Addendum to Statement of Advice

Under:	Fast-track Approvals Act 2024
In the matter of:	FTAA-2605-1236 – Remarkables Ski Area Upgrade and Doolans Expansion
Addendum to Statement of advice dated 7th October 2026	Susan Walker
Date:	27 October 2026

Introduction

1. My full name is Susan Walker.

2. This is an Addendum to my statement of advice to the Director-General of Conservation on the Remarkables Ski Area Upgrade and Doolans Expansion Project dated 7 October 2026 (statement of advice).

3. This Addendum is provided along with my statement of advice to inform the expert statement of advice of Jane Macleod on planning matters; being matters relevant to the Resource Management Act 1991 and standards, policy statements or plans created under that Act.

Code of conduct

4. Whilst it is acknowledged this is not an Environment Court Proceeding, I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2023. I have complied with the Code of Conduct in the preparation of this advice. Unless I state otherwise, this advice is within my area of expertise, and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

Water take for snowmaking

5. The applicant proposes to take water from Doolans Creek and pump it uphill to a reservoir at Tarn 3.

6. This water take and reservoir arrangement would involve the complete destruction of Tarn 3 (a distinctive ephemeral wetland and naturally uncommon ecosystem or NUE) for the creation of the reservoir, and permanent loss of the part of the scientifically important lateglacial moraine system in which Tarn 3 sits[1].

7. Related works would include a long water take access track and services route from the Doolans Creek intake to the Doolans Base building[2]. Those works would involve

    a. permanent vegetation clearance and soil disturbance along the length of the access track and accompanying service trenches and pipelines, and

    b. creation of engineered stream crossings and associated sedimentation and drainage disruption below the two large tarns in the south of the Doolans Basin.

8. As indicated on Figure 1 below, the water take access track and services route may cross landforms that are moraines (and therefore a naturally uncommon

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[1] Statement of advice of Mr Barrell (geomorphology)

[2] The Project Description states (Section 3.5.6.2 Water Take) that to 'access the water take location, a 4WD drive access road will be constructed from the Doolans Base Building to the take location. A rising water main, power and telecommunications will be trenched underneath the access road.'

ecosystem or NUE) in the highest-elevation segment that crosses below the two large tarns in the south of the Doolans Basin.

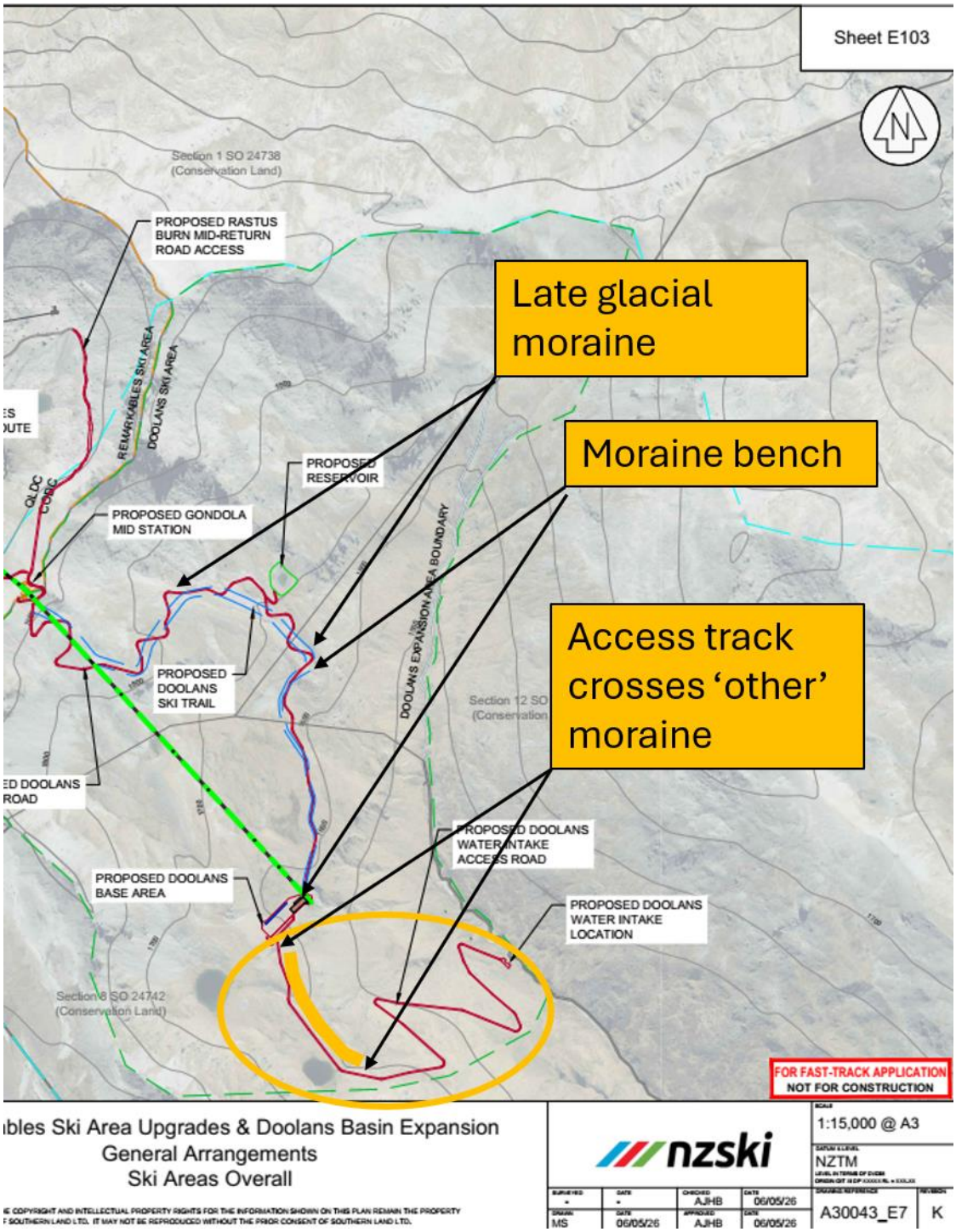


Figure 1. Location of the water take access track and services route (circled in orange), showing the segment of the track and services route that may cross landforms that are moraines, and therefore a naturally uncommon ecosystem or NUE (indicated by an orange bar between the lowest pair of black arrows) . Segments of other infrastructure intersecting the late glacial moraine and moraine bench features referred to in my statement of advice are also shown by arrow pairs. The base map is Sheet E103 in C-00 Remarkables Ski Area Upgrade and Doolans Expansion - General Arrangement.

9. As noted in my statement of advice, NUEs (including moraines) were not mapped comprehensively in the TEIA, and this still needs to be done so that the locations and extents of effects on NUEs can be assessed across the Project site[3].

10. As described in my statement of advice, snowmaking from any water source has adverse effects on vegetation and ecosystems[4], through

    a. accelerated soil compaction, soil anoxia due to surface ice, and soil saturation and prolonged waterlogging;

    b. greater, later snow melt which, in combination with compacted and saturated soils, creating more rapid, higher-velocity surface runoff, scouring and erosion, and

    c. delayed snowmelt which compresses the growing season.

11. If artificial snow is not discharged, moved by grooming or blown off the engineered Doolans Ski Trail, the soil and snow compaction effects would be largely confined to that trail, but scouring and erosion effects would extend beyond the trail[5].

12. Additional adverse effects are caused when higher-conductivity water from lower elevations is used for snowmaking[6]. Doolans Creek water has a different chemical composition from natural snow. Use of Doolans Creek water for snowmaking would lead to widespread nutrient enrichment and pH alteration, because enriched meltwater from the artificial snow would flow throughout

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[3] Identification of moraines and other NUEs requires consideration of geomorphology and physical character, and separate mapping, neither of which was provided in the TEIA. In my statement I relied on Mr Barrell's statement (geomorphology) to identify the late glacial moraine, and QMAP to identify the moraine bench. I also noted in my statement of advice (paragraph 57b and caption to Figure 3, respectively) that '[t]he water take access track is likely to cross further (unidentified) moraine landforms which are also NUEs' and that '[o]ther areas of moraine are likely to be present across the Project site but are not mapped in [Figure 3]'.

[4] Susan Walker statement of advice, paragraph 78.

[5] Susan Walker statement of advice, paragraphs 83 and 108d.

[6] See Meijer zu Schlochtern et al. (2014) (Attachment 1 to my statement of advice) and Susan Walker statement of advice paragraph 78d.

the full drainage network below the main trail[7]. The outcome would be cumulative and irreversible ecosystem degradation, both of terrestrial ecosystems and of natural wetlands and their peat forming processes (as described by Dr Kavazos in his statement of advice)[8].

13. If Lake Alta were to be used as an alternative source of snowmaking water, this would avoid a number of high-magnitude adverse ecological effects. Specifically. the revised Project would:

    a. retain the distinctive ephemeral wetland NUE that is Tarn 3 (assuming a reservoir is not needed);

    b. retain the part of the scientifically important late glacial moraine system in which Tarn 3 sits (assuming a reservoir is not needed);

    c. avoid the loss of any 'other' moraine NUEs south of the moraine bench that would otherwise be crossed by the proposed water take access track and services route;

    d. avoid all of the proposed permanent vegetation clearance and soil disturbance (and consequent ecosystem fragmentation and edge effects) along the length of the water take access track and services route;

    e. avoid engineered stream crossings and associated sedimentation and drainage disruption below the two large tarns; and

    f. to the extent that the water chemistry from Lake Alta is more similar to natural snow, avoid widespread terrestrial and wetland ecosystem degradation through nutrient enrichment and pH alteration across the meltwater drainage network below the main trail[9].

14. There may be additional infrastructure required to transfer water from Lake Alta to Doolans Basin. I expect that the water pipeline would follow the tracks

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[7] Susan Walker statement of advice paragraph 108c.

[8] Statement of advice of Dr Kavazos (freshwater), PART 3: Assessment of effects under *Ongoing operational effects on freshwater environment*

[9] Water chemistry data are not provided for Lake Alta in the Application, to my knowledge.

and trails already proposed, but trails might need to be wider or larger. Until the assessments of infrastructure needs are made, I cannot comment on whether there would be new effects (nor the magnitude of any new effects).

Effects on naturally uncommon ecosystems within the QLDC boundaries

15. In my statement of advice I wrote[10] that '*[i]n the Rastus Burn catchment there would also be loss and modification of NUEs (screes of acidic rock) for the temporary construction access above the current Sugarbowl ski area north of Helicopter Ridge, and for the permanent access and service route between Helicopter Ridge and Curvey Basin*.'

16. The affected 'screes of acidic rock' NUEs referred to in that paragraph of my statement are within Queenstown Lakes District Council (QLDC) boundaries. I have circled the two affected areas within QLDC boundaries on the Applicant's map sheet E402 (identified as 'Sugarbowl scree' and 'Curvey scree' sections respectively on Figure 2)[11].

17. Through the reforming and stabilisation of the screes, the proposed tracks, trails and retaining walls would remove the functioning of the naturally dynamic scree slope ecosystem.

18. Track and trail construction across the steep unstable terrain of the Sugarbowl scree would likely also lead to adverse effects on the tarn ('Swan Lake') and the seepage and cushion bog wetlands below the new track, through the accelerated release of sediment during and after construction[12]. The tarn, the seepages, and the cushion bog are also naturally uncommon ecosystems (NUEs).

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[10] Susan Walker statement of advice paragraph 73.

[11] I note that the construction access above the current Sugarbowl ski area north of Helicopter Ridge may be permanent and not temporary (as indicated in my statement).

[12] As noted in my statement of evidence (paragraphs 108a and 140 and footnotes therein), the proposed sedimentation control measures fall short of best alpine practice and allow discharges at levels that will lead to permanent degradation of terrestrial and wetland ecosystems. For example, the proposed construction management plan will enable discharge of sediment laden runoff with turbidity up to 150 NTU (Nephelometric Turbidity Units) which is a 400 to 750-fold increase in turbidity over the current NTU of 0 to 0.35 NTU.

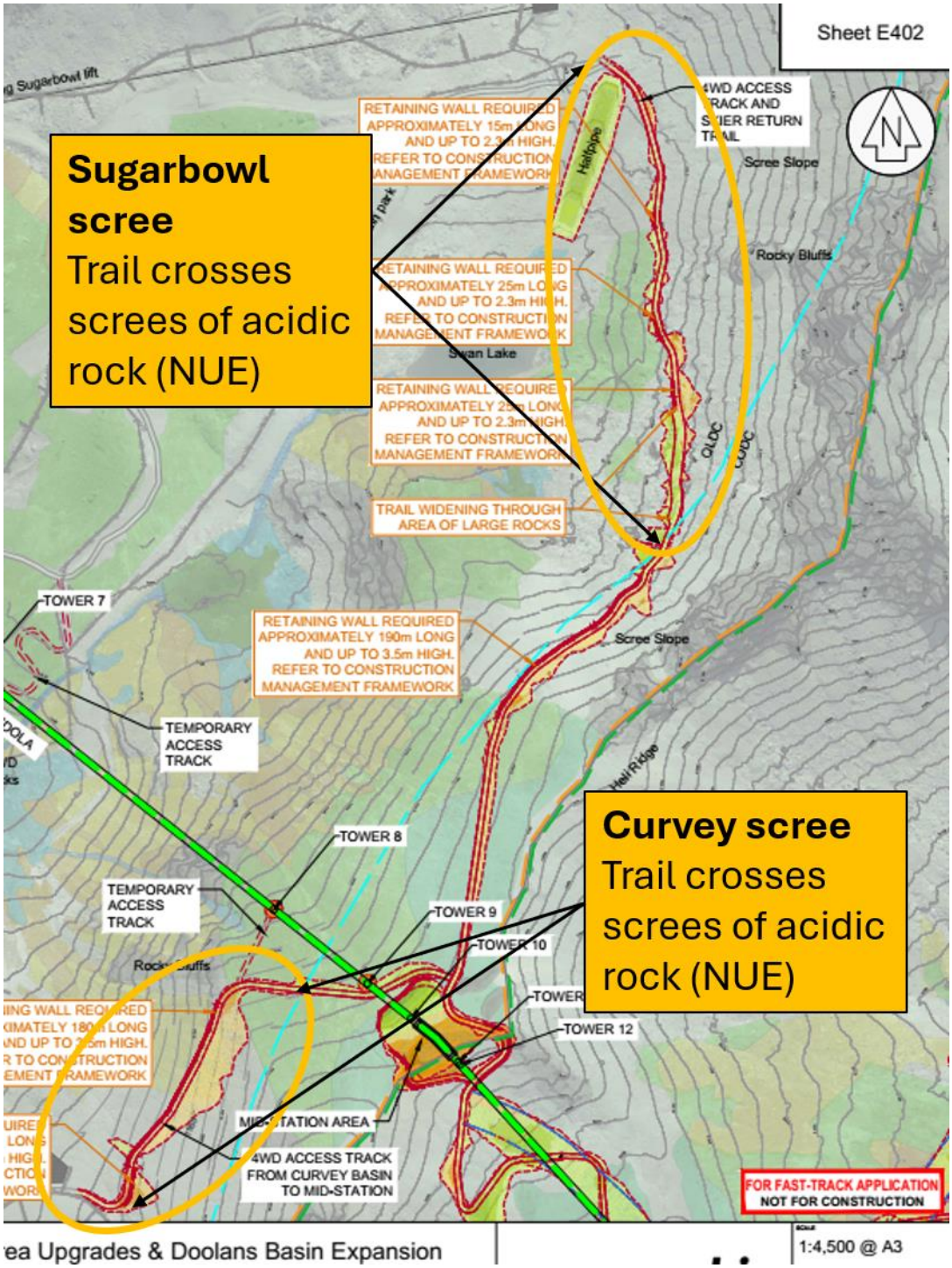


Figure 2. Two locations (marked by orange circles) where engineered trails would clear the 'screes of acidic rock' naturally uncommon ecosystem (or NUE) in the Rastus Burn, within the QLDC boundary. Black arrow pairs indicate the segments of trail that intersect the screes, and orange boxes identify the two screes referred to in this statement as the 'Sugarbowl scree; and the 'Curvey scree'. The base map is Sheet E402 in C-06 Remarkables Ski Area Upgrade and Doolans Expansion - Rastus Burn Access Roads & Utilities.

19. I traversed and viewed these ecosystems in my site visits on 30 April and 1 May 2026. All areas support indigenous vegetation and are habitats of indigenous fauna (especially invertebrates). The vegetation is very sparse in places where screes are most active and/or boulders are large. However sparse vegetation is a characteristic feature of scree ecosystems; and the amount of vegetation cover provides no indication of the ecological significance or value of a scree ecosystem.

20. The TEIA also recognises that the NUEs in the Rastus Burn areas are vegetated. The screes of acidic rock traversed by the proposed roads are mapped partly as the rockfield vegetation community and partly as cushionfield, high elevation cushionfield, and tussock grassland vegetation communities. The TEIA maps the wetlands below the proposed road across the Sugarbowl scree as tarn, seepage and cushion bog vegetation communities.

21. In my opinion, the proposed activities in the Rastus Burn west of the district boundary would therefore result in the removal or loss of ecological integrity and resilience of naturally uncommon ecosystems (screes of acidic rock, tarn, seepage wetland, and cushion bog) which contain indigenous vegetation and habitat for indigenous fauna.

Naturally uncommon ecosystems across the Project Site

22. Naturally uncommon ecosystems (NUEs) that would be removed or damaged by the Project are also present in the Doolans Basin[13], and these NUEs also support indigenous vegetation and are habitat for indigenous fauna[14]. Therefore the proposed activities would result in the removal or loss of ecological integrity and resilience of naturally uncommon ecosystems which contain indigenous vegetation and habitat for indigenous fauna across the Project site, and not only in the Rastus Burn.

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[13] At paragraph 68 of my statement of advice, I note that "Effect magnitudes are likely to be very high, especially in the Doolans Basin area, where it appears that most of the direct disturbance footprint would result in the loss of NUEs".

[14] Susan Walker statement of advice paragraphs 55 to 59, and paragraphs 67 to 72, and Statement of advice of Dr Kavazos, **PART 3: Assessment of effects**.

23. In my statement of advice I noted that NUEs define where biodiversity offsetting and compensation is not appropriate in the sense of the NPSIB and ORPS Principles for biodiversity compensation[15]. However I did not provide an opinion about whether NUEs in the Rastus Burn - and elsewhere in the Project Site (including in the Doolans) - are irreplaceable (in the sense of Principle 2 in the NPSIB Principles for Biodiversity Compensation)[16].

24. In my opinion NUEs are irreplaceable in that sense because they:

    a. are naturally uncommon by definition (i.e. of limited extent nationally and therefore are naturally scarce ecological resources, with few equivalents or replacements) and

    b. cannot be replaced on the ground if destroyed because they have specific, unusual, and often extreme physical characteristics and biota that cannot be re-created or restored within resource management timeframes[17].

Vegetation and soil monitoring for edge effects

25. In my statement of advice, I noted a number of likely edge effects and hillslope-wide impacts of the proposed infrastructure[18] but I did not cover monitoring and remedial management for these effects should the project go ahead.

26. To effectively detect, quantify, and mitigate the edge effects and hillslope-wide impacts outlined in my statement, I would recommend establishment of a

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[15] Susan Walker statement of advice paragraph 56.

[16] i.e. NPSIB Appendix 4 '*(2) When biodiversity compensation is not appropriate: Biodiversity compensation is not appropriate where indigenous biodiversity values are not able to be compensated for. Examples of biodiversity compensation not being appropriate include where: (a) the indigenous biodiversity affected is irreplaceable or vulnerable; …*

[17] Irreplaceability is not defined in the NPSIB. However, I consider an appropriate definition to be that of Maron et al. (2026) who state that they '*define ecological assets, including ecosystems, habitat types, and habitat features, as ecologically irreplaceable when they are impossible or extremely difficult to restore or recreate within an ecologically relevant timeframe. Retaining these assets is therefore essential to avoid uncompensated, cumulative biodiversity loss*'.

[18] Susan Walker statement of advice paragraphs 108 and 109.

BACI (Before-After-Control-Impact) monitoring framework for soil and vegetation parameters. Because edge effects can extend tens to hundreds of metres, monitoring transects should extend at least 200 metres perpendicular to the trail edge into undisturbed alpine vegetation, paired with matching control sites.

27. Appropriate numbers of transects and within-transect sampling points for each measured variable should be determined by power analysis (which is likely to involve prior sampling before monitoring design)[19]; and geometric distance series[20] employed to place more sampling points close to where changes are likely to be more severe, while extending far enough to capture longer-range impacts.

28. Full specification of monitoring design and variable selection would require detailed input from subject experts and is beyond the scope of this addendum. However, potential variables to measure and monitor effects on soils and vegetation along transects include:

    a. sediment traps (to detect extension of sedimentation and drainage pathways away from the main trail, and new patterns of erosion/accumulation creating altered landforms), along with annual high-resolution LiDAR or UAV photogrammetry (to detect, measure and map micro-topography, rill formation, and accumulation zones),

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[19] A power analysis is a statistical calculation used before data collection to determine the minimum sample size (number of transects and sampling points) needed to reliably detect an environmental impact if one actually exists. It ensures there is not under-sampling (which would be inadequate to catch subtle changes in pH or early weed invasions) and that time and budget is not wasted by over-sampling variables that are highly uniform or easy to detect.

Robust power analysis typically requires the input of field measurement data to determine expected effect sizes (the magnitudes of the expected edge effect change), and natural background variance. Including the Rastus Burn catchment in prior field measurement would be appropriate to indicate likely effect sizes. A desired statistical power (e.g. 80% or 0.80) and significance level (α = 0.05) must also be selected and specified in advance.

[20] For example, if 10 measurement points per transect was appropriate, a geometric distance series might be 1.0, 1.8, 3.2, 5.8, 10.5, 19.0, 34.2, 61.6, 111.0, and 200.0 m from the trail edge.

b. soil penetrometer measurements to detect compaction and compaction depth,

c. seasonal (e.g. post-melt and autumn) soil core assays of total Nitrogen (N), available Phosphorus (P), exchangeable cations (CEC) and pH (to detect nutrient enrichment and pH shifts); and total petroleum hydrocarbons (TPH) and heavy metals (e.g. lead, zinc, copper) (to detect pollutants),

d. bulk density, soil organic carbon (SOC) stocks, hot water extractable carbon (HWEC) and soil basal respiration (SBR)[21] (to detect changes in soil carbon storage and microflora),

e. automated temperature logging at the soil surface (e.g. with anchored iButtons) to detect and map annual snow-free dates,

f. weekly spring observations of vegetation phenology by botanical experts (to detect timing of emergence, budburst and flowering of indicator species),

g. botanical assessment of cover percentages of all indigenous plant species (to detect shifts in plant community composition), total cover of bare soil and vegetation (to detect erosion), and non-native species presence and abundance (to detect weed ingress),

h. measurement of late-summer dust deposition (using gauges) and of dust load and necrosis on plant leaf surfaces (to detect dust distribution, accumulation and effects).

29. Variables in subclauses clauses b. to f. above may also be useful to detect and monitor effects of snow grooming on soils and vegetation[22]. However, a different sampling layout would be needed to detect effects both on grooming trails and downslope of those trails [23].

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[21] The timing of these assays could potentially vary. For example, it may be appropriate to implement more expensive assays at baseline and three-yearly, with less expensive tests undertaken annually.

[22] Susan Walker statement of advice paragraphs 85 to 89.

[23] For example, a mixture of stratified-random sampling and transects may be appropriate.

30. Defined thresholds (or differences from control transects), and defined management responses will be needed for each variable where a threshold is exceeded.

Susan Walker

27 October 2026