



GeoSolve Ref: J190531
2 September 2019

Fiordland Trails Trust

Attention: David Boniface [dajeck@xtra.co.nz]

Hydrology Review Fiordland Trails Trust Lake 2 Lake Leg 6

Resource Consent Application Reference: APP-20191150

Dear David,

In accordance with our Agreement dated 22 August 2019 we have undertaken a desktop review of existing information relating to the application for a retrospective consent for wetland modification on a section of Leg 6 of the Lake 2 Lake Trail near Manapouri. This report reviews the hydrological aspects of the trail and recommends remediation work.

Material Reviewed

The Opus resource consent application and the Environmental Report by Beale Consultants November 2018 have been reviewed. The effects of the trail on the upper part of the wetland have been identified in Wildland Consultants report dated 26 February 2019 Effects Assessment that states:

- The trail cuts across the flow of water in the upper part of the wetland, and diverts previously inflowing water into an adjacent stream. This is likely to cause local drying of the wetland adjacent to the water table, and reduce water flow to the larger downstream part of the wetland. These effects are likely to cause local changes in wetland vegetation over time, allowing facultative wetland species such as mānuka to increase in abundance at the expense of obligate wetland species such as purei.

In addition the Environment Southland request for further information dated 7 March 2019 and the Opus reply dated 27 March 2019 has been reviewed.

Aerial Imagery and Photos

The site has not been visited. Aerial photos with 0.75m and 0.4m definition for the area taken in 2008 and 2017 respectively have been used for site familiarisation. GoogleEarth images from 2007, 2013, 2014 and 2019 have also been viewed. Drone images supplied by David Boniface and ground photos from Simon Beale and David Boniface have been viewed.

Culvert installation

Two 800mm diameter plastic pipe culverts have been installed and details of depth of invert provided (David Boniface L2L Trail Leg 6, Culvert Analysis, Supply Bay Road to Twidle Property, August 2018). The channels upstream and downstream of the culverts do not appear to have been altered so groundwater levels should be similar to before construction.

Track Construction and Watertable

The track construction included stripping of vegetation and most topsoil. The placement of fill for the trail would have reduced natural flows at that level. Flows in the gravels underneath the stripped zone would still pass through the site.

Photos of the watertable that drains towards the southern culvert on the upstream side of the track indicate that this is up to 400mm deep, although generally more like 300mm. This watertable picks up a small channel that would have continued on to ground between the two culverts downstream of the track.

Area potentially affected by reduced groundwater levels

The areas potentially affected by the track construction on upstream and downstream sides of the track are shown on the attached Figure 1.

Proposed Solution

The proposed remediation by way of filling in the upstream watertable is supported as a part solution. A small diameter pipe, nominal size 300mm to 400mm diameter, to pass the higher elevation water between the 800mm culverts would return water to the area of higher ground below the track, and ensure this area does not dry out. This should be placed approximately halfway between the two larger culverts., with the actual location to be confirmed on site. It is considered that a culvert with the ability to pass 20 l/s should be sufficient. This could be provided by a 200mm diameter culvert. Smaller culverts can have a tendency to get root bound and cleaning out is easier with a culvert in the 300 to 400mm diameter size and should be used. See Figure 1 attached for details.

Discussion and Conclusion

It is concluded that the construction of the trail between the northern and southern culverts has reduced the interflow from upstream to downstream of the trail through the higher ground between the two 800mm culverts. A small area adjacent to the watertable that feeds to the southern culvert would also have been affected.

It is recommended that remediation be undertaken:

- (a) through filling in of the watertable as previously proposed by Opus in letter 27 March 2019, and
- (b) placing a 300-400mm diameter culvert through the high ground approximately halfway between the two larger culverts. The actual location should be confirmed on site.

Yours faithfully,



David Hamilton
Senior Water Resources Engineer



Fiordland Trails Trust Leg 6 Lake 2 Lake Section
 Proposed Mitigation/ Remediation Works
 Base image is drone image supplied by David Boniface
 David Hamilton, Geosolve Ltd. 2 September 2019

Figure 1: Drone image of section of trail showing proposed remediation work