMRA), or alternatively provide a clear justification for not undertaking one.

3.4.2 Current status of identified issues

3.4.2.1 Fully resolved issues

To address the issues raised above the Applicant has:

- Undertaken further statistical analyses comparing water quality in the Rastus Burn upstream and downstream of the wastewater discharge, thereby resolving issue 5.a in Section 3.4.1 above; and
- Provided the requested instream carbonaceous BOD_5 data which demonstrates that there is a low risk of the wastewater discharge driving heterotrophic growths in the Rastus Burn, thereby resolving issues 4 and 6 in Section 3.4.1 above.

3.4.2.2 Partly resolved issues

The Applicant has:

- Provided a periphyton risk assessment (Appendix D to e3s2026c) to support the conclusion that the discharge of wastewater to land will maintain a low cover of periphyton near baseline levels, provided that effects on water quality are as described in e3S 2026d and the final consent conditions include a periphyton monitoring and response framework. While I consider that uncertainty remains regarding these assumptions (see Sections 3.4.2.3 and 3.4.2.4 below), I consider that no further updates to e3s 2026c are required in relation to this matter. Accordingly, Issue 1 in in Section 3.4.1 above is partly resolved, but still requires confirmation based on predicted water quality effects and the final consent conditions; and
- Provided further justification in their *Response to ORC re B.10 Rastus Burn Wastewater Freshwater Ecological Impact Assessment 28 Aug 26* to support the conclusion that "*the current discharge of wastewater to land is considered to maintain a macroinvertebrate community indicative of 'excellent' health*", including during summer. While I do not disagree with the reasoning provided in that response, I note that the conclusion requires confirmation based on predicted future water quality. Accordingly, Issue 2 in Section 3.4.1 above is partly resolved, pending confirmation of the predicted water quality effects.

3.4.2.3 Unresolved issues

- Rather than addressing my concerns regarding the summertime dilution ratios presented in previous versions of Figure 20 (now 22) (Issue 5.b), the author of e3S 2026d opted to remove the summer-time dilution ratios I had previously raised issues with. While Table 10 in the final version of e3S 2026d is meant to provide some context around potential impacts in summer in order to address Issue 5.b in Section 3.4.1 above, I note that incorrect pH values are used for summer, resulting in potential

ammonia impacts being underestimated (this is covered further in Section 3.4.2.4 below). As a result it is my opinion that Issue 5.b in Section 3.4.1 above remains unaddressed and the potential for the discharge to generate significant adverse effects has not been adequately considered. As a result Issue 3 in Section 3.4.1 above also remains unresolved.

- A mass-balance assessment has not been incorporated into e3S 2026d to assess the potential range of effects associated with the load limits requested in the proposed conditions and thereby addressing Issue 7. While the *Response to ORC re B.11 Wastewater Discharge Impact Assessment 27 Aug 26* notes that this work will be done, but hydrological investigations planned for this winter are needed first, it is my opinion that this is not the case as:
    - Acknowledging that there are insufficient data to undertake even basic wastewater assessments suggests that the Applicant has not undertaken the technical work required to lodge a complete application;
    - A deliberately conservative mass balance assessment can be undertaken now as a starting point by (mathematically) delivering the proposed consent condition TN loads to the stream under various scenarios, and applying an adjustment factor for the observed (or, better yet, predicted) ratio between TN and ammonia in the wastewater. Should this confirm the assumptions of the ecological effects assessment, there would be no need to undertake further detailed work; and
    - I do not consider that the unknown dilution and attenuation in groundwater cited in *Response to ORC re B.11 Wastewater Discharge Impact Assessment 27 Aug 26* prevents such an assessment from being done, as:
        - There is no reason to assume nitrification of ammonia in the first step of a conservative assessment; and
        - Even if groundwater dilution and attenuation are uncertain, these can conservatively be assumed to be zero in an initial mass-balance assessment. My understanding was that all of the load from the wastewater discharge enters the river. Any dilution or attenuation occurring in groundwater can therefore be treated as additional conservatism in the initial assessment, rather than a reason why the assessment cannot be undertaken.
- To date the Applicant has not provided commented on why a QMRA is not needed. Thus, Issue 8 in Section 3.4.1 above remains unresolved.

3.4.2.4 Additional assessment related to unresolved issues

To address the unresolved issues identified in Section 3.4.2.3, I have:

- Updated the summer estimate of the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2018) Default Guideline Value (DGV) for the protection of 99% of species from ammonia toxicity in Table 10 of E3s 2026b, using the correct maximum summertime pH reported in Table 2 of Appendix B to that report; and

- Undertaken a simple mass-balance exercise to estimate total nitrogen concentrations in the Rastus Burn at modelled 7-day mean annual low flow, median flow and mean flow (Booker, 2015 – the same flow model used in e3s 2026b), under three scenarios representing different ways in which the TN load sought under proposed consent condition WW.8 could be discharged. These scenarios are:
    - Scenario 1 = TN load is discharged each month following the same distributional pattern as observed in 2022, the year on which the load limits in condition WW.8 are based

$$Daily\ load = \frac{(Load\ in\ month_i\ in\ 2022 / Total\ load\ in\ 2022) \times 750\ kg}{Number\ of\ days\ in\ month_i}$$

    - Scenario 2 = The TN load is discharged evenly throughout the year. The purpose of this scenario is to provide a worst case estimate of summer-time concentrations.

$$Daily\ load = \frac{750\ kg}{365\ days}$$

    - Scenario 3 = The TN load is discharged evenly throughout just the ski season (June to October). The purpose of this scenario is to provide a worst-case estimate of winter-time concentrations.

$$Daily\ load\ during\ ski\ season = \frac{750\ kg}{153\ days}$$
$$Daily\ load\ outside\ of ski\ season = 0\ kg$$

    Under each scenario, daily in-stream TN concentrations downstream of the wastewater discharge were calculated for each month at each of the three flow rates by:

$$Concentration\ in\ g/m^3 = \frac{Daily\ load\ (kg) \times 1000}{Flow\ (m^3)/s \times 86400}$$

    Output concentrations were then assessed against the seasonal ANZG (2018) DGVs for the protection of 99% of species from ammonia toxicity effects in Table 10 of e3S 2026d (including the corrected summer-time value), on the basis that ammonia concentrations make up the vast majority of total nitrogen discharged in wastewater (see Table 8 of e3S 2026d)

The outputs of the water quality assessments described above should not be treated as accurate predictions of future water quality. Rather, in the absence of better information from the Applicant, they indicate the potential risk of adverse water quality effects and can inform a meaningful review of consent conditions relating to nitrogen load limits and their ongoing refinement.

The updated values in Table 10 of e3S 2026d indicate that the risk of summertime ammonia toxicity may be greater than recognised in the Applicant's substantive application. A key assumption underlying the effects assessment in e3S 2026c is that the wastewater discharge

presents minimal risk of ammonia toxicity, with instream concentrations expected to remain below the ANZG (2018) DGV for the protection of 99% of species (Table 1). This level of protection is appropriate for high ecological or conservation value systems such as the Rastus Burn. However, the updated values in Table 10 of e3S 2026d indicate that this outcome is less certain than suggested by the Applicant's assessment.

Table 1: Updated version of Table 10 in e3S 2026d, using the correct summertime pH values from Table 2 of Appendix B. Cells shaded red indicate exceedances of the cited ANZG default guideline value (DGV).

Maximum Value	Summer (mg/L)
Upstream	0.12
50m Downstream	0.1
200m Downstream	0.04
1.5km downstream	0.06
Maximum pH of Downstream 50m and 200m	8.4
Estimated Maximum Seasonal Water Temp[1]	14
Freshwater 99% species-protection guideline values for total ammonia (mg/L N) at different pH and temperature (ANZG, 2026)	**0.099**
[1]Estimated temperature based on field measurements from February, March, June, July 2026	

Furthermore, mass-balance analysis suggests that discharging 750 kg of TN per year to the Rastus Burn could result in greater effects than those described in e3S 2026c and e3S 2026d. Specifically, exceedances of the updated seasonal ANZG 99% species protection DGVs for ammonia in Table 10 of e3S 2026d are predicted under all scenarios and flow conditions (Table 2).

Table 2: Mass-balance estimates of in-stream ammoniacal nitrogen concentrations for each month under three scenarios, at 7-day mean annual low flow, median flow and mean flow. Red-shaded cells indicate exceedances of the updated seasonal ANZG 99% species protection DGVs for ammonia in Table 10 of e3S 2026d.

	@ 7-day mean annual low flow			@ Median flow			@ Mean flow		
Month	Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3
Jan	0.001	0.374	0.000	0.000	0.179	0.000	0.000	0.114	0.000
Feb	0.000	0.374	0.000	0.000	0.179	0.000	0.000	0.114	0.000
Mar	0.001	0.374	0.000	0.001	0.179	0.000	0.000	0.114	0.000
Apr	0.004	0.374	0.000	0.002	0.179	0.000	0.001	0.114	0.000
May	0.007	0.374	0.000	0.003	0.179	0.000	0.002	0.114	0.000
Jun	0.573	0.374	0.910	0.274	0.179	0.436	0.175	0.114	0.278
Jul	1.173	0.374	0.881	0.561	0.179	0.422	0.359	0.114	0.269
Aug	1.497	0.374	0.881	0.716	0.179	0.422	0.458	0.114	0.269
Sept	0.951	0.374	0.910	0.455	0.179	0.436	0.291	0.114	0.278
Oct	0.188	0.374	0.881	0.090	0.179	0.422	0.057	0.114	0.269
Nov	0.049	0.374	0.000	0.024	0.179	0.000	0.015	0.114	0.000
Dec	0.012	0.374	0.000	0.006	0.179	0.000	0.004	0.114	0.000

While the outputs presented in Table 1 and Table 2 are conservative, they highlight the importance of setting consent conditions that ensure that TN load limits accurately reflect current operations. In particular, there appears to be a small risk that current operations could, theoretically, result in short-lived ammonia toxicity effects in the Rastus Burn, although this has not been observed to date. Furthermore, the mass-balance assessment suggests this risk could increase substantially if the proposed limit of 750 kg TN/year is applied without a high level of confidence that it reflects current operations.

My reading of e3S 2026d, Stantec 2026c and the proposed consent conditions is that this uncertainty has not been resolved. Stantec 2026c acknowledges that actual TN loads in the base year (2022) may have been significantly higher or lower than the proposed limit. Accordingly, to ensure that the ecological effects of the proposed wastewater discharge do not exceed those assessed in e3S 2026c, I consider that one of the following options should be implemented:

- The Applicant could provide further information through the Fast-track Approvals process to either:
    - Confirm that the proposed limit of 750 kg TN/year appropriately reflects current operations; or
    - Justify an alternative TN load limit that reflects current operations.
- The Applicant could amend the consent conditions to provide absolute certainty that the load limits will be amended if future investigations establish that the proposed load limit exceeds historical discharge loads. To clarify, I do consider that e3S 2026c provides a sufficiently strong evidence base to support the conclusion that the current wastewater discharge is not resulting in significant adverse effects, despite the outputs presented in Table 1. Thus, if the proposed load limits are ultimately determined to be significantly lower than historical discharge loads, there would be justification to amend them upwards. This is discussed further in my comments on consent conditions in Section 3.7.3; or
- The Applicant could accept an instream ammoniacal nitrogen limit for the Rastus Burn, based on the ANZG 99% species protection DGV adjusted for pH and temperature and applied as an annual 95th percentile concentration.

3.4.3 Summary

While most key issues relating to the wastewater discharge component of NZSki Limited's Fast-track Approval application were resolved through pre-engagement, concerns remain regarding the potential for ammonia toxicity under low-flow conditions and the adequacy of the proposed TN load limit of 750 kg/year. In particular, I do not consider that the ecological effects of discharges at the proposed TN load limit have been adequately assessed.

Additional data analysis undertaken for this statement indicates that the risk of adverse ecological effects may be greater than suggested by the Applicant's assessment, particularly if the proposed TN load limit exceeds historical discharge loads. While this analysis does not provide accurate predictions of future water quality, it highlights the need to confirm that the

proposed load limit reflects historical operations, or to include consent conditions that either establish an instream ammoniacal nitrogen limit or require the proposed TN load limit to be amended if subsequent investigations determine they do not reflect current operations.

The analysis presented in this statement is conservative from a methodological perspective. However, it is the only quantitative assessment currently available to inform my recommendations on consent conditions, as the Applicant has not undertaken a comparable assessment.

3.5 Topic 2 – Doolan's Creek Water Take

3.5.1 Key issues identified through pre-engagement

In my reviews of the draft versions of e3S 2026a and e3S 2026b, undertaken before the Applicant lodged its substantive application, I identified the following issues associated with the water take from Doolan's Creek:

1. The effects of abstraction needed to be assessed at multiple downstream locations, rather than only 600 m and 2,500 m downstream. Specifically, the revised assessment needed to compare abstraction rates and residual flows with the 7-day mean annual low flow at various downstream locations, with reference to established guidance and particular consideration of reaches supporting fish populations. The assessment needed to identify the point downstream at which the abstraction represents a low proportion of mean annual low flow, describe the potential effects on fish populations upstream of that point and, where relevant, quantify the significance of those effects in the broader catchment context (e.g., the length of stream affected).
2. The potential for the backwash discharge to result in a conspicuous change in visual clarity needed to be assessed.

3.5.2 Current status of identified issues

3.5.2.1 Fully resolved issues

To address the issues raised in Section 3.5.1, the Applicant:

- Updated e3S 2026a to include an assessment of the hydrological effects of the proposed water take at different locations;
- Provided an expert assessment by Dr Richard Allibone of the effects of the predicted hydrological changes on ecological communities (Appendix S). Although this assessment did not include all the information previously requested, it provides a sufficiently strong evidence base to assess the effects of the proposed water take; and
- Provided further information on the potential for changes in visual clarity associated with the backwash discharge in *Response to ORC and DOC RFI B.09: Freshwater Ecological Impact Assessment*, dated 27 August 2026. This information indicates that backwashing will occur at the start of each season and during flood events. Accordingly, any sediment pulses associated with the discharge are unlikely to cause

greater disturbance than that associated with the stream's natural hydrological variability. The Applicant also confirms that each backwash event will last only one to three minutes.

Consequently, both Issues 1 and 2 described in Section 3.5.1 above have been resolved in the substantive application.

3.5.2.2 Summary

In my opinion, e3S 2026a and e3S 2026b, in their current form, address all the issues I raised during pre-engagement and provide a technically complete assessment of the aquatic ecology effects of the proposed water take from Doolan's Creek. Based on the information presented in these reports, I do not consider that the proposed activity will result in significant adverse effects on aquatic life.

3.6 Topic 3 – Tracks, Stream Crossings and Stormwater

3.6.1 Key issues identified through pre-engagement

In my reviews of the draft version of e3S 2026e, undertaken before the Applicant lodged its substantive application, I identified the following issues associated with the tracking, stream crossings and stormwater components of the proposal:

1. e3S 2026e assessed the discharge of cement or cement-related contaminants to surface water as an effect of the activity, although this did not appear to form part of the proposal. This introduced uncertainty regarding the scope of the proposed activity and the effects being assessed;
2. Section 5 of e3S 2026e described the effects of the proposed works in terms of the stream bed area affected, both in absolute terms and as a percentage of the total stream bed area within the catchment. In my view, this approach was inappropriate because the calculations were subject to considerable uncertainty and provided little additional insight beyond the length of stream affected; and
3. Doolans Creek meets the ANZG (2018) definition of a high conservation or ecological value system, as reflected in the values assessment presented in Section 4.3 of e3S 2026e. Consequently, it was inappropriate to assess the predicted zinc concentrations in Table 15 against the ANZG (2018) 95% species protection DGVs when assessing the effects of stormwater discharges from the new base in the Doolan's Creek catchment. I also identified that the mass-balance assessment indicated the potential for significant adverse effects from stormwater discharges when the appropriate ANZG (2018) DGVs were applied. Given the relatively small area of proposed impervious surfaces and the predominantly sheet-flow discharge of stormwater, this outcome appeared counterintuitive. I therefore recommended that the authors revisit their stormwater assessment methodology.

3.6.2 Current status of identified issues

3.6.2.1 Fully resolved issues

To address the issues raised in Section 3.5.1, the Applicant has:

- Confirmed in Response to ORC RFI B.14: Tracks, Crossings, Stormwater, Freshwater Ecological and Hydrological Impact Assessment, dated 27 August 2026, that the initial design specifications have been updated to ensure there will be no discharge of concrete to flowing water. e3S 2026e has been updated accordingly. Accordingly, Issue 1 in Section 3.6.1 is now resolved;
- Updated e3S 2026e to describe the effects of the proposed works in terms of river length disturbed, rather than bed area affected. This addresses Issue 2 in Section 3.6.1;
- Revised the dissolved metal assessment in e3S 2026e. Although the results indicate that the relevant ANZG (2018) DGV could be exceeded, the author considers the acute thresholds cited by Gadd *et al*. (2024) to be the more relevant statistic. I do not agree with this approach for several reasons, including that the cited guidelines are currently available only in a client report that has not undergone the peer-review processes associated with ANZG guidelines or scientific publication. However, I note that the ANZG (2018) DGVs have since been reviewed and that the Applicant cannot assess the proposal against the revised DGVs using the data currently available. Furthermore, a simple first-principles assessment of the proposal, recognising that the impervious area is small relative to the catchment area and that stormwater is predominantly discharged to land before reaching surface water, indicates that further analysis is not necessary. Accordingly, I consider Issue 3 in Section 3.6.1 to be resolved.

3.6.2.2 Summary

In my opinion, e3S 2026e, in its current form, addresses all the issues I raised during pre-engagement and provides a technically complete assessment of the aquatic ecology effects of the proposed tracking, stream crossings and stormwater discharges. Based on the information presented in the report, I do not consider these activities likely to result in significant adverse effects on aquatic life. This conclusion includes the effects of stream loss associated with culverts and splash crossings.

3.7 Comments on proposed conditions

3.7.1 Erosion and sediment control

In my opinion, total suspended solids (TSS)/turbidity triggers for discharges from sediment ponds to surface water should be included as consent conditions to ensure that such discharges are appropriately managed. At present, these triggers are included in Table 7 of the draft Construction and Environmental Management Plan.

3.7.1.1 ESC.9 and ESC.10

In my opinion, further controls are needed to ensure that flocculant use is appropriately managed and the risk of aluminium toxicity is avoided. This could be achieved through a discharge standard, a receiving environment standard or, more efficiently, a requirement for the Chemical Treatment Plan to demonstrate that aluminium concentrations in discharges to surface water will not reach levels that could cause toxicity.

3.7.2 Hydrology and instream structures

3.7.2.1 WAT.14

It is unclear whether the proposed water meter will measure cumulative water take and report the cumulative volume at 15-minute intervals, or measure the instantaneous rate of take at 15-minute intervals and use these measurements to estimate the volume taken. The former approach is preferable because it directly measures the cumulative volume taken.

3.7.2.2 WAT.28

In my opinion, it is not appropriate to allow an ecologist to assess whether stream crossing structures have been implemented as designed and are functioning properly. This assessment should be undertaken by an engineer, as it falls outside the typical expertise of an ecologist.

3.7.2.3 WAT.33

While I understand the intent of the proposed sediment monitoring in this condition, I consider that it serves little practical purpose. Sediment deposition is dynamic, and its assessment is inherently subjective. It would be difficult to attribute a 10% increase in sediment deposition to the activity with any confidence. Furthermore, remediation would itself have adverse effects and, as I understand it, would require resource consent where stream clearance is not permitted by the regional plan.

I suggest that a narrative limit prohibiting sediment deposition from the activity would be more effective. Compliance officers could then inspect for evidence of deposition, which is generally readily apparent when it occurs.

3.7.2.4 WAT.34

In my opinion, the proposed stormwater monitoring targets the lowest-risk period of the activity, when soil contamination around the pylons and metal yields from metal cladding are likely to be lowest. Given that the Applicant considers stormwater monitoring necessary, I suggest that sediment and wet-weather monitoring be undertaken every five years for the term of the consent. If either monitoring programme identifies a potential issue, this could trigger additional monitoring and, if necessary, remediation.

I also consider the proposed macroinvertebrate monitoring to be of limited value in this context, particularly given that no methodology is specified and there is no control over how it would be undertaken. The need for remediation should instead be determined solely on the basis of water quality results.

3.7.3 Servicing and infrastructure

3.7.3.1 WW.8

This condition will need to be revisited once the additional work being undertaken by e3S has been completed. However, I consider that the proposed five-year rolling statistics for TSS and BOD_5 are inappropriate, as they could mean that compliance is not assessed until up to seven years after a relevant exceedance occurs.

3.7.3.2 WW.10

In my opinion, Clause (4) appears to constrain ORC's ability to undertake enforcement, as it would first require ORC to determine whether the exceedance or non-compliance was beyond the consent holder's control. This also applies to WW.12.

3.7.3.3 WW.18

In my opinion:

- Monitoring should include not only the Macroinvertebrate Community Index (MCI), but also the Quantitative Macroinvertebrate Community Index (QMCI);
- This condition should specify the exact monitoring protocols to be followed. In particular, Surber sampling will be necessary for macroinvertebrate monitoring; and
- An additional condition is required to specify the ecological effects that the activity must not cause, as a compliance limit. For example, this could include a reduction in QMCI of greater than 20% or periphyton biomass exceeding 50 mg chl-*a*/m² at the downstream site.

3.8 Comments on Construction and Environmental Management Plan

In my opinion, the draft Construction and Environmental Management Plan is fit for purpose in terms of managing surface water effects. The absence of fish from the project footprint simplifies the management of construction activities within surface water bodies, as the primary effect requiring management is sediment release. This appears to be adequately addressed in the document, noting that I am not an erosion and sediment control expert.

3.9 References

Australian and New Zealand Governments and Australian state and territory governments (ANZG), 2018. Australian and New Zealand guidelines for fresh and marine water quality. Governments and Australian state and territory governments, Canberra, Australia.

Booker, D.J., 2015. Hydrological indices for national environmental reporting (Client Report No. CHC2015- 015). NIWA, Christchurch, New Zealand.

Gadd, J., Hickey, C.W., Snelder, T.H., 2024. Acute copper and zinc water quality guideline values for Aotearoa: Technical report of the derivation including bioavailability model evaluation (Technical Report). Hydrotoxy Research, Auckland, New Zealand.