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15 June 2023

Environment Canterbury
200 Tuam Street,
Christchurch 8011

Attn: Consents Team & Cherie Lennon

Dear Cherie

S92 RESPONSE BY MT COOK ALPINE SALMON LTD ON CRC233674 AND CRC233675 (ISAAC CONSERVATION TRUSTEES LIMITED)

Question 1 Inland Natural Wetlands

a) The ponds and connecting drains were created between 1970-1990 as part of quarrying activities by Isaac Construction Ltd (see attached historic imagery). Prior to this the land was grassed. The "natural" waterway (i.e. the Otukaikino) starts at the downstream boundary of Isaac's near McArthurs Road.

None of the identified waterbodies are natural inland wetlands under the NES, they were constructed quarry pits, with the removed gravel used by Isaac Construction for roading material. The pits have filled with groundwater and connected by constructed canals and artificial waterway (drains).

Under the LWRP, the connecting drains between the lakes and ponds (previously quarried land) inside Peacock Springs are considered "artificial watercourses" as they were constructed by human action. Plants that have established along the riparian margins of this artificial water course are excluded from the LWRP definition of wetlands (as they are "artificial").

The LWRP used to echo the broad RMA definition of a wetland but now follows the new naturalness criteria in the NES. The LWRP definition now reads:

Wetland includes:

1. wetlands which are part of river, stream and lake beds;

2. natural ponds, swamps, marshes, fens, bogs, seeps, brackish areas, mountain wetlands, and other naturally wet areas that support an indigenous ecosystem of plants and animals specifically adapted to living in wet conditions, and provide a habitat for wildlife;

3. coastal wetlands above mean high water springs;

but excludes:

(a) wet pasture or where water temporarily ponds after rainfall

(b) artificial wetlands used for wastewater or stormwater treatment except where they are listed in Sections 6 to 15 of this Plan;

(c) artificial farm dams, drainage canals and detention dams; and

(d) reservoirs for firefighting, domestic or community water supply.

The Isaac Lakes are artificial water bodies engineered to detain water as a dam, so they don't follow the definition of a wetland under the LWRP or NES. The artificial nature of these wetlands is proven through historic aerial imagery of the quarry. Prior to 1960, the entire area was a dry section of the Waimakariri River braided plain (App. I). No wetlands were present in the vicinity prior to the artificial construction of Peacock Springs between 1970 and 1990. However, they will certainly qualify as an RMA wetland which does not distinguish between artificial/constructed wetlands and natural ones. Clear guidance around these definitions is provide in Ministry for the Environment (2021).

The NES-FM (2020) only applies to natural waterbodies and waterways. The definition of a natural inland wetland in the NES-FM excludes wetlands that have developed in or around a deliberately constructed water body, since the construction of that water body.

Question 2 Existing Resource Consents

This consent is still held by ICL under CRC081610 and was originally consented for use in these raceways. As per condition 4 of this consent the water taken from this bore shall be used for raising fish and is consistent with that as described in the application.

For completeness the following responses are provided:

a) A clear description of the groundwater take : Refer to CRC081610 for all these details. The rate of take will not exceed the consented limit of this take.
b) The groundwater take is already consented for the purpose of supplying and raising fish in the races.
c) N/A ,as the volume and use of water is within the scope of condition #3 of the existing consent.
d) The discharge of the groundwater is included and allowed for previously in the wider "discharge" from Peacock Springs under CRC183089.

Question 3 Potential adverse effects associated with the proposed discharge

a) Contaminants generated in the raceways come mainly from un-eaten fish food (Nitrogen and Phosphorus), potential pathogens and bacteria from dead fish, and organic compounds from sediments in the raceways and fish wastes. The following table details the contaminants expected, and proposed mitigations. The potential effects of these contaminants with respect to water quality is in part b.

Table 1 Excerpt from Environmental Management Plan for Hatchery Upstream of site listing all contaminant sources and mitigation actions.

Contaminant Source	Potential Impacts	Potential Contaminants	Mitigation(s)

Accidental fish feed spillage to water	Isolated nutrient enrichment in raceway	Organic compounds e.g. Nitrogen/Phosphorus BOD/COD and O_2 levels	Training staff in feed techniques Avoid feeding in high winds Feeding Protocol SOP
Overfeeding, with feed wastage to water	Nutrient enrichment leading to anoxic conditions in raceway	Organic compounds e.g. Nitrogen/Phosphorus TSS/Sediment BOD/COD and O_2 levels	Feeding Protocol SOP & frequent feed workshops Water & sediment quality monitoring and remove sediment on scheduled cycles
Accumulation of fish faeces under cages	Nutrient enrichment leading to anoxic conditions in raceway	Organic compounds e.g. Nitrogen/Phosphorus TSS/Sediment BOD/COD and O_2 levels	Monitoring of deposition rates and adjusting removal cycles Developing nutrient budgets
Dead fish in pens	Foul odour Potential disease	Pathogens/Bacteria BOD/COD and O_2 levels	Mortality retrieval SOP to prevent exceeding threshold WQ levels
Mass fish mortality	Foul odour Potential disease	Pathogens/Bacteria BOD/COD and O_2 levels	Mortality retrieval SOP to prevent exceeding threshold WQ levels
Chemical spillage to water	Poisoning of farmed fish Poisoning of surrounding life Potential fire	Toxic chemicals[1] Flammable chemicals	Chemical storage SOP Spill kit on site Note no Pharmaceuticals are used in this operation.
Odour impacts	Encourage pests Nuisance odour	Bacteria, geosmin, off-gassing, algae	Mortality bins disposed of no less than weekly Odour & Noise Management SOP
Fuel spillage to Water	Poisoning of farmed fish Poisoning of surrounding life Potential fire	Toxic chemicals Flammable chemicals	Chemical storage SOP Chemicals all stored appropriately Spill kit on site Where possible, avoid refuelling on rafts

An environmental management plan will be developed for this operation (as required for NZ Sustainable Aquacultural Management and Aquacultural Best practice) to detail the normal operating procedures and resulting actions necessary to maintain water quality and achieve industry best practice at this site. The contaminants to be monitored and the frequency of monitoring are covered in question #4 below.

b) Assessment of effects of these contaminants with respect to Water Quality and Ecology Values

Potential effects of the proposed activity are on the water quality downstream of the discharge could include a decrease in the dissolved oxygen (DO) concentration and an increase in the concentration of nutrients, such as nitrogen (N) and dissolved reactive phosphorus (P)".

[1] The only chemical that may be used is Halamid (MSDS attached), which is an aquatic disinfectant. This is used on fry between 4-14g when which are susceptible to damaged gills from irritants (from TSS and other particles). If used treatment is for 3 days per race way.

The potential adverse effects of the proposed surface water diversion on the water quality and ecological values of the artificial channel include an increase in nutrients, such as nitrogen (N) and phosphorus (P), and a decrease in dissolved oxygen.

The sources of a potential nutrient increase caused by the proposal are excess feed in the runoff water, and excrement from hatchery salmon. Excess feed will be mitigated by limiting the food input to the correct mass for fish bio-load at any given point. Bio-load in the raceways will not exceed 4 tonne per raceway, or 20kg/m³. This will minimise the chance of excess feed being present in the discharge, or left un-consumed on the bed of the raceway. The raceways will be cleaned on a weekly basis to remove faecal matter and any excess feed, preventing this from entering the artificial channel and ultimately the Ōtūkaikino River.

This minimal nutrient discharge is backed up with water quality samples collected in August 2022. Samples were collected upstream and downstream of two parallel salmon raceways, active during sampling. The total dissolved inorganic nitrogen (DIN) level immediately downstream of the proposed discharge, upstream of the two active raceways, was 0.751 mg/L. The total DIN at the Ōtūkaikino River headwaters, downstream of the two active raceways, was 0.627 mg/L. This implies a minimal nutrient output from the active raceways, and a high rate of longitudinal mixing in the waterway.

As outlined in the AEL ecological report, a net decrease in dissolved oxygen levels will occur in the water passing through the raceways. This is due to high oxygen demands of the salmon bio-load. This loss of dissolved oxygen will be mitigated before the water is discharged back into the artificial channel, using weirs at the end of each race to aerate the discharge water. If this is does not sufficiently return dissolved oxygen levels to the natural background levels, the weir aeration can be supplemented using oxygen injection methods.

Effects of Nutrients

N and P nutrients, at elevated levels, can cause significant plant growth and algae blooms in waterways. In the ecology assessment no mats of filamentous algae were observed, nor other periphytic indicators of nutrient enrichment.

The regular removal of un-eaten fish food and detritus from the fish races and retention in the dewatering bag will remove the source of nitrogen and phosphorus. A pool vacuum will be used to clean the races and will operate at a rate of 80-150 L/min for up to two hours per day (assuming only one race is cleaned per day). The water that subsequently percolates out of the dewatering bag will be orders of magnitude lower than the flows discharged from the multiple raceways, so if there is any dissolved N or P in the filtered water it will be diluted by the returning raceway water.

It is also noted that there is approximately 1,350m from the outfall of the raceway through a network of artificial waterways and lakes to the start of the Ōtūkaikino Stream (see Figure 1 below). The loadings of N&P from the proposed raceways will be lower than the background levels and disperse/dilute in the network of artificial drains between the raceway and the outfall to the Ōtūkaikino.

Overall we assess that with proposed cleaning the effect of N and P on the water quality will be less than minor.

Figure 1 Artificial drains and ponds between Raceway outfall and the Ōtūkaikino Stream

Effects of Dissolved Oxygen

The sources that could cause a decrease in dissolved oxygen (DO) are listed in the table above. As per the ecology assessment in the AEE a *"Decrease in DO concentration can impact on the health of fish in the vicinity of the discharge" to the receiving* [artificial] *waterbody".*

These impacts will be mitigated by the cresting weirs at the end of each salmon race which serve to aerate the water and by regular removal and cleaning of sediments in the base of the races to the dewatering geofabric bags.

As per the ecology assessment *"If monitoring shows that the drop from the races does not sufficiently increase the DO levels, extra oxygen can be injected into the discharge water. The recommended minimum DO level, required to maintain the health of all fish species across development stages, is considered to be 5.0 mg/L (Franklin 2014). This is less than the recorded minimum DO level of the Ōtūkaikino at McArthurs Road, however care should be taken to ensure water entering the waterway from the proposed discharge meets the DO ≥ 5.0 mg/L requirement"*.

The proposed environmental management plan will also monitor the feeding of the fish, the deposition of un-eaten food and faecal matter in the raceways and regularly remove fish/fingerling that die to ensure the water being discharged to the artificial waterway does not result in chemical demands that would reduce DO levels in the artificial waterway that the race water is returned to.

The upstream "Clearwater" hatchery operated by Mt Cook Alpine Salmon contributes N and P to the artificial waterway that water is to be taken from to supply the raceways. Mt Cook Alpine Salmon will carefully monitor the upstream operation to ensure that these dissolved nutrients are not at a level that have an adverse effect on the fish being raised in the raceways.

The dewatering bags will retain faecal matter, bacteria and pathogens from the fish raceways. This will divert contaminants that could potentially in increase of "load" into the artificial lakes and waterways at this site.

As the returning water will be aerated to environmentally acceptable levels, and the wastes that would otherwise build up will be regularly removed to the dewatering bag we conclude that the effects on water quality and ecology will be less than minor.

Effects of Chemicals

The only chemical used in the rearing of fingerlings is Halamid (which is an aquatic disinfectant). This is an approved chemical to be used in aquatic operations will have no adverse effect on the ecology or water quality.

c) As discussed above, un-eaten food and faecal matter from fish will be removed by frequent vacuuming of the fish races, and will be pumped into a dewatering geofabric bag. This will remove the nutrient content and potential pathogens from the water discharged from the raceways and ensure the ecological and water quality effects are less than minor for the receiving artificial drain.

d) Mt Cook Alpine Salmon propose to install a series of woven geotextile dewatering bags in the unused raceways to capture and treat the uneaten food, faecal matter, and detritus from the base of the race(s). A swimming pool type vacuum cleaner will be used to remove these contaminants and pump this into the dewatering bags. The solids or semi solids will remain in the bag and the water returned to the channel after percolating through the geofabric lining.

The cleaning is estimated to take approx. 2 hours/raceway and when the raceways are fully stocked the races would be suctioned out once a week. When the race is at capacity (i.e. fully stocked) with 3 tonnes of fish, it will produce about 2% of un-eaten food and detritus, or about 60 kg/week per race.

Figure 2 Geofabric dewatering bag/cell used at Tekapo by Mt Cook Alpine Salmon.

e) proposed further mitigation given the assessments required from (a)-(d).

The number races that are operational at anyone time depends on the size of the fish being raised. In practice, this means that when the fry are small there will be less races in operation and the associated water take will be less. As the fish grow, more volume is required and additional races will be bought on-online.

The races will be cleaned on a weekly basis to remove un-eaten food and other debris that accumulates on the floor of the races. The timing of the cleaning will be staggered so only one race is cleaned per day so as not to overload the dewatering bag, and also logistically there is not sufficient staff on site to clean more than one race per day and complete the other daily tasks.

When the dewatering bag is full it will be sealed off and allowed to fully dry out. Cleaning will continue and discharge a new bag placed adjacent to the first. The full back will be removed and sold as fertiliser.

Question 4 Water Quality Monitoring

a) Methods proposed by applicant to monitor for contaminants entering the stream.

Mt Cook Alpine Salmon Ltd will take grab samples of water at the intake and upstream of a culvert below the discharge point on a weekly basis. They will test the concentrations various constituents (see #4b below).

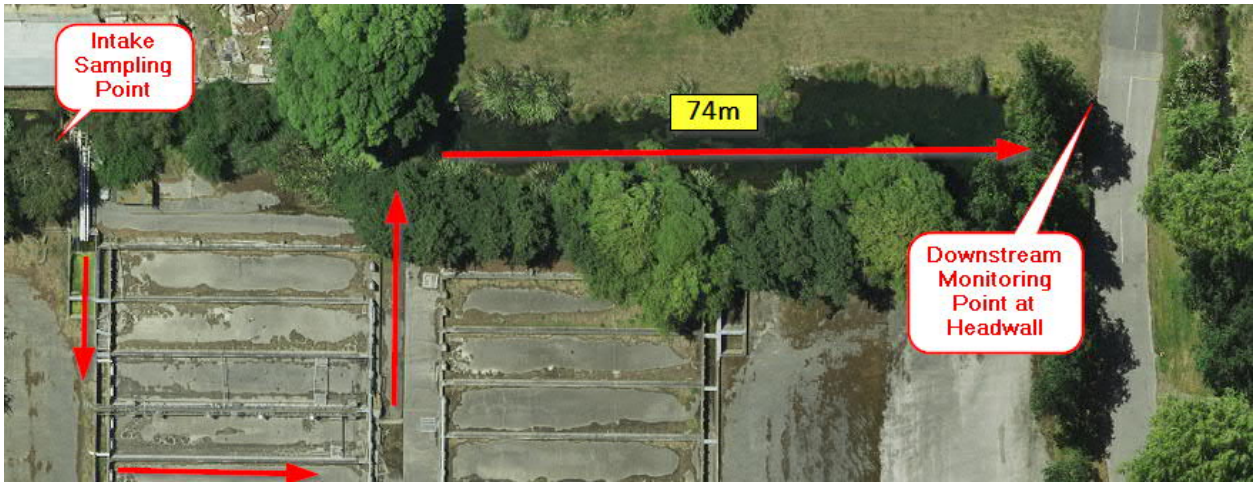

Figure 3 Proposed Sampling Points for Monitoring

b) Proposed conditions for monitoring up and downstream of the take and discharge locations:
Mt Cook Alpine Salmon will test dissolved oxygen and water temperature on a daily basis and once a month will test the concentrations of ammonia, nitrates, CO2, chlorine, BOD5, pH and TSS. Results will be provided to ECan within 10 days of testing.
The proposed limits are:

- Ammonia: 0.9mg/L
- Nitrate: 0.7 mg/L
- TSS : 50mg/L
- CO_2 : XX at 25°C
- Dissolved Oxygen (DO) – 5mg/L (minimum threshold 80% Saturation)
- BOD_5 <2mg/L
- pH between 5-9

Question 5 Potential adverse effects of the take of water on fish passage and screening

a) An assessment as to how fish passage will be maintained

As per the AEL response to the Sec. 88 letter received 14th November 2022, surface water flow, and therefore fish passage, will be maintained across the 35 m of waterway between the intake and

discharge locations. From the summer baseflow of approximately 331 L/s (measured on 12/12/2022), a stage decrease of 0.2 m or less will have a trivial impact on fish passage and habitat availability. As the impacted reach is only 35 m, it is predicted that backflow will occur from the discharge site toward the weirs. This will maintain water depth across the channel and prevent fish stranding. A diversion of 80% of the measured 331 L/s summer base flow would leave approximately 66 L/s in the artificial channel. This, combined with backflow from the discharge, is enough to maintain surface water connection and therefore fish passage across the impacted reach.

Note that during autumn, when higher takes are proposed, mature eels tend to migrate downstream during rain events, and are able to navigate the weir by cresting over it. Large eel migration takes place during high flows at night, so the proposed take activity will have a less than minor effect on large eels. Similarly, in late autumn some captive trout in the Peacock Springs lakes may migrate upstream and have the ability to negotiate over the weir. To mitigate any other impacts the proposed take may have on the navigability of the weir structure, mussel spat ropes have been proposed to be installed in the low flow habitat on the true right bank of the channel. Spat ropes facilitate the movement of juvenile eels across instream obstacles, although the presence of juvenile eels already upstream demonstrates that at least some eel passage is already possible.

The proposed fish screens will be made of stainless steel wedge-wire, with 3mm bar apertures. Any fish larger than 3mm will not be able to enter the intake area. The fish screens will be arranged in a triangle on the true right bank, and will not impact fish passage along the artificial channel.

b) An assessment as to the effects on water quality and fish passage if the take continues based on the proposed 80% of available flow especially after periods of low flow.

The water required for the fish races will vary depending on the biomass of fish in the race and the age/weight of the fish being raised (see Figure 4 that shows the biomass changes based on projected stocking). This graph shows that initially when fish are small the inputs are small, meaning the take needed (to maintain optimal dissolved oxygen and water temperature) will be required less as the fish mature.

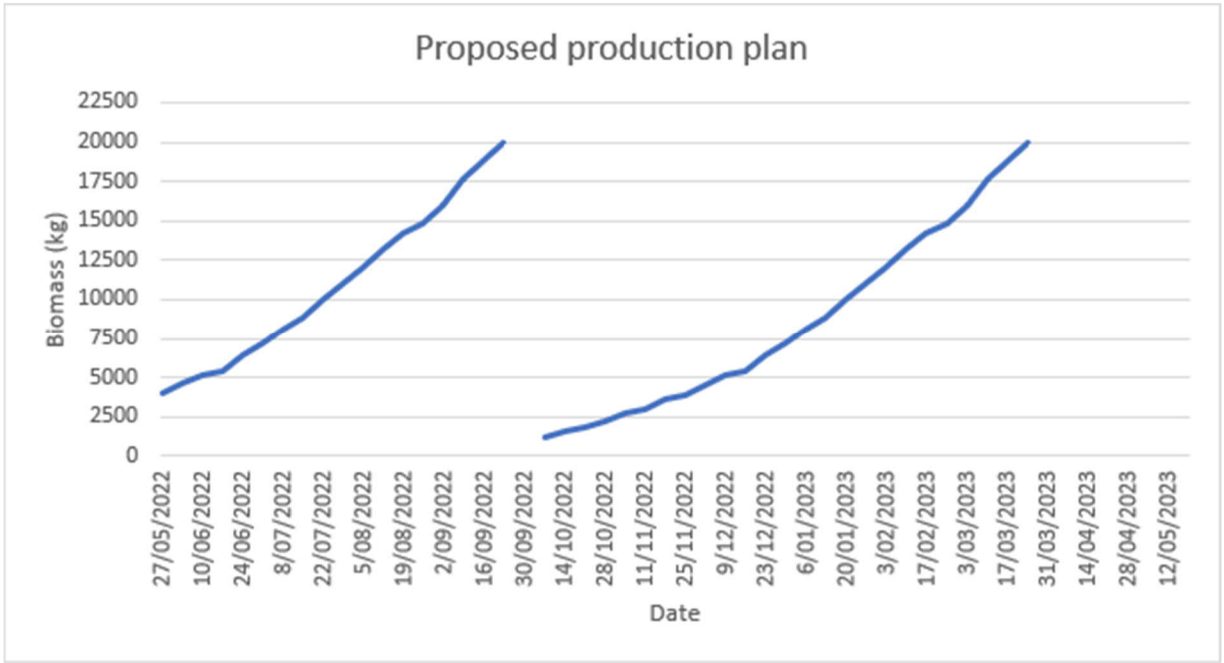

Figure 4 Estimated Biomass based on current Production Plans

Therefore, the maximum rate of take required may only be for short periods 2-3mths, after which, more water will pass over the weir, providing fish passage and maintaining downstream water quality.

Note, that it is expensive to pump water, so Mt Cook Alpine Salmon will not pump water if they don't need to, and in low flow periods or following low flow periods will adjust the fish stocks (biomass) according to the available water in the artificial drain.

c) any further mitigation is to be provided as to a minimum water level or minimum flow to ensure fish passage (and fish stranded) are avoided and water levels are maintained.

Mt Cook Alpine Salmon monitor the DO and water temperature levels daily and will be observing/inspecting the stream at the intake on a daily basis as well. Workers have a good viewing point, and during these inspections they will be able to see if there are fish stranded or stuck along the waterway, but they will be able to assess the amount of water available (as this directly effects the available DO and the fish welfare of the fish being raised). They will be able to adjust operations accordingly to respond to balance the water requirements for the raceways to the ecological requirements downstream of the intake.

d) Confirm if mesh or screens used.

3mm Stainless Steel wedge wire screens will be used (see Figure 5 below).

Question 6 Potential Adverse Effects On Aquatic Values

a) An updated drawing is attached to show the proposed intake setup and the following description is provided to answer this question:

Mt Cook Alpine Salmon have a variable speed and a fixed-speed pump onsite, with the option of installing a third pump if required. The pumping operation will utilise the variable speed pump set until it reaches the flow rate of the fixed speed pump. At this point the fixed speed pump will take over and the variable speed pump will provide additional flow to meet demand. Depending on the biomass and the DO requirements the third pump may also be added on in the same manner.

Water pumped into a stilling bay will discharge over a 6m long weir into the head raceway. A level transducer will be installed in this stilling bay and the hydraulic head will be calibrated to flow so that ECan/Isaac Conservation and Wildlife Trust & Mt Cook Alpine Salmon can continuously monitor the take of water at this site (see

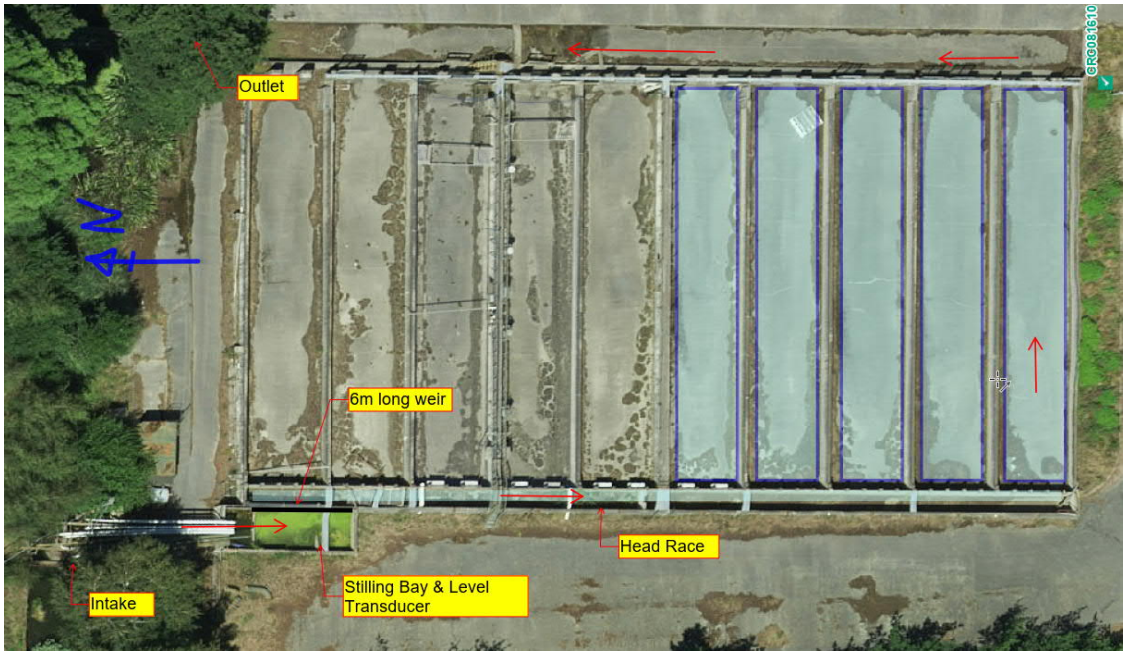

Figure 5 below).

Figure 5 Layout of Proposed Middle Raceway Operation

Preliminary calculations (assuming broad crested weir discharge relationship) are that the level transducer will need to record head between 35-120mm in the stilling basin "bay" and will be able to record from 60-400L/s respectively).

The screens are to be supplied by Andar Engineering Solutions in Washdyke. They will have a debris screen over the wedge wire screen. Initially Mt Cook Alpine Salmon will manage weed removal by

manual brushing the debris screen but provisioned to allow to install an automated mechanical brush system should it be required.

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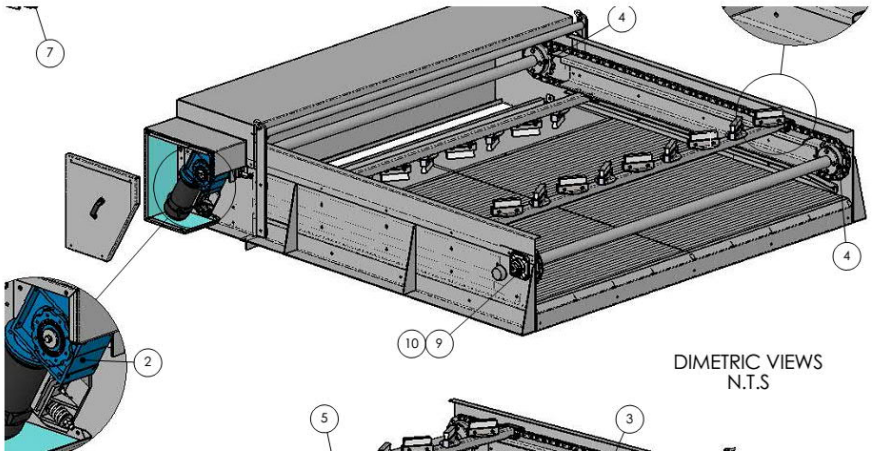

Figure 6 Fish Screens Proposed at Intake (excluding debris screen)

b) Provide clarity on length of screens, and max take (rate) of water through each.

A maximum of four pumps are proposed to be installed in the waterway, with the ability to take a combined maximum of 300 L/s. The design of the fish screen is such that one large fish screen will surround all three pumps, creating a large triangular area inaccessible to fish.

c) Clarify how screens will be maintained over time

Screens are proposed to be manually cleaned daily, at this stage, by Mt Cook Alpine Salmon staff, as their experience on the upper salmon farm (at this site) indicates that weed and debris is not a big problem. The screens will be built with provision for automating the cleaning if needed.

d) Approach velocity calculations provided previously, will detail again with new dwg

To comply with Schedule 2 of the Canterbury Land and Water Regional Plan (CLWRP), the fish screen must be at least 2.5 m^2 for an intake flow rate of 300 L/s. The engineering drawings dated 01/02/2023 depict a total of 4.72 m^2 of 3mm wedge wire screens surrounding the intake area (the updated drawings show slightly larger fish screens). Approach velocities for the fish screens cannot be calculated, and are recommended to be assessed when the screen installation is complete. The sweep velocities will be adjustable if required following installation. A combination of a large screen area, in combination with a diligent, and finally mechanised, brush-cleaning regime, is expected to minimise approach velocities to a level compliant with Schedule 2.

Question 7 Assessment in accordance with the National Policy Statement for Freshwater Management 2020

a)Te Mana o Te Wai requires the values of freshwater to be managed according to the hierarchy of obligations, in a way that prioritises;

1. First, the health and well-being of water
2. Second, provides for human health such as drinking water, and last

3. all other uses for people and communities to provide for their social, economic and cultural well-being.

The proposed activity will carefully monitor the water quality and flows within the artificial water body to ensure that the proposed activity of raising fingerling fish does not have an adverse effect on the health and well-being of the water. The regular removal of fish wastes and ongoing management at the fish races will ensure that this is achieved.

The proposed activity is not located near any drinking water take, but it is noted that in achieving the first obligation, it will also protect human health.

The proposed activity will provide jobs for the local community and not have an adverse effect on any cultural well-being downstream in the Ōtūkaikino Stream approx. 1.3km downstream of this activity.

The Ōtūkaikino Stream water quality standard is not consistent with that for drinking by humans, being Class OTU/GROYNES (viz. water managed for drinking water for animals, fisheries, fish spawning, aquatic ecosystems, public health, and aesthetic purposes). The existing downstream habitat is subject to animal stock and fouling by water. However, the aquatic habitat provides a richer biodiversity, and higher stream health measures, than other coastal rivers in Canterbury. In the reach between the proposed intake and discharge points, the MCI stream health measure was "fair" (MCI =92). This proposal is not expected to render water quality in the Ōtūkaikino River, in isolation of other factors, to a point it fails to comply with the Class OTU/GROYNES water quality standards of the WRRP, nor reduce the life-supporting capacity of the water, nor reduce its cultural value to Tangata Whenua.

Question 8 Ecology Assessment

a. Refer to section 4 of the AEL report "Environmental effects of flow diversion for salmon aquaculture". Most of the area in the 20 m reach between the proposed intake and discharge was electric-fished on 17/06/2022. In addition, an area upstream of the intake was electric-fished on 25th November 2022, and stream health and chemical water quality was assessed.

Question 9 Tangata Whenua values and Iwi Management Plan assessment

a. An assessment of the potential effects of the proposal on cultural values;

b. An assessment of the proposal against the relevant Ngāi Tahu Plans and Policies including, but not limited to, the Mahaanui Iwi Management Plan (2013) and the Te Rūnanga o Ngāi Tahu Fresh Water Policy : as follows

The Ngai Tahu resource management strategy for the Canterbury region, Te Whakatau Kaupapa (Tau et al. 1990) was also consulted during the assessment of this proposal. This document refers to the Ōtūkaikino being traditionally used for embalming, however this practice is not known to occur today.

Recommendations and proposed Consent Conditions

Mt Cook Alpine Salmon propose the following monitoring conditions:

- Pump testing to evaluate the sensitivity of the residual flow environment in context to fish migration periods and resident fish habitat requirements.

- Thereby leading to criteria to establish the maintenance of residual flow between the take and return discharge sufficient to ensure fish passage and provide fish habitat.

- A condition establishing a paired monitoring regime for water quality upstream of the take and downstream of the discharge (see Question 4b).

- If not undertaken already, a cumulative effects water quality monitoring site (including Ammoniacal N) at McArthurs Road

References

- Mahaanui Kurataiao Ltd 2013: 5.3. Wai Maori. Mahaanui Iwi Management Plan.
- Ministry for the Environment 2021. Defining 'natural wetlands' and 'natural inland wetlands'. Wellington. No. ME 1590. 25 p.
- Ngai Tahu 2002. Te Runanga o Ngai Tahu Freshwater Policy. No. p.
- Tau, T. M.; Goodall, A.; Palmer, D.; Tau, R. 1990. Te Whakatau Kaupapa: Ngai Tahu Resource Management Strategy for the Canterbury Region. Ngai Tahu, No. 77 p.

Yours sincerely

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Attachments:
Historic Aerial Imagery: Question #1
Updated Detailed Design Drawings of Intake: #Question 5