11/7/2016

Charles Horrell

Otago Regional Council

Dear Charles

RE: Section 92 responses

Attached are further responses to section 92 request. Your reference A915743, dated 1 July.

Information required from NIWA and;

Information required from RSU.

Yours sincerely
OCEANAGOLD CORPORATION

John Bywater
Consenting Project Advisor

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Memorandum

To: John Bywater, **OceanaGold**

From: Greg Ryder, **Ryder Consulting**

Date: 8 July 2016

Subject: **OceanaGold Coronation North Project – ORC s92 request for further information**

Dear John,

Further to the s92 letter from the ORC, I have provided some comments on matters relating to surface water ecology.

On page 2 of the ORC letter from Mr Horrell, point 3 comments on the risk of trout introductions in the Mare Burn. In terms of management (avoiding the introduction of trout and other recreational fish to the Mare Burn catchment), there are already several small reservoirs in the catchment (albeit much smaller than the proposed Coal Ck. reservoir), but conceivably these could already be stocked with trout (or at least the opportunity to do so already exists). So it seems to me to be somewhat unfair that OceanaGold should be asked to manage a risk that arguably already exists.

Notwithstanding that comment, in terms of 'legal' introductions, it is my understanding that Fish & Game do not introduce trout or other game fish to an area where they do not already exist.

In terms of 'illegal' liberations', the main risk of exotic fish introduction is associated with a larger, new dam in the Coal Creek catchment. In terms of management to avoid introductions, the reservoir location is remote and removed from main public roads, and situated on private land owned by OceanaGold. Fish introductions would have to be by individuals who were aware of the reservoir's existence and were able to access it (by vehicle) to release fish and presumably with the intention of returning to fish it. Therefore management would seem to revolve around mechanisms to remove or reduce ability to have easy access to the site. Geographic remoteness would seem to me to be an existing management tool that may be able to be capitalised on to make it to make access even more difficult or less attractive for illegal fish introductions (e.g. padlocked gates, security warnings, cameras). Overall, I consider the risk of fish introductions to be very low, but not possible to completely rule out.

Other management options could involve surveillance surveys to check for fish. It would be possible to periodically drain the reservoir to either search for exotic fish and or carefully net the outflow to catch any fish in the reservoir. Such an exercise could be done via a controlled lease so flows could be managed. Alternatively the reservoir could be surveyed every five years or so to check for the presence of exotic species.

Appendix 2: Technical assessment and information requests from NIWA

NIWA has prepared a table on page 4 (Table 3) of potentially ecologically relevant criteria suitable for the proposed MB02 monitoring site. With respect to turbidity and suspended solids, no ecological protection criteria is presented but one is for aesthetics (change relative to background clarity). While I

consider the permitted change in clarity is reasonable and certainty achievable in my experience with surface waters draining the Macraes Gold Mine site, I do not think they should be based on an aesthetic measure as these creeks are not used for recreational activities (they are very small, narrow and shallow) nor are they in areas that have easy public access.

Deepdell Creek is arguably the most monitored stream in Otago. Galaxiid abundance and recruitment in this creek and other nearby creeks has remained stable, although quite variable from year to year (see chart below), suggesting existing water quality criteria are working for fish populations.

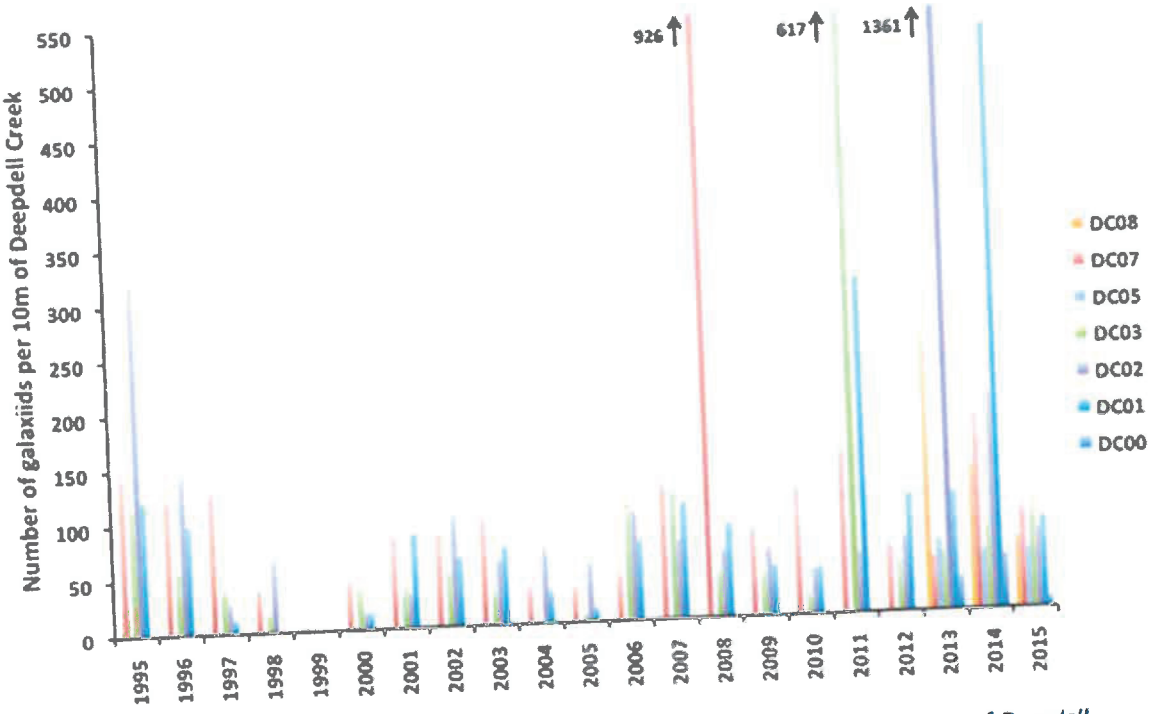


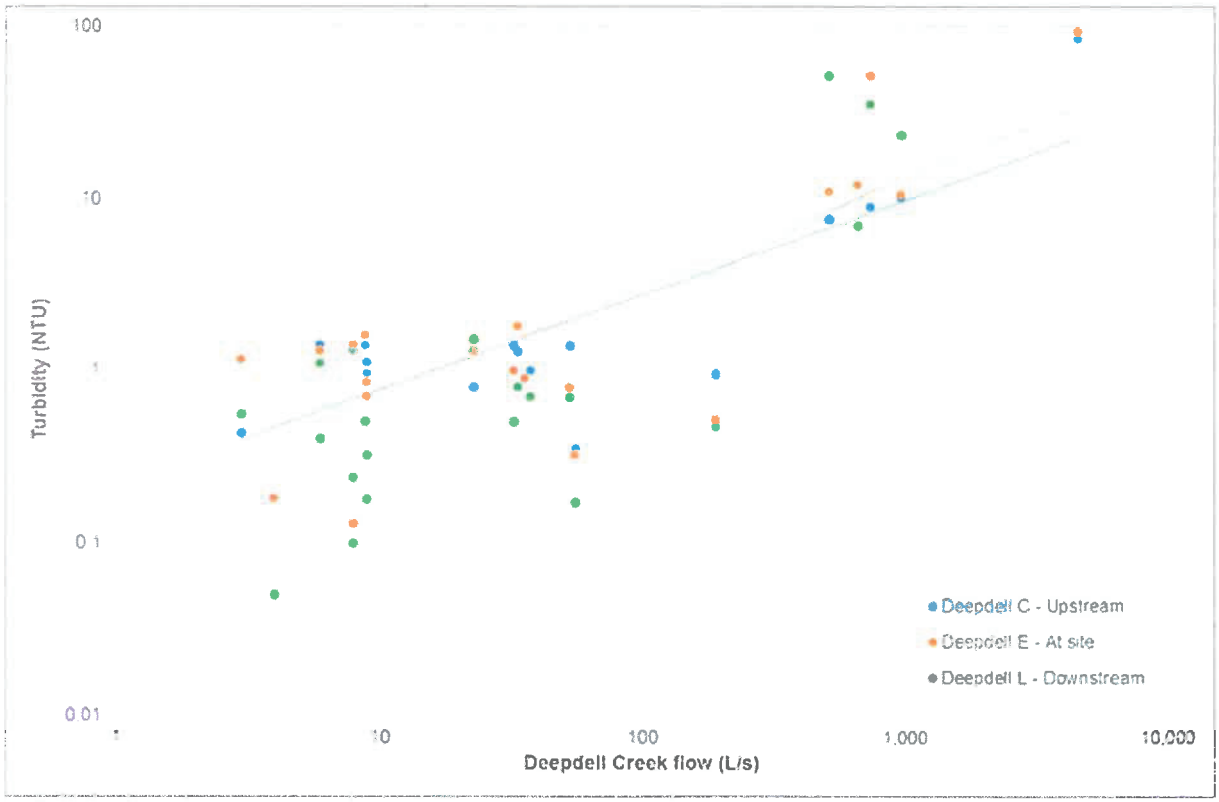
Figure 39 ***Number of flathead galaxiids (per 10 m reach) found in summer surveys of Deepdell Creek, 1995 to 2015.***

Sediments

On page 5 of the NIWA review, the section on sediments mentions that there is no monitoring data to support the statement that the existing management procedures have worked well. Brett Sinclair (Golder Associates) has provided me with a chart of turbidity versus stream flow in Deepdell Creek prior to March 1993 (see chart below). This chart indicates that the initial construction work for the mine did not affect stream turbidity at that time.

Quarterly surveys of sites throughout Deepdell Creek since the early 1990s (including macrophyte and periphyton cover assessments, together with photo records) indicate that sites downstream of the mine continue to be dominated by small boulders and cobbles. Fine sediment accumulation has not been an obvious feature at these sites. It is our experience that streams draining the Macraes Gold Mine typically have good clarity in medium to low flow conditions.

While we have not monitored fine sediment cover or sediment embededness in a quantitative manner as a part of routine monitoring, it is a method that could be included at stream monitoring sites with a minimal amount of additional time required.



Turbidity vs flows in Deepdell Creek prior to March 1993 (initial construction period). Source: B. Sinclair, Golder Associates (NZ) Ltd.

Coal Creek freshwater dam discharge

Page 6 of the NIWA report comments on the potential for stratification and potential deoxygenation associated with the freshwater dam. I recommend that an annual 7-day continuous dissolved oxygen monitoring condition be included for Coal Creek at CCMP01. The monitoring should be required in late summer or early autumn and be used to check whether the reservoir is discharging deoxygenated water to the creek, and how the concentrations sit in relation to NPS-FW attribute states. It would be useful to collect this information in the creek prior to the construction of the reservoir to provide some baseline information on oxygen levels. Monitoring (pre and post reservoir construction) should be undertaken at comparable times each year and information on flow and met conditions also collected.

Under (v) Aquatic Biological Monitoring, I suggest that, rather than the existing clause requiring the fish survey methodology be developed in consultation with the Consent Authority, the clause be reworded to state that fish survey methodology shall be consistent with that employed in other surface water monitoring programmes associated with Macraes Gold Mine resource consents. This would ensure consistency in sampling methodology and enable comparisons in population trends to be made for all monitoring site.

Other aspects of the proposed monitoring conditions with respect to surface water aquatic ecology look OK and consistent with existing practices at the mine.

Please let me know if you have further questions.

Regards,

Dr Greg Ryder
Director/Environmental Scientist