

Waikaka Gold Review Questions, May 2025.

Freshwater Ecology Audit Questions.

1. Diversions and longfin Eel migrations.

The migration pathways of any species (including eels) wishing to pass through the Waikaka system will be maintained at all times as there will always be flow through one or other of the channels. The diversion process will be a gradual turning of the flow from an existing channel to the diversion channel. This will allow many fish to leave a channel being diverted while the remainder will be salvaged. The diversion channel will have a small flow for several days prior to the diversion being completed and the full flow diverted. Fish passage will therefore always be available.

Longfin eels are very abundant in the Waikaka Stream. The predation pressure they exert on the trout population means there is a major size class gap in the trout population where middle size trout (approximately 250-400mm) are in very low numbers and only a small proportion make it to a large enough size (>400mm) to be resistant to eel predation. It is acknowledged that there will be ecological effects of the diversions but the effort put into creating habitat in the rehabilitated channel will create stable and permanent high-quality habitat.

2. Sinuosity in Shepherds Creek.

Shepherds Creek will be rehabilitated with the existing sinuosity replicated.

3. Shading of Diversion channels?

The diversion channels will be shorter than the existing stream section and flow correspondingly faster. There is therefore shorter residence time and less exposure to the sun and opportunity for increases in water temperature. The diversion channels are short term so all the effort put into providing shade will be directed at the rehabilitated channel.

4. Potential Wetland.

The potential wetland referred to is not a wetland. While the feature has been historically formed by the river it is now adjacent to but separate from the river. There is no wetland vegetation and the area is rough pasture grasses with some gorse and broom.

5. Habitat Features of the Rehabilitated Channel.

The key features of the rehabilitated channel will be a higher proportion of pools and riffles, coarser substrate (more cobbles), plantings for shade and bank stability, creation of backwaters, and riparian fencing. Some of the long straight sections, probably previously channelized, could support some extra pools/riffles to enhance productivity and key habitat such as pools which for example provide additional cover and thermal refuges that will be in short supply until the full rehabilitation process is complete.

6. Ecological and impact assessment, EIANZ format.

Background.

The Waikaka Stream is a lowland tributary of the Maitai River and in the reach surveyed is good quality habitat supporting healthy bully, brown trout, and longfin eel populations. It is largely riparian fenced and the willows make a major and important contribution to shading, bank stability, channel control and aquatic habitat cover. The willow root mats allow for extensive undercut banks that provide a critical habitat cover/refuge component for the eels in

particular. The trout present provide a significant sports-fish recreational resource on which the Mataura Water Conservation Order is based.

Drainage ditches provide some low quality habitat for a very sparse Gollum galaxiid population.

The stream flows through highly developed agricultural land farmed intensively for crops, sheep, beef, and dairy. It has historically been extensively re-routed, straightened, and channelized as can be seen from older plans and aerial photos.

The review questions included a request to follow the format in this document to assess ecological values and impacts, *Roper-Lindsay, J., Fuller S.A., Hooson, S., Sanders, M.D., Ussher, G.T. 2018. Ecological impact assessment. EIANZ guidelines for use in New Zealand: terrestrial and freshwater ecosystems. 2nd edition.*

EIANZ, assigning Value.

This table, from EIANZ, identifies ecological values to be considered in the EIANZ format.

Table 4 Attributes to be considered when assigning ecological value or importance to a site or area of vegetation/habitat/community.

Matters	Attributes to be considered
Representativeness	Criteria for representative vegetation and aquatic habitats: • Typical structure and composition • Indigenous species dominate • Expected species and tiers are present • Thresholds may need to be lowered where all examples of a type are strongly modified Criteria for representative species and species assemblages: • Species assemblages that are typical of the habitat • Indigenous species that occur in most of the guilds expected for the habitat type
Rarity/distinctiveness	Criteria for rare/distinctive vegetation and habitats: • Naturally uncommon, or induced scarcity • Amount of habitat or vegetation remaining • Distinctive ecological features • National priority for protection Criteria for rare/distinctive species or species assemblages: • Habitat supporting nationally Threatened or At Risk species, or locally¹⁹ uncommon species • Regional or national distribution limits of species or communities • Unusual species or assemblages • Endemism
Diversity and Pattern	• Level of natural diversity, abundance and distribution • Biodiversity reflecting underlying diversity • Biogeographical considerations – pattern, complexity • Temporal considerations, considerations of lifecycles, daily or seasonal cycles of habitat availability and utilisation
Ecological context	• Site history, and local environmental conditions which have influenced the development of habitats and communities • The essential characteristics that determine an ecosystem's integrity, form, functioning, and resilience (from "intrinsic value" as defined in RMA) • Size, shape and buffering • Condition and sensitivity to change • Contribution of the site to ecological networks, linkages, pathways and the protection and exchange of genetic material • Species role in ecosystem functioning – high level, key species identification, habitat as proxy

The Waikaka Stream in the reach surveyed is a very good example of a small lowland stream supporting a vibrant population of bullies, trout, and eels. It is an unusual reach in that it is extensively riparian fenced so that the riparian zone is largely not grazed and farm animals have little if any access to the water's edge. Vegetation cover is almost complete with rank grasses covering the ground and trees, mostly willows, providing extensive shade and almost complete resistance to erosion of the banks. This combination provides stable and productive habitat that is reflected in the longfin eel, brown trout, and bully populations. Such extensive and protected riparian zones are relatively uncommon in lowland intensively farmed regions

of Southland and Otago. River reaches upstream and downstream lack this level of protection.

Factors that limit the quality of habitat within this reach are related to sediment and nutrient sources from the catchment upstream of the survey reach.

Table 1, Summary table of values/species within the mine foot print.

Feature	Rating/Value
Riparian Zone	V Hi
Shading	V Hi
Water Quality	Moderate
Substrate	Moderate
Longfin eel	Nationally Critical
Gollum Galaxiid	Nationally Vulnerable
Common Bully	Abundant
Brown Trout	Sportfish/Cultural

Table 2, Summary table, assessing effects of river diversions.

Ranking	Very high	High	Moderate	Low	Comment
Feature					
Representativeness		*			Channelized
Distinctiveness	*				Longfin eels
Diversity		*			Fish Species
Ecological Context	*				
Impact Severity	*				
Duration	Short (up to 5 yrs.)				
Rehab Channel Quality	*				Habitat
Overall Impact**				*	Rehabilitated

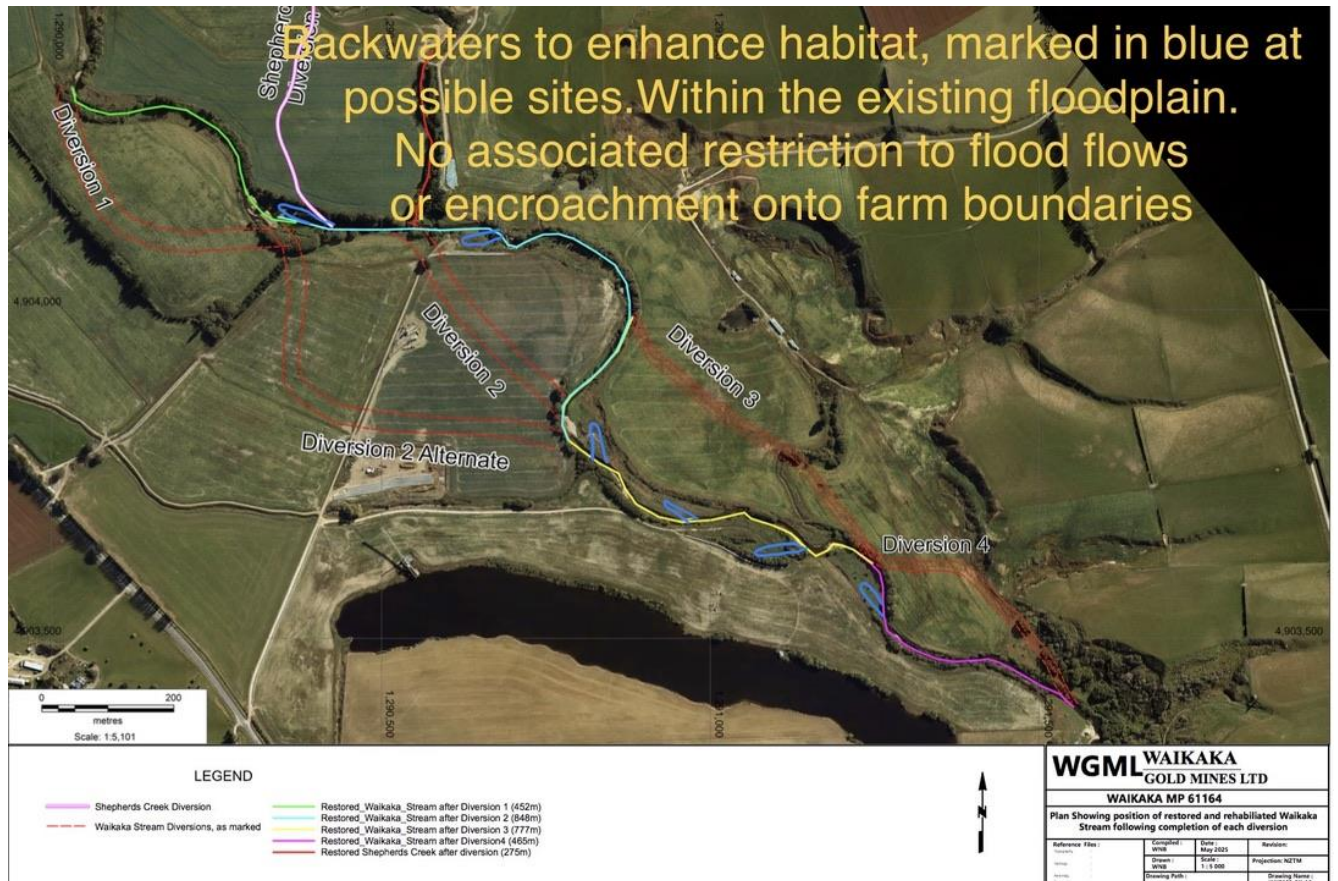
**With a well-designed rehabilitation channel of “better than or equal to” existing habitat the overall impact can be ranked as ‘Low’. (significant adverse effects that can be remedied and/or mitigated).

Historic maps and plans indicate a much more sinuous channel design than currently exists and channelization has resulted in some unnaturally long straights in the river. These tend to be of uniform depth and could usefully be modified to provide some additional pools and riffles to enhance the area of food production (riffles) and cover and thermal refuges (pools). The latter are particularly important for the rehabilitation phase where an absence of taller trees will increase exposure to incident light and therefore higher temperatures. The plan to use hybrid willows for bank stabilization and shading will begin to show benefits within 5 years (substantially quicker than other tree species) so in the years 1-3 post rehabilitation channel establishment, temperature mitigation and erosion resistance will be limited. Some repair and maintenance may be required.

A habitat type absent from the Waikaka Stream in the reach to be mined and diverted is backwaters. They are absent as a consequence of historic channelization and river straightening. Backwaters provide an additional habitat type and therefore variety. Foraging opportunity, cover, flood and temperature refuge, are some of the components available in backwaters.

The addition of some backwaters would greatly assist with the rehabilitation program and further enable the “better than” aspect of mitigation for temporary loss of habitat during diversion. Backwaters can be easily constructed and suitable locations within the existing floodplain and property boundaries are available, figure below.

Backwaters are still water bodies (except during floods), not as deep as pools but deeper than runs. Substrate is usually fine as sediment settles out in the still water. They have a downstream connection to the river. Eels, trout and to a lesser extent bullies would benefit from the presence of backwaters and can be seen foraging in these locations in other water bodies.



“Blue” marks potential sites for the provision of backwaters. These suggested locations have not been confirmed by field inspection but are likely spots from the plans and field knowledge.

Ross Dungey
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