Otago Regional Council

Document Id:

MEMORANDUM

To: Charles Horrell

From: Pete Ravenscroft

Date: 8/8/2016

Re: Comments following S92 response

Background

OceanaGold are seeking to extend the mine footprint associated with the Coronation Project. The existing project operates in the headwaters of Camp Creek, with the proposed new operation expanding into the Mare Burn catchment. As part of the consent process Otago Regional Council sought additional information from OceanaGold. The following are the four specific items that additional information was sought as part of the Resource Science Unit:

1 *Council's preference, pursuant with policy 6.5.5(d) of the Regional Policy Statement for Otago, is to promote discharges to land where practical rather that to water bodies. Please provide comment on alternative methods of discharging.*

2 *Concerns have been raised that the proposed residual flow of 5 litres per second cannot be maintained below Coal Creek Dam, given the size of catchment above the dam. Please provide flow summaries for the proposed Coal Creek Dam and indicate how you will maintain the proposed residual flow at all times*.

3 *Trout pose a highly significant threat to the Taieri flathead galaxias. The existence of a dam in the upper Mare Burn catchment provides an opportunity for trout to be illegally liberated into the dam. This would result in trout colonising the downstream catchment and the subsequent loss of the local Taieri flathead galaxias. Do you intend to manage/remove the dam after it's no longer required? Could you also please comment on how you will avoid the introduction of trout and other recreational fish species to the Mare Burn catchment*?

4 *No comment on how discharges will be diluted in particular sections of Maori hen Creek and Trimbells Gully. Please confirm how adverse effects on these sections will be avoided, mitigated or remedied.*

This file note addresses the additional information supplied by OceanaGold.

Background information for the Taieri flathead galaxias

The province of Otago is home to a suite of non-migratory galaxiids, which can be broken into two to distinct body shaped groups. Firstly, pencil- shaped galaxiid and secondly a stockier shaped group of galaxiids commonly referred to as the *Vulgaris* galaxias species complex.

The diversity of these galaxiids has transpired by number of historical geological events. These include glaciations and the up-rising of numerous mountain ranges and basins splitting/capturing several river catchments have all gone to shape the diversity within the *G. vulgaris* species complex

Within the Vulgaris complex there are two distinct morphological types that are evident, described as 'flathead' and 'roundhead' (McDowall and Wallis 1996). Six species have now been formally described and decisions on the taxonomic status of the remaining are yet to be made (McDowall 2006b, Crow and McDowall 2011).

Taieri flathead galaxias (*Galaxias depressiceps*) forms part of the Vulgaris complex and as the name implies it is a 'flat-headed' fish. This galaxias was described 1996 (McDowall and Wallis), with the type locality being Healy Creek, Kye Burn.

The Taieri flathead galaxias is found primarily in the upper Taieri River, where it is restricted largely to the upper, and higher elevations tributaries and located downstream in the Taieri down to the Nenthorn and Three O'Clock Streams. The Taieri flathead also spills over into the headwaters of the Shag and Waikouaiti Rivers, including tributaries such as Deepdell Creek and Jimmy's Creek.

There are also two biogeographical significant populations of Narrowdale and Akatore Creeks, which are disjunct from the remaining the populations.

The process of allopatric speciation in conjunction limited dispersal mechanism has meant the majority of the non-migratory galaxias species have relatively restricted geographical distributions, some being confined to a single catchment. This confinement means that there can be relatively small number of populations (to begin with), then, combined with on-going population losses, (which are due to numerous threats), and has increased the conservation concerns across all the species and taxon.

The threat status of Taieri flathead galaxias is listed as Nationally Vulnerable (Goodman et al 2014), this is the third highest threat ranking given those species facing extinction.

Item 1

Council's preference, pursuant with policy 6.5.5(d) of the Regional Policy Statement for Otago, is to promote discharges to land where practical rather that to water bodies. Please provide comment on alternative methods of discharging.

Golder Assoc. provided the following response:

Council's preference, pursuant with Policy 6.5.5 (d) of the Regional Policy Statement for Otago, is to promote discharges to land where practical rather than to water bodies. Please provide comment on alternative methods of discharging.

The primary areas of mine water discharges from the proposed Coronation North Project are:

1) The toe of the Coronation North WRS in each of four gullies that contribute flows to Mare Burn (Figure 1).

2) The overflow points for the Coronation North Pit and the Coronation Stage 5 Pit.

Of the four WRS seepage discharge points, the two that contribute seepage flows to the Coal Creek catchment (Coal Creek seepage locations 1 and 2) are at elevations high enough in their respective sub-catchments that diversion of the flows to a land discharge could be considered. These discharges are however small compared to the overall site discharges (Table 1).

In terms of catchment areas available to accept discharges to land, only the discharge from Coal Creek seepage location 2 could be reasonably diverted via a race or pipeline to an adequate land disposal area, without the necessity for pumping. The other three WRS seepage discharges are located too deep in their respective gullies to enable diversion to suitable land irrigation areas without the need for ongoing pumping or the installation and maintenance of long pipelines to appropriate irrigation areas.

Item 2 Concerns have been raised that the proposed residual flow of 5 litres per second cannot be maintained below Coal Creek Dam, given the size of catchment above the dam. Please provide flow summaries for the proposed Coal Creek Dam and indicate how you will maintain the proposed residual flow at all times.

Golder Assoc. gave the following response and calculations:

In assessing the potential for the proposed Coal Creek dam to provide a continuous discharge of 5 L/s for water quality mitigation purposes, it was assumed that the Coal Creek catchment would have similar surface water flow characteristics to Deepdell Creek, reduced proportionately for the differing areas of the two catchments. The actual modelling of the catchment was done on a slightly more conservative basis, with the run-off rates being less than would be projected from a simple proportional reduction in the flows recorded at Golden Point weir (Table 2). On this basis, we are comfortable that the proposed Coal Creek dam could potentially provide a continuous discharge exceeding 5 L/s. The modelling of the proposed freshwater dam indicated a continuous discharge of up to 7 L/s is achievable from the dam layout documented[5], although this higher flow rate is not required to enable OceanaGold to meet the proposed water quality compliance criteria.

Table 2: Deepdell Creek and Coal Creek flow statistics.

Parameters	Min	L.Q. (2)	Median	Average	U.Q. (3)	Maximum
Deepdell Creek at Golden Point weir (1)	catchment area 4,080 ha					
Daily average (L/s)	0.0	10.7	28.7	108.2	85.0	44,220
Coal Creek at proposed dam site	catchment area 650 ha					
Daily average (L/s)	0.0	1.3	3.7	15.8	10.4	2,880

Notes: 1) Flows calculated based on midnight to midnight for the monitoring period July 1985 – December 2015.
2) Lower quartile.
3) Upper quartile.

A catchment yield of 8 % was applied to the above calculation to provide a degree of conservatism to the result. The catchment yield for Deepdell Creek is 11 %, suggesting the yield for the Coal Creek catchment may also be higher. The conservatism was incorporated in this calculation in lieu of specific monitoring data for Coal Creek.

Once full to overflow the freshwater dam with a volume of 677,000 m^3 would provide for annual evaporative losses of 90,000 m^3 and an annual managed discharge at 5L/s of 160,000 m^3 for approximately 2.7 years even if inflows were zero. In addition, evaporative losses from the reservoir surface would decrease as the water level decreases, extending the actual period of available water even if no inflows were occurring.

I am comfortable with this approach however hydro data provided by OceanaGold for Deepdell Creek suggest that 7dLF was 4.35l/s. Therefore we still have some reservation whether a residual flow of 5l/s can be obtained.

Item 3

Trout pose a highly significant threat to the Taieri flathead galaxias. The existence of a dam in the upper Mare Burn catchment provides an opportunity for trout to be illegally liberated into the dam. This would result in trout colonising the downstream catchment and the subsequent loss of the local Taieri flathead galaxias. Do you intend to manage/remove the dam after it's no longer required? Could you also please comment on how you will avoid the introduction of trout and other recreational fish species to the Mare Burn catchment?

Ryder Consulting provided the following response on behalf of Oceania.

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.

The formation of a 13ha pond, with depth of 24metres is somewhat larger than several small reservoirs located within the catchment. Whether these existing reservoirs/ponds could hold let alone maintain a sustainable trout population is unknown and would require further investigations but the couple I am aware of, they are highly unlikely to support a trout population.

The despite the remoteness the threat of illegal sports liberations are real, and if it was to occur then the extinction of this population of Taieri flathead galaxias is probable, particularly is this type of 'enclosed system.'

Without the presence of the dam it is unlikely that trout would be liberated into the Mare Burn and due the historic gold mining weir downstream they can't naturally gain access into the Mare Burn. Therefore OceanaGold provides the opportunity for a trout fishery to become established therefore should be responsible for the management of any effects.

The need for the dam is still uncertain but if it is shown to be necessary then the dam will become a permanent feature in Coal Creek. Therefore the risk of trout being liberated is an ongoing concern. The preferred option is that the dam not is installed and other mitigating measures be considered. There are options surrounding the management of rock stacks that lessen leaching.

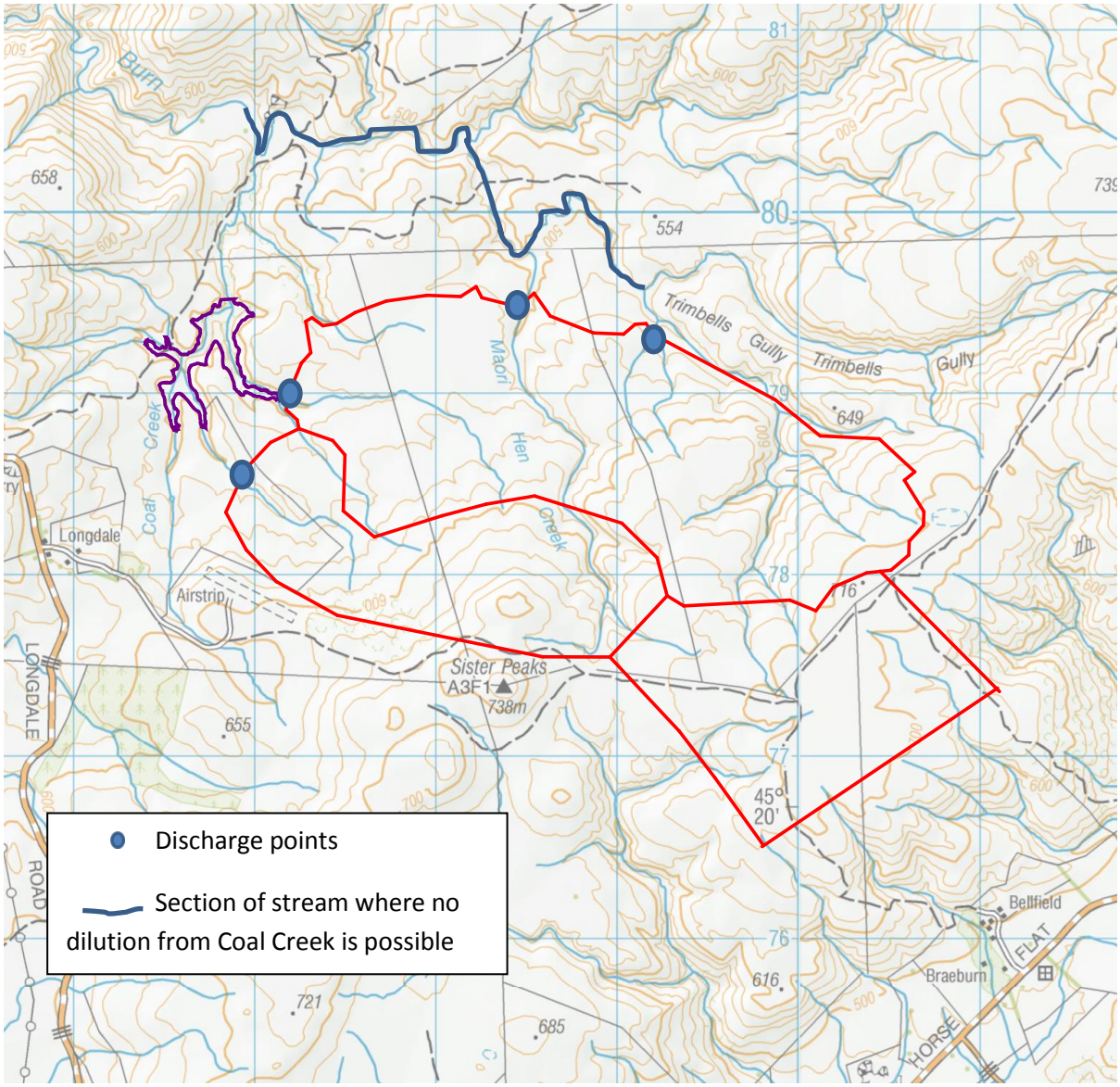
Item 4 No comment on how discharges will be diluted in particular sections of Maori hen Creek and Trimbells Gully. Please confirm how adverse effects on these sections will be avoided, mitigated or remedied.

Golder Assoc. gave the following response

The upper reaches of Maori Hen Creek are mostly within the footprint of the planned Coronation North Pit. The stretch of Maori Hen Creek between the pit and its confluence with Trimbells Gully is to be infilled with the Coronation North WRS. In addition, OceanaGold plans to install a silt dam in the Maori Hen Creek gully between the toe of the Coronation North WRS and the confluence with Trimbells Gully. On that basis, there will be no remaining free-flowing stretch of Maori Hen Creek once the Coronation North Project has been completed.

The water quality in Trimbells Gully upstream from the main WRS seepage location (Figure 1) is not expected to be affected by mine water discharges from the Coronation North Project. The water quality in Trimbells Gully and in Mare Burn for the stretch between the main WRS seepage location and the proposed compliance point MB02 will be affected by seepage discharges from Coronation WRS. Measures planned by OceanaGold to avoid, mitigate or remedy the effects of these discharges include:

- The installation of silt dams at the toe of the WRS in Maori Hen Creek and at the main WRS seepage location (Figure 1) to reduce the discharge of suspended solids from the WRS to Trimbells Gully during the operational period of the mine.
- The rehabilitation of the WRS to reduce the discharge of suspended solids from the WRS to the silt dams following mine closure.
- Iron and arsenic carried in solution in discharges from Coronation North WRS are expected to precipitate out in or upstream from the silt ponds at the WRS toe. This process has been observed at the existing silt ponds on site.



There is still the section of Trimbells Gully where no dilution from Coal Creek is possible, as highlighted in the above map.