Development Proposal and Environmental Management Plan

November 2020

Mountain Stream Fishery Pty Ltd

38036 Tasman Highway, Targa

Report to

Board of the Environment Protection Authority

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Executive Summary

Mountain Stream Fishery is a flow through aquaculture facility that currently operates under a production limit of 50 tonnes per annum. This DPEMP is requesting for the limit to be increased to 181.5 tonnes per annum with the existing infrastructure on site. This proposed maximum annual production is approximately equal to its proposed maximum standing biomass based on the farm size of 5650 m^2. The facility has already been operating above the permitted limit for annual production.

Following the establishment of the *Finfish Farming Environmental Act 2017*, the current annual production limit was transferred from the Permit DA5.97.160 (see Appendix 1), issued by Launceston City Council on 11th September 1997 (as amended on 14th October 2002) to an environmental licence issued by the Director, EPA. MSF is now seeking to increase its production limit from 50 tonnes per annum to 181.5 tonnes per annum and to install a drum screen on the production tanks (tanks were installed and commissioned in 2017).

Two key issues have been highlighted by the EPA to address in this document:

1. Potential water quality impacts on the St. Patrick River associated with proposed discharge of effluent to surface waters.
2. The risk of translocating or releasing of pests and pathogens, and potential impacts on aquatic ecosystems.

A detailed analysis of monitoring data for the inlet, outlet and mixing site relative to the proposed site- specific trigger values is provided. This analysis shows:

- The proposed site-specific trigger values are currently met at both the outlet and mixing zone site (250m downstream) for NOx, nitrate, TSS and conductivity. The site acts as a sink for TSS in times of high sediment concentrations in the river.
- TP, TN, TKN, nitrite and nitrate all exceed the proposed site specific trigger values but are of the same order of magnitude.
- Effluent DRP and ammonia are significantly elevated, with median concentrations an order of magnitude higher than the site-specific trigger value at both the outlet and the mixing zone site.

The similarity between the North Esk River (at Ballroom) and the inlet at MSF validates the use of the 80th percentile of the MSF inlet samples as the reference condition. It is proposed that 250 m downstream of the outlet of the farm is monitored and assessed against performance trigger values. The recommended trigger values (as 80th percentile of inlet water) are provided in this report.

The decrease in pollutant concentration after the commissioning of the drum filter will be assessed with data collection for 12 months. It is expected that the use of a drum filter and installation of twenty additional aerators are likely to increase the dissolved oxygen concentration and increase water quality.

The site is in a remote rural area and while the closest neighbour is 200 m from the boundary, the likelihood of noise disturbance will be minimal. Downstream there is the Myrtle Park Campgrounds which is of local recreational importance to the community. In an external air

dispersion assessment, potential odour sources were identified and published emission rates used to model emissions from the hatchery using CALPUFF. The model predicts that the odour concentration exceeds the criterion of 2 OU along the southern boundary. Therefore, the site would be non-compliant with the EPPair. The maximum predicted concentration at or beyond the boundary was predicted to be lower than 6 OU.

There is limited risk of flooding. There are no conservation reserves, no High-Quality Wilderness areas, no sites of geo-conservation significance, and no conservation covenants nearby. Sections of the St Patricks River upstream and 700 meters downstream are classified as high RS Conservation Management Priority. There are no plans for vegetation clearing or burning that may impact on vulnerable or endangered species such as the giant freshwater crayfish (*Astacopsis gouldi*) or the Hydrobiid snail (*Beddomeia ronaldi*). The use of chemicals on the site must be monitored and used according to MSDS or permits.

The PEVs identified for this area include a) protection of Aquatic ecosystems, b) Recreational Water Quality and Aesthetics, c) Raw Water for Drinking Water Supply, and d) Industrial Water Supply.

A list of alternative wastewater treatment options has been provided and two of these are already underway at the time of preparing this document. They include the conversion of Pond 21 to a settlement pond as well as the installation of a drum filter and sludge tanks.

At the time of preparing this document, MSF are also in the process of increasing biosecurity protocol with the installation of a bio-secure check-in station for visitors and workers and a truck disinfection station.

A list of commitments that Mountain Stream Fishery will adhere to have been collated in the preparation of this document.

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List of Abbreviations

Abbreviation	Definition
ASOP	Actuarial Standards of Practice
AUSRIVAS	Australian Rivers Assessment System
BOD	Biological Oxygen demand
CAR	Comprehensive, adequate, and representative
CAR	Comprehensive, adequate, and representative
CFEV	Conservation Freshwater Ecosystem Values
DGV	Default Guideline Value
DO	Dissolved oxygen
DoEE	Australian Government, Department of the Environment and Energy
DPEMP	Development Proposal and Environmental Management Plan
DPIPWE	Department of Primary Industries, Parks, Water and Environment
DRP	Dissolved Reactive Phosphorus
EMP	Environmental Management Plan
EPA	Environment Protection Agency
FFMP	Fish Farm Management Plan
FT	Flow through
FTE	Full time equivalent
HA	Huon Aquaculture
HA	Huon Aquaculture
LCC	Launceston City Council
MSDS	Material Safety and Data Sheet
MSF	Mountain stream Fishery
NOx	Nitrate + Nitrite
NRM North	Natural Resource Management North
NTU	Nephelometric Turbidity Units
NWI	National Wilderness Inventory
PEVs	Protected Environmental Values
SOP	Standard Operation Procedure
SSGV	Site Specific Guideline Values
TKN	Total Kjeldahl Nitrogen
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total suspended solids

1. Introduction

1.1 Proponent details

Title of Proposal	Development Proposal and Environmental Management Plan for Increase in Hatchery Production.
Proponent Details	Mr Taras Malahoff Mountain Stream Fishery Pty Ltd 145 Financial Pty Ltd, Level 1, 145 Hobart Road Kings Meadows TAS 7249 ABN: 47 140 232 819 ACN: 140 232 819
Contact Person's Details	Nick Butler, Hatchery Manager 38036 Tasman Highway Targa, 7259 0487 098 156 nickbutler@mountainstreamfishery.com.au

1.2 Hatchery overview

The Mountain Stream Fishery Hatchery (MSF) is located on the banks of the St Patricks River just north of Myrtle Bank. The site is primarily a traditional flow-through aquaculture facility, with water drawn directly from the St Patricks River. The site has 13 grow-out raceways, 7 recently destocked brood stock ponds, three concrete tanks and a hatchery building, which includes office facilities. Until April 2018, a public fishing facility was operated, this is currently closed and unlikely to be reopened due to biosecurity risks.

Brood stock for salmon and trout species are held at the facility and used for caviar production and small runs of fish production. Eyed eggs are supplied annually from Huon Aquaculture Pty Ltd (HA) owned hatcheries from around the state.

1.3 Proposed activity

It is intended that Mountain Stream Fishery will increase its production limit from 50 tonnes per annum to 181.5 tonnes per annum and commission a drum screen to filter water from the production tanks that were installed in 2017.

1.4 Key Issues

There are two key issue that have been flagged for follow-up by the EPA, see Table 1.

Table 1: Key issues associated with MSF increase in production.

	Key Issues
1.	Potential water quality impacts on the St. Patrick River associated with proposed discharge of effluent to surface waters.
2.	The risk of translocating or releasing of pests and pathogens, and potential impacts on aquatic ecosystems.

2. Proposal Description

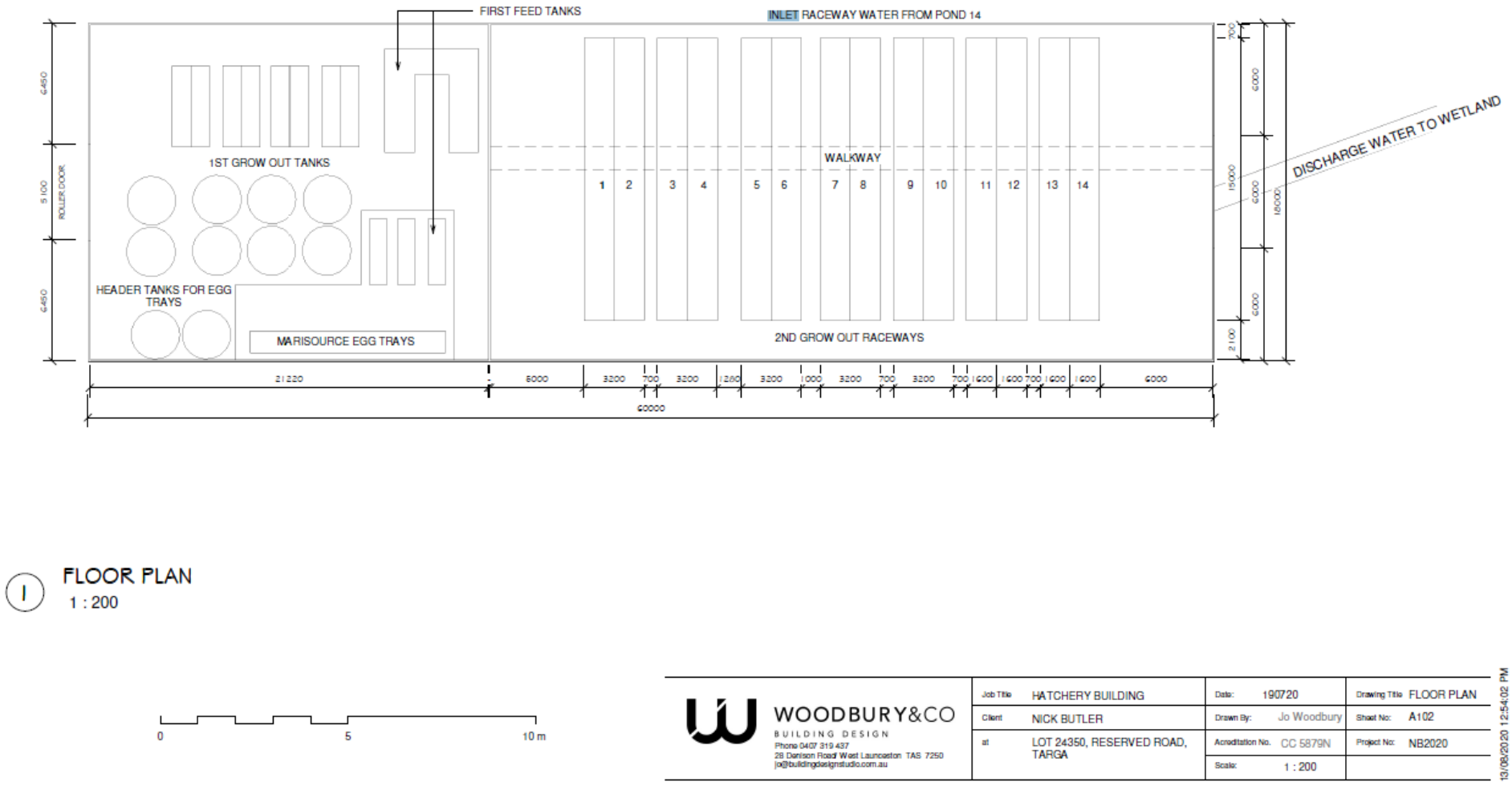
2.1 Existing Facility

Production

MSF is atypical compared to other hatcheries in Tasmania. It is a particularly cold-water site where the salmon grow slowly over 20-22 months from incubation to on-growing at sea. The slow growing conditions enables the site to produce 'S 1.5' salmon (approximately 20-22 months old). The 'S 1.5' fish grow and increase in weight faster than the same size fish, when put to sea, from recirculating hatcheries, at 12-14 months old. This compensatory growth in the MSF salmon provides us with an advantage over recirculating hatchery grown fish. Fish grown at MSF become the lead harvest fish for the following year, once sent to sea sites. Fish are therefore not processed on site, but live transported to a 'grow-out' facility.

MSF's role is to incubate eggs supplied by Huon Aquaculture from their Springfield hatchery. These eggs are from selected stock from the Tasmanian selected breeding program. The eggs that arrive anywhere from July to August are hatched and grown to 400g average size over a 20-22-month period. The eggs arrive at "eyed" stage of development and hatch after one week of incubation. MSF has only two months (May and June) of the year with a single year class on site and 2-year classes for the remainder of the year. MSF's peak growing season is from November to May which coincides with the low flow summer period, see Figure 2. The water temperature range is from 3°- 22° Celsius. Peak biomass occurs in May before fish are trucked offsite for on growing at sea. Total feed peaks in April, see Figure 3. Peak discharge of nutrients in the discharge water coincides with peak biomass and feeding in late April.

The hatchery building contains the business office, staff amenities as well as the incubation room, first feed tanks and first and second grow-out tanks and raceways, see Figure 1. There is a small recirculation facility that includes temperature control, filtration and ultra-violet water treatment for the incubation room. This facility hatches the eggs and grows the fry to approximately 20 grams before transfer to outside grow out tanks and raceways. The hatchery has a maximum capacity of 10 tonnes and peak capacity is at mid-May prior to transfer to outside raceways.



1 FLOOR PLAN
1 : 200

Figure 1: Hatchery building plan for MSF.

MSF predominantly hand feeds the fish. The three concrete tanks have auto feeders. Monthly weight checks are conducted to establish biomass figures. When conditions prevail, up to (but no more than) 3% weight of biomass is fed daily. During summer there is low flow and warm water carries less oxygen. During this time there are days where the fish are unable to be fed. Each raceway and tank will receive differing amounts of feed depending in the environmental conditions of the individual pond/tank. MSF does not feed when the water temperature is above 18°C or if the dissolved oxygen is below 6mg/l. Hand feeding allows for accurate control over feeding with minimal waste. Auto feeders are closely monitored to ensure no wastage of feed. All feed contains faecal binder which allows for faeces to pass through the raceways and tanks to settle in retention ponds before the water enters the wetland.

The fish are vaccinated in September each year. Vaccines are two strains of Yersinia, Vibrio, Aeromonas and pilchard Orthomyxovirus. These vaccines protect the fry, over summer, from *Yersinia ruckeri* infection and then the other pathogens once the fish are at sea. MSF no longer uses antibiotic-treated feed as yersinia infections are no longer seen over the growing season. Chemically treated water is limited to foot bath and truck wash stations using Virkon. Virkon is not returned to waterways. 1% Virkon treated foot bath water is changed every 2 days and disposed of into the Enviro-cycle septic tank. The use of Formalin has almost been eliminated as the eggs are transported to MSF at an advanced stage. Any formalin treated water is collected in IBC pallecons and transported offsite to be disposed of appropriately.

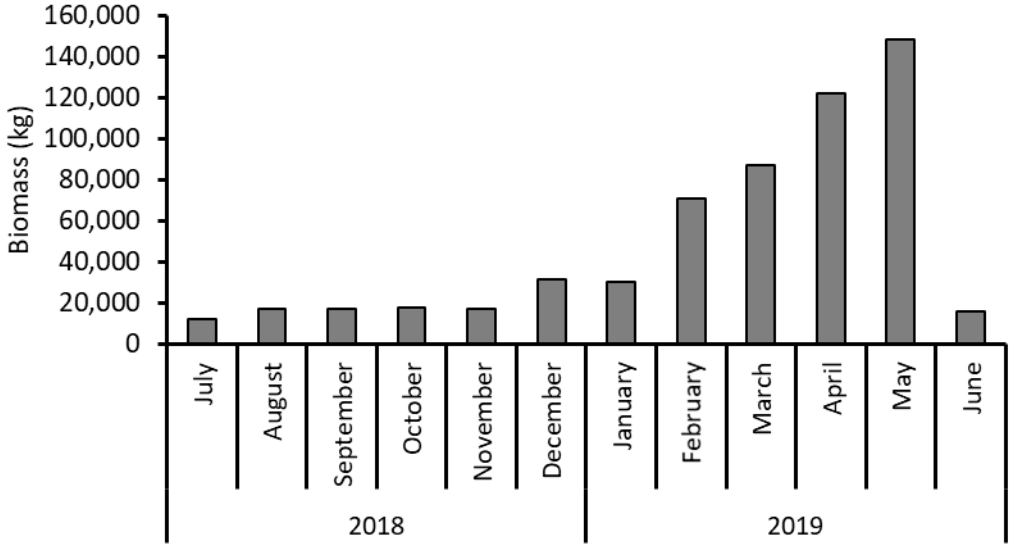


Figure 2: Total monthly biomass (kg) for the last 12 months of fish kept in the raceways (pond 1- 13) and concrete tanks (T1 – T3).

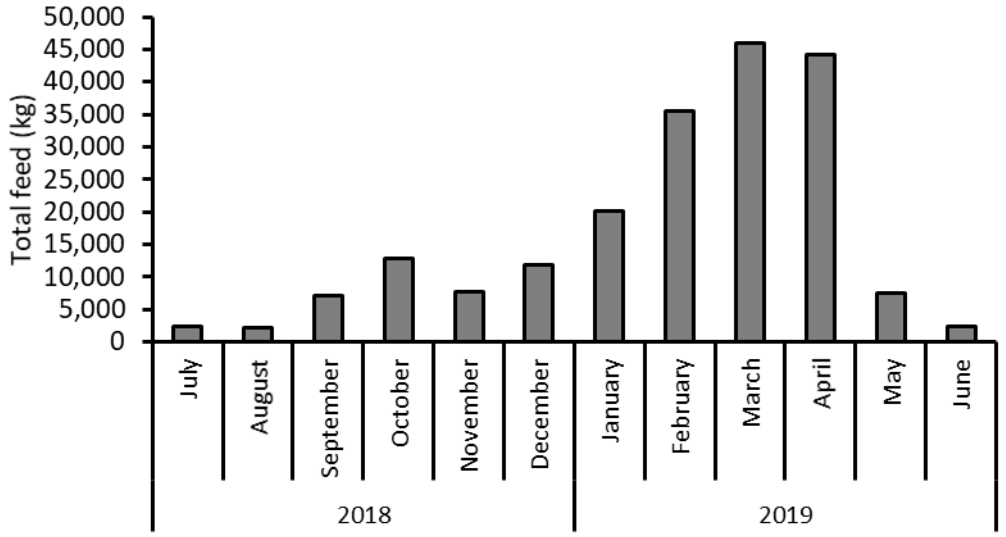


Figure 3: Total monthly feed (kg) for the last 12 months fed into the raceways (pond 1- 13) and concrete tanks (T1 – T3).

Water flow through farm

The water supply for MSF comes from the St Patrick River (see Figure 4 for a diagram of the flow of water through the farm). MSF has a diversion weir on the St Patricks River which diverts water down an existing flood channel to a second weir that directs the water into the property at a rate of 43 megalitres per day. Flow is measured, twice per day, at the inlet flood gate, see Figure 5. Under MSF's Water Licence (licence 8089) flow is taken at the maximum allowable daily limit in peak biomass situations. At times of high flow DPIPWE allows for "opportunistic take', MSF is allowed an additional 18 megalitres per day. The inlet flood gate aperture is manually increased or decreased depending upon the depth of head above the inlet pipe. Engineer, Mr Dale Luck, from Johnstone, McGee and Gandy Pty Ltd validated flow chart, August 2020. Water is taken at the maximum daily amount once fish biomass surpasses 50 tonnes

Four new oxygenating "u-tubes" are being installed to increase the available oxygen for the grow out raceways. This equipment will be used for 4 months from December to April each season. Maximising oxygen in the raceways will help increase the dissolved oxygen in the discharge water.

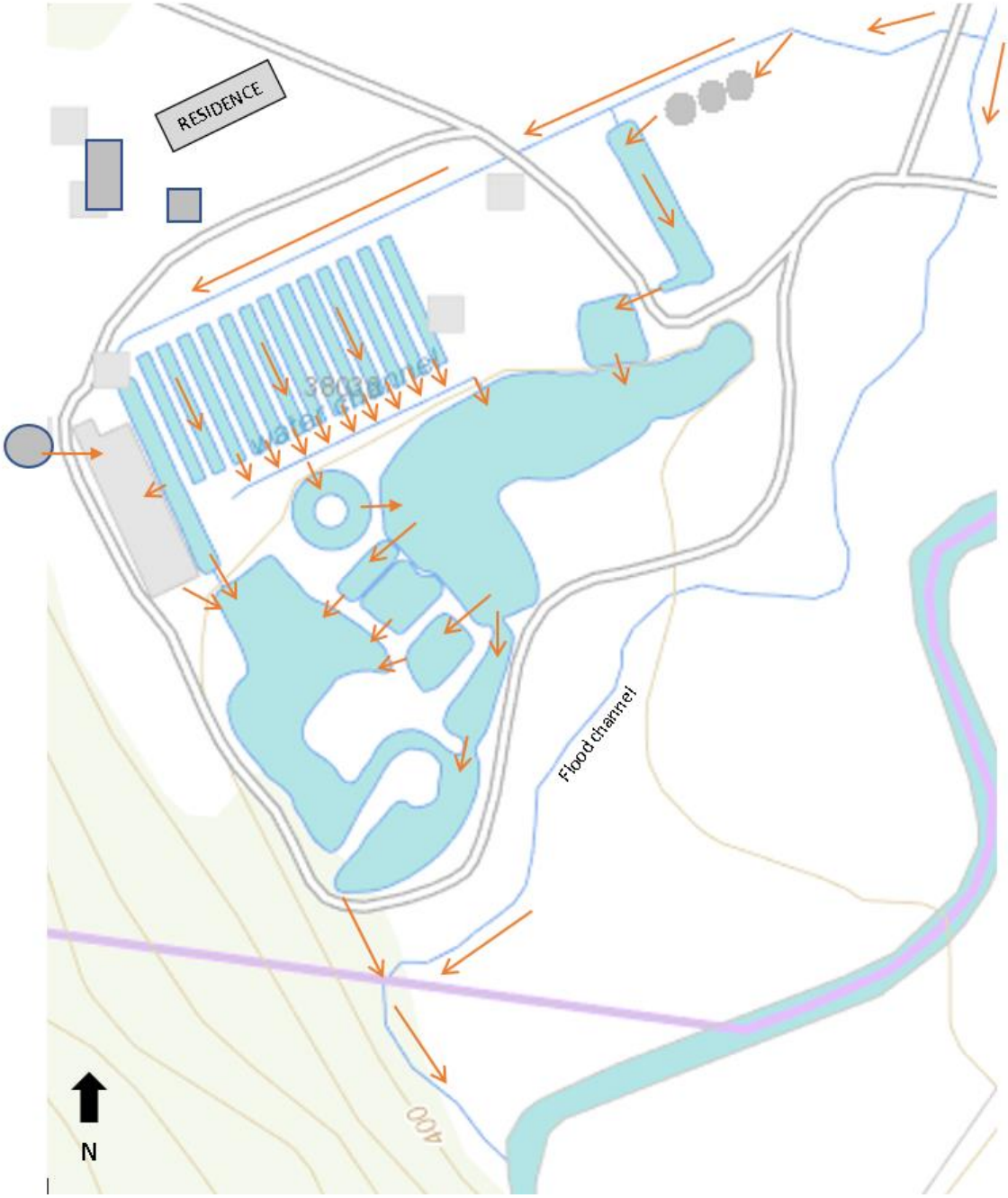


Figure 4: Site plan to show the direction of gravity-fed flow of water through the farm.

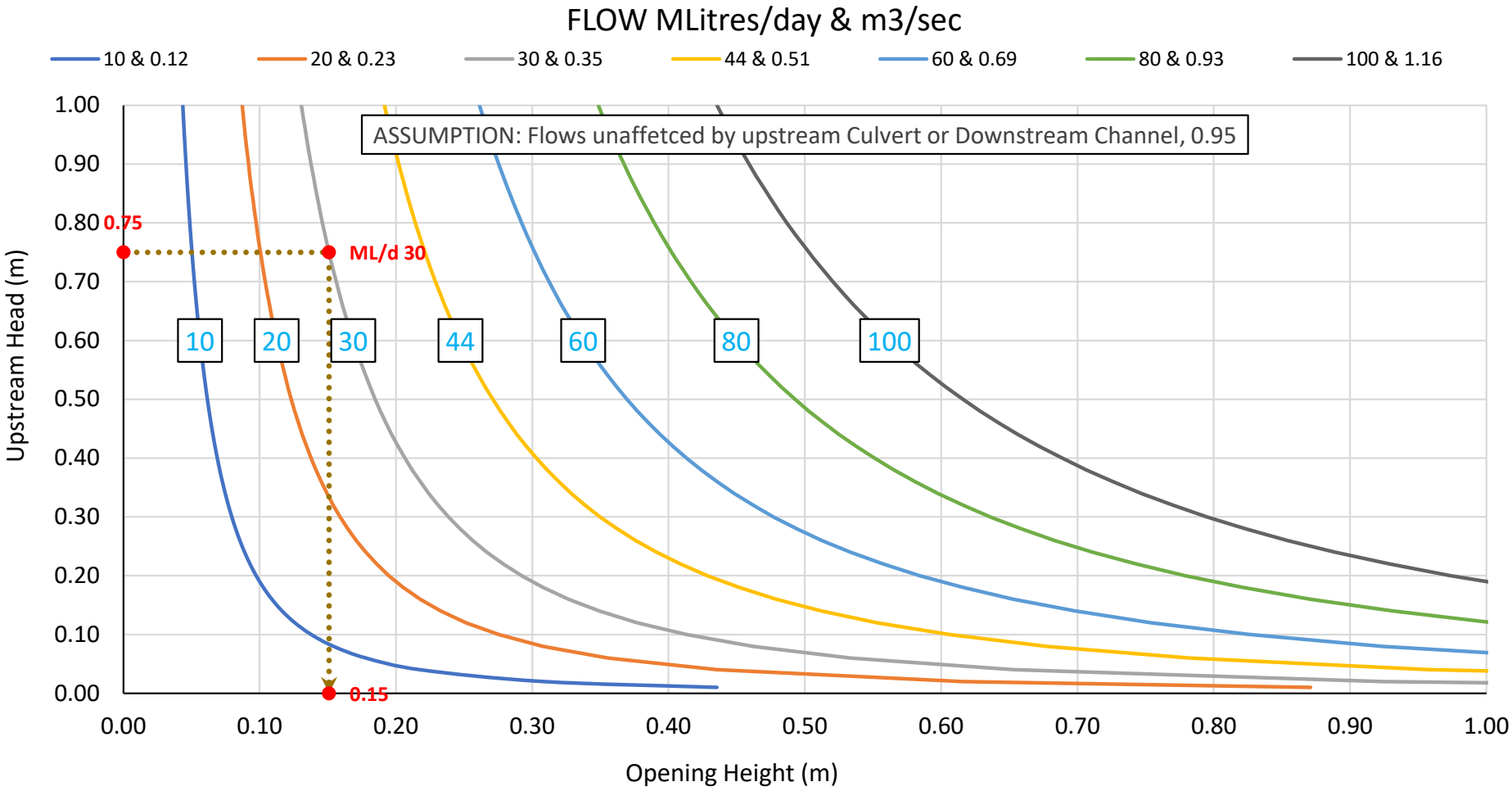


Figure 5: Chart of the flow of water given the upstream head (m) and opening height (m), provided by Johnston McGee and Gandy Engineers and Planners.

There is a drum filter at the inlet to remove leaves and other detritus that floats down the river (predominantly feral willow leaf removal in Autumn), Figure 6. Detritus is collected at discharge channel and removed annually. First intake water for fish production is a 15kW lift pump for the three 200 m^3 concrete fish production tanks, fish are stocked at no greater than 55 kg/m^3 at peak production at the end of April each year.

From here the water flows to 13 production ponds. Production ponds vary in size from 270 m^3 to 500 m^3 and have outlet pipes that restrict flow at 30 L/s. Fish are stocked no greater than 35kg/m^3 at peak production. Inlet water then flows to hatchery building via the 75 L/s hatchery header tank pump. The stocking densities are the RSPCA recommended limits for the two differing types of grow out tanks/ponds. The tanks have a higher rate of water exchange than the flow through raceways. This factor allows for higher biomass per kg/m^3 of fish in the tanks. These stocking densities are only achieved in the last month of the grow out cycle prior to transport of the farm to sea.

Water passes through ponds 22, 21, the raceways and hatchery and flows into the retention dam (formally public fishing dam). Water from the retention dam flows to ponds 15, 16, 17 (decommissioned), 18 and 19 respectively then through the wetland.

At the time of writing this report the non-production ponds were stocked as per Table 2:

Table 2: Stocking of non-production ponds as at October 2020, MSF.

Pond	**Number**	**Individual size**	**Species**
Retention dam	Unknown	Unknown	
Pond 15	1012	3kg	Salmon
Pond 19	346	2kg	rainbow trout brood stock
Pond 18	491	1.8kg	Brook trout
Pond16	*Empty*		
Pond 17	*Empty*		
Pond 22	1986	1.5kg	replacement brood-stock salmon
Pond 21	158	2kg	leucistic rainbow trout

These 7.907 tonnes of fish are important brood stock for the farm and are a source of genetics for the Inland Fisheries Service. The wetland sweeps across the remainder of the farm and water discharges into the flood channel which then connects to the St Patricks River. The trout in pond 19 will be culled by the end of 2020 and salmon in pond 15 culled by the end of 2021.

Currently the site uses 43 ML of water per day. The water enters the site from the Inlet channel (see Item 1, Table 3). The supply of water is gravity fed through the farm, except during periods of low river flow. This usually occurs in the peak of summer and there are 2 pumps that are used to recirculate the fish-farm water (see Items 2 and 4, Table 3).

Figure 6: Site map of mountain stream fishery with **1)** Weir sample location, **2)** Wier, **3)** Drum filter and lift pump for tanks, **4)** Cement tanks, **5)** Quiescent pond, **6)** Residence, **7)** Diesel storage ,**8)** Drum filter, **9)** Pond 22, **10)** Oxygen generation shed, **11)** Water recirculation pump 1, **12)** Pond 21, **13)** Water recirculation pump 2, **14)** Raceways (ponds 1-13), **15)** retention dam, **16)** Header tank, **17)** Pond 14, **18)** Hatchery, **19)** 'U' tubes **20)** Pond 15, **21)** Pond 16, **22)** Pond 17, **23)** Pond 18, **24)** Pond 19, **25)** Wetlands, **26)** Outfall from wetlands to flood channel, **27)** Effluent water sampling site.

Recirculation, if required, is 375 litres per second. Recirculation pumps are operated at any time throughout the year on an as and when required basis. A visual determination of water level and flow in the farm determines the operation of these pumps. Recirculation pump 1 has a maximum output of 300 litres per second and the pump 2 has an output of 75 litres per second. Pump 1 has a variable speed drive and water is passed through a de-gassing unit to remove carbon dioxide maximising oxygen uptake in the recirculated water. Pump 2 is a direct

drive unit and water is passed through an oxygen cone allowing for higher than ambient oxygen levels in this recirculated water.

The recirculation is to re-use the water and is used minimally as nutrient concentration occurs. Periods of low flow and low dissolved oxygen trigger the re-use of water. All water exits the farm via the 'wetland'.

The sites' outfall pipe (see Item 6, Table 3) is the same, one metre diameter pipe as the inlet pipe. This ensures that MSF replenishes the St Patricks River with the same amount as flows into the Farm. Water sampling, for testing for increased effluent parameters, is taken from just below the outfall pipe.

Table 3: GPS coordinates for water sources and pumps.

	Item	Easting	Northing
1	Location where Inlet channel enters the property.	531829	5427940
2	Recirculating pump 1	531744	5427836
3	Carbon dioxide cascade column de-gasser	531711	5427915
4	Recirculating pump 2	531651	5427851
5	Oxygen Generator	531640	5427851
6	Outlet pipe	531618	5427622

Waste Management

Currently the site does not actively filter wastes from any of the tanks or raceways. Waste from all areas accumulates in Ponds 15 through to 19, the retention dam and wetland serpentine. Sludge is removed from these areas as and when required. Daily fish mortalities are covered with native species wood chips in a wind-row system 22m above the river on the southern boundary of the farm. MSF is preparing to run a trial on the processing of fish waste into hydrolysate which can be used as fertiliser. This trial will require separate approval and as such will not be detailed in this DPEMP.

If a mass mortality event occurs due to environmental factors (low dissolved oxygen or high temperature water) MSF will undertake clean up and macerate the dead fish ready for fermentation and, upon the success of the hydrolysate trials, conversion to hydrolysate will occur. Mass mortality in excess of 500 kg will be transported offsite. General hard waste is transported off site by J.J. Richards Pty Ltd monthly. For full details on the waste management, see Section 6.5 Waste Management.

Energy Requirements

Current average energy requirements are 4020kWh per day. The largest daily use of power is for the 'Airsep' oxygen generator. This runs constantly suppling oxygen to diffusers that replenish dissolved oxygen to the farm. Power is also used to run pumps to supply the header

tank to the hatchery. The dwelling and sheds use average power. In the event of power failure to MSF there is a 330kVA bunded Diesel generator linked to the grid to power MSF.

Operational movements

For 11 months of the year only one truck per week enters or leaves the site. This is to deliver feed, freight, or collect waste from Launceston. For the remaining month 10 tankers per day come from the channel district southern Tasmania to load fish at the end of the growing cycle. This occurs for 6 days a week for up to 3 weeks around May annually.

Licensing

The existing activity operates under the Fish Farm licence 52 (see Appendix 2) which was issued on the 1st of September 2018 and expires on the 31st of August 2021. The site also operates under the Water Licence Number 8089 (see Appendix 3) which expires on the 30th of November 2020. The following restrictions apply:

- Water use per day 43 ML
- Total water use per year 15695 ML

The site also operates under the Environmental Licence 9835/1 (see Appendix 4) which was issued on the 24th April 2018.

2.2 Proposed changes to existing facility

MSF has grown in response to increases in biomass requirements, due to grow out contracts, as and when required. Permit DA05.97.160 (issued by Launceston City Council on the 11th of September 1997 and amended on the 14th of October 2002) had a limit of 50 tonnes capacity which had been surpassed before the current manager commenced his employment. The capacity of the grow out ponds is limited to 30 – 35 kg per cubic metre of water in the flow through system and 50 -52kg per cubic metre in the grow out concrete tanks. MSF has 5650 m^3 and this gives MSF a maximum total production capacity of 181.5 tonnes. 2019 production was the highest at 159.2 tonnes. MSF management do not plan to exceed 162 tonnes (current contractual obligation) or 90% of capacity due to high risk of an adverse environmental impact resulting in reportable mass fish mortality. The remaining tonnage of brood-stock and second year class fish should not exceed 20 tonnes, MSF has reduced total biomass by culling surplus fish in outlying ponds 16, 17, 18, 21 and the retention dam.

This DPEMP also proposes the installation and use of a drum filter, see Figure 7. Three concrete tanks were commissioned in December 2017. The outfall from these tanks lead to a quiescent pond where 90% of solids drop out of the water column before the wastewater flows into pond 22. The installation of a 100µm drum filter will strip the waste from these tanks (see section 6.5) and pump it to three 24000l storage tanks and solid waste will be pumped off the farm by Veolia Pty Ltd.

MSF are also in the process of increasing biosecurity protocol by installing a bio-secure check-in station for visitors, workers and a truck disinfection station and a hardwaste collection. Construction on these structures were completed during the preparation of this DPEMP, in 2019.

At the time of preparing this report the drum filter for the three concrete tanks has been installed but will not be commissioned until this DPEMP has been approved. This is the only construction envisaged for MSF.

Figure 7: Site map of proposed changes with **1)** Truck Disinfection wash down Station, **2)** Hardwaste Collection Point, **3)** Visitor Check-in station, **4)** Cement tanks (commissioned 2017), **5)** drum filter, **6)** sludge tanks, **7)** Visitor and workers bio-secure check in station.

2.2 Construction

The only construction to be undertaken is the three sludge tanks to capture the waste. A drum filter was installed during the process of developing this report but will not be commissioned until the DPEMP is approved.

2.3 Commissioning

Commissioning for the drum filter is straight forward and requires only the installing of a pump and wiring to a 20-amp, 3-phase plug to start the operations of the drum filter. Commissioning of the drum filter will occur after EPA approval.

2.4 General Location Map

The MSF hatchery and grow-out facility are located on the banks of the St Patricks River. The land it occupies had previously been semi cleared for farming. The property is zoned as Rural Resource within the Launceston City Council Interim Planning Scheme 2015.

Site address:

38036 Tasman Highway
Targa, Tasmania 7256

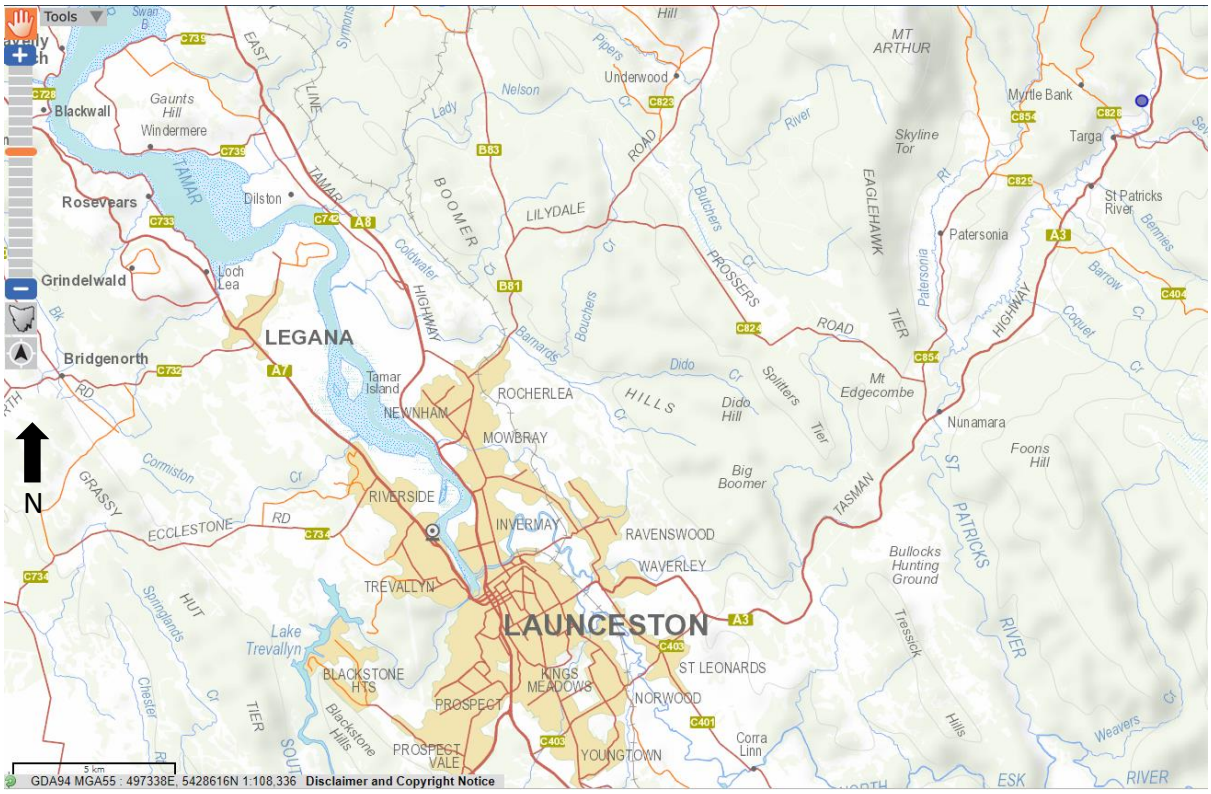


Figure 8: Location of the MFS hatchery site (blue dot) (sourced from DPIPWE (n.d); scale 1:3,385).

The farm is located on the western side of St Patricks River (as indicated by the brown boundary lines in Figure 8. From the river, a flood channel delivers water to the farm, diverted by a series of flood gates. Downstream of the farm, the water exiting flows into the flood plain which then re-joins the river 100 m away.

The farm is surrounded by farmland, with large areas occupied by dense vegetation and the closest residential structure is approximately 180 m from the edge of the farm due north. Downstream 2000 m is the Myrtle Bank Picnic Grounds and campground. There are seven residential structures adjacent to St Patricks River within 10km of the farm outfall. The land adjacent to St Patricks on the western side is classified as public reserve.

The western side of the farm is bordered by a ten-metre cliff that would serve as shelter for the farm (and any odours/noises that emanate from it).

2.6 Off-site Infrastructure

There will be no need for the construction of new off-site infrastructure or ancillary facilities to allow the proposal to proceed.

3. Project Alternatives

The rationale for increasing the hatchery production at Mountain Stream Fishery is to make full use of the available infrastructure and water to maintain commercial contracts with other aquaculture companies. Currently there are no other potential site locations for the additional production.

To minimise the impact of the farm's activities on the St Patricks River, a list of alternative wastewater treatment options has been explored to help to reduce nutrient levels in the discharge waters (see Table 5). None of these options are seen as a complete reduction in nutrient discharge but each should reduce the outfall nutrient discharge. Operationally, empty ponds will need to be available on the farm as procedures such as stripping the fish require emptying one pond of fish and moving to another. MSF intends to have 4 ponds empty across the site at any one time through the grow out season. Feed will include faeces binder which has been proven to increase nutrient retention after filtration (refer to presentation 'Sustainable Hatchery Feed Technology', Appendix 5.

Table 4: Improvement of filtration rates by faeces binder (sourced from Appendix 5).

Binder	**Improvement**
Total suspended solids	40.4 %
Total phosphorus	39.3 %
Total Kjeldahl Nitrogen	16.8 %

N.B. Data are average for 30, 60, 100, and 200 µm.

Conversion to a full recirculating facility is not feasible. Discussions with Billund Aquaculture CEO, Mr Patrick Tigges, have been ongoing. Initial estimates of four to six million dollars, depending on the size of the facility (160 -240 tonnes per year) are a realistic opinion of Billund Aquaculture . A recirculating facility would also grow fish at a faster rate, which paradoxically, would lose MSF's advantage of slow grown fish. A re-use of water system may be possible, however MSF currently re-uses water via its "u-tubes" and recirculation pumps, so little is required to achieve 20% re-use of current water supply per day.

Aeration of current empty deep ponds (15,16,17,19, and 22) by utilizing existing air blowers and 20 new Clayton Force 7.2 Aerators will be conducted in the 2020-21 growing season. Currently all grow-out raceways and tanks are heavily oxygenated with one hundred and fifty six MBD600 0.4 mm Diffusers dispersing up to 600 litres per minute of oxygen to the fish as they grow.

Table 5: Overview of alternative wastewater treatment options

Option	Description	Cost	Advantages/ Disadvantages
Settlement pond	Empty pond 21 of fish and utilise as a settlement pond. This would need controlled flow and the settled sludge emptying annually.	Low	A: Pond already exists. D: Ongoing maintenance will require a truck to come on site to remove accumulated sludge. It is also possible that this alone will not reduce the dissolved nutrients. *N.B. This outcome has already been achieved as of May 2019.*
Drum filter	Install a drum filter in the outlet raceway to collect solids and filter the water.	High	A: Capturing solids is a very efficient way to reduce nutrients. D: Very costly to install the technology and would need to set up infrastructure to capture solids and pay to truck it offsite. It is also likely that the drum filter will not remove dissolved solids. *N.B. this option is currently being undertaken*
Floating wetlands	Utilise the space provided in the retention dam to install floating vegetation to increase processing of nutrients.	Low	A: A sustainable way to recycle nutrients. D: Would need to replace vegetation regularly. May not be effective at the exiting flow rates on the farm.
Aquaponics	The use of the fish ponds (and nutrients within) to grow edible vegetation.	Medium	A: A sustainable and economical way to recycle nutrients. D: Would require a lot of changes to the infrastructure and take time to learn the process. Not commercially viable.
Convert to RAS system	Convert the farm into an entirely closed Recirculated Aquaculture System.	High	A: Full control of water usage and wastes D: highly expensive and structurally unfeasible.

4. Public Consultation

The DPEMP will be advertised in a local newspaper and made available for public viewing for a period of 28 days. No other consultation is planned.

5. The Existing Environment

5.1 Planning Aspects

The site is located at 38036 Tasman Highway, Targa (see section 2.4 for full details). The land is zoned as Rural Resource within the Launceston City Council Interim Planning Scheme 2015. In the event of any structural additions or modifications of waterways, the Road and Railway Assets Code (LCC Code E4) and Water Quality Code (LCC E9) may apply. As this proposal does not require any construction or modification of existing waterways, these codes will not be elaborated on.

The land on which the site is located is owned by the proponent, Mr Taras Malahoff. The boundaries are shown by the pink lines in Figure 9. A 'Right of Carriageway' easement exists on the eastern boundary which provides access to 38038 Tasman Highway, Targa. This residence is 180 meters from the northern boundary of the site.

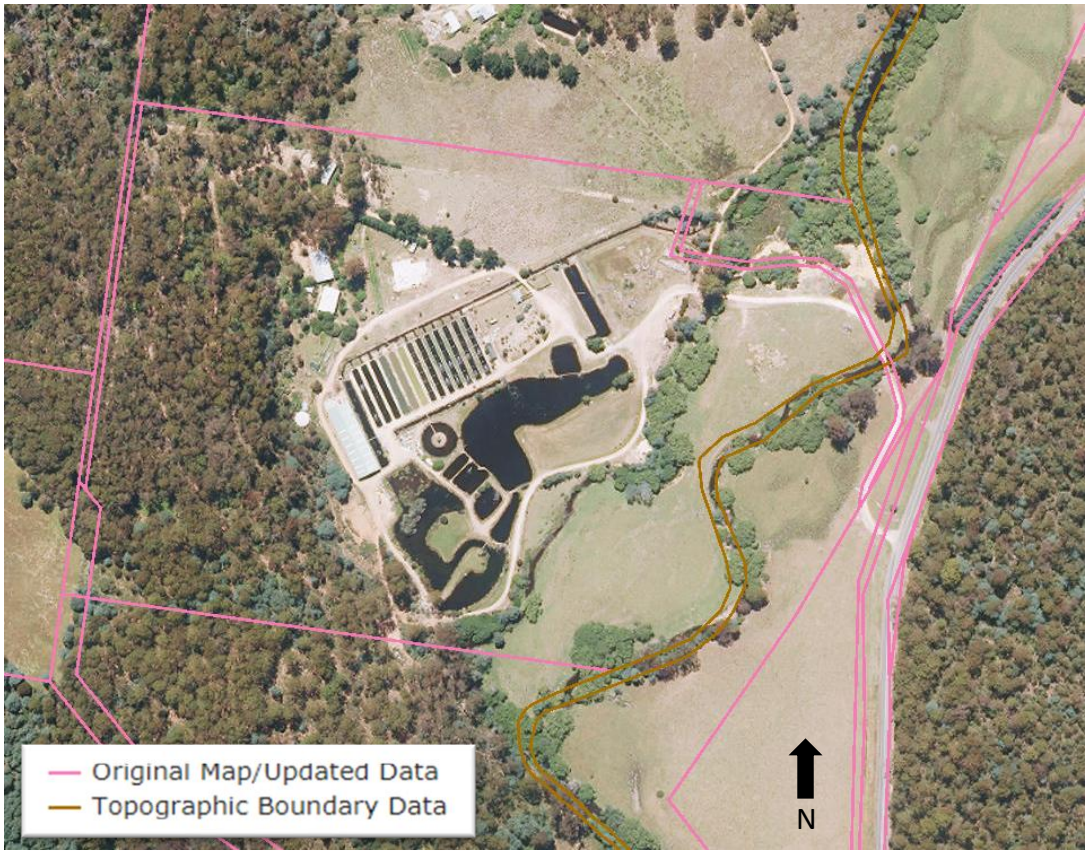


Figure 9: Location of the MFS hatchery site (sourced from DPIPWE (n.d); scale 1:3,385).

Existing buildings include a residential dwelling (residence of the owner/proponent); a hatchery; a storage shed; a diesel storage shed; a gravity fed water tank next to the hatchery; the 14 raceways; and three concrete tanks (recently commissioned). In early 2019, a concrete truck disinfecting station was constructed and a small Visitor and Worker bio secure check-in station (both for biosecurity reasons).

The site is surrounded by farmland and two residences (see section 2.4 for more detail).

There will be no modification to waterways/waterbodies at this stage in the proposal and as such there will be no approvals will be required. There are no new dams proposed for this DPEMP but dams will be maintained through desludging (see Section 6.5 Waste Management for details).

The only filtering that is currently done on site using technology is conducted at the inlet (the drum filter that removes solids prior to the concrete tanks). The filtrate from this filter is discharged back into the flood channel that runs to the east of the farm. There are no other forms of filtering on the farm. All water subsequently exits the farm from the outlet (through the 'wetlands').

5.2 Environmental Aspects

Topography

Mountain Stream Fishery is located at Targa which is next to Myrtle Park. The site is in a valley next to the St Patricks River that runs from Ben Ridge in the east (at an elevation of 925 m) and runs 68 km downstream till it merges with the North Esk River (at 218 m). To the west is the Mount Arthur Forest Reserve and to the east is the Mount Maurice Forest Reserve.

Climate

The local climate for Targa includes a long term average minimum temperatures of 5.9°C and maximum temperatures of 14.8°C, see Figure 10. However, for 2019 the hottest temperature so far for was 33.7°C (24th January 2019) and coldest was 1.6°C (31st March 2019). As with the rest of Tasmania, Targa has four distinct seasons.

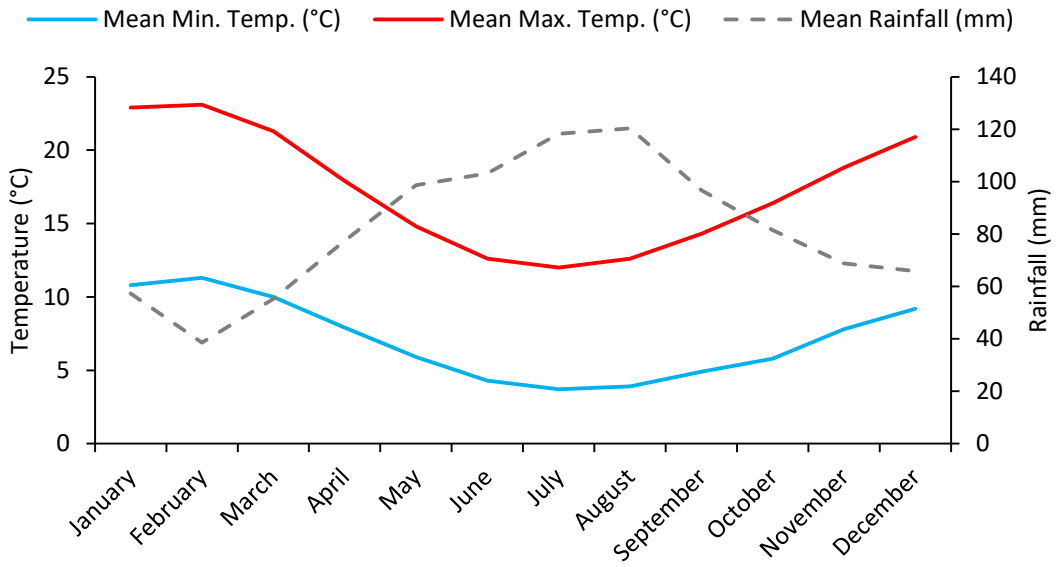


Figure 10: Monthly average minimum and maximum temperatures (°C) and monthly rainfall (mm) (summary statistics from all years of data recorded by the Bureau of Meteorology (BOM, 2013).

Geology and geomorphology

The area around the site is predominantly siltstone, with inter-bedded quartz-rich sandstone increasing towards the top. The area around includes parmeener and dolerite to the south and Devonian granite to the east (McClenaghan et al. 2011). Siltstone is defined as a sedimentary rock that is comprised of particles that can be between 0.002 mm and 0.06 mm. It is formed from the deposition of silt at the bottom of bodies of water (Open Learn, 2006).

Soils

The site has a rating of Nil to Low for the wind erosion hazard (DPIPWE, n.d.). This means there is a nil to low chance of the wind transporting soil particles to other areas of the site. The site is categorised as Nil for Soil Sodicity Hazard which means there is an appropriate amount of sodium held in the soil. There is a Very low risk of Hillslope erosion for most of the site as it is a flat area. On the western side of the site where there is a steep cliff, there is an extreme hillslope erosion hazard which means there is an increased risk of moving soil/debris. Approximately 1/3 of the site has a low risk for inland acid sulphate soils. Acid sulphate soils are harmless until exposed to air. When exposed to oxygen, a chemical reaction causes sulphuric acid to be released which can be detrimental to buildings, roads, and other structures (Queensland Government, 2017).

Vegetation

The vegetation on site is classified as non-forest as it is a residential property. To the west of the property is Tall Eucalypt forest and to the south are Low Eucalypt forest (DPIPWE, n.d.).

Fauna

There are no restricted, or threatened species currently recorded within a 4km radius of the site. Two species of conservation significance, water rat (*Hydromys chrysogaster*) and platypus (*Ornithorhynchus anatinus*) have been recorded on site.

Groundwater

See section 6.3. Groundwater.

Natural Processes

The site is classified as a Type 2 Bushfire Interface Area (DPIPWE, n.d.). This means that the area is a blend of vegetation and structures. The most recent bushfire occurred north of the site (<400m) in November 2016.

There is a flood gate at the entrance to the facility which controls water intake in high flow periods on the St Patricks River. In the unlikely event of increased water flow (or flooding) from the St Patricks river, the flood gate is lowered to a point at which the water is diverted over a spillway back into the St Patricks river.

In June 2016, the property experienced a one in one-hundred-year flood. The whole property was inundated (see Figure 11), however, the production fish had already been sent to sea sites minimizing the risk of escapees. The hatchery building lost in the order of 35 000 fish that were < 40 g in size and an unknown quantity of brood stock escaped. Discussions with the water management department of DPIPWE and Inland Fisheries Service concluded that in that instance, no storm water protection would have stopped inundation of MSF. The only remedial action that could be taken was to ensure all screens were clear of debris enabling flood waters to subside through controlled outlets (see ASOP2807 Preventing Accidental Release, Appendix 6).

Figure 11: The entrance to the hatchery shed inundated with water during the '100-year flood' of June 2016.

Conservation Reserves

There are no existing conservation reserves within 500 m of the site (DPIPWE, n.d.).

High Quality Wilderness Areas

High Quality Wilderness areas are defined in the Tasmanian Regional Forest Agreement as an area having a National Wilderness Inventory (NWI) rating of 12 or larger. By this definition, there are no High-Quality Wilderness Areas near the site (Parks and Wildlife Service, 2004).

Species, sites of areas of special conservation significance

The area is renowned for platypus and the farm is a site for the permitted capture of platypus for Platypus House. Platypus House uses permits provided by Parks and Wildlife and Inland Fisheries Service and believe MSF and the St Patricks River is a 'wonderful environment' for platypus. An Australian Rivers Assessment System survey is conducted twice a year into macroinvertebrates with an 'A' grade rating achieved both upstream and downstream of MSF (see Appendix 7). A summary of this study is provided in 'Pre-existing Monitoring Programs" below.

Hydrological characteristics

The water flow for 2018 recorded in the St Patricks River is provided in Figure 12 as sourced from the DPIPWE website. The 7Q10 was calculated for the years 2009 to 2018 was found to be 0.0107 cumecs which occurred in January 2016 (data sourced from Water Information Tasmania Web Portal (DPIPWE 2019).

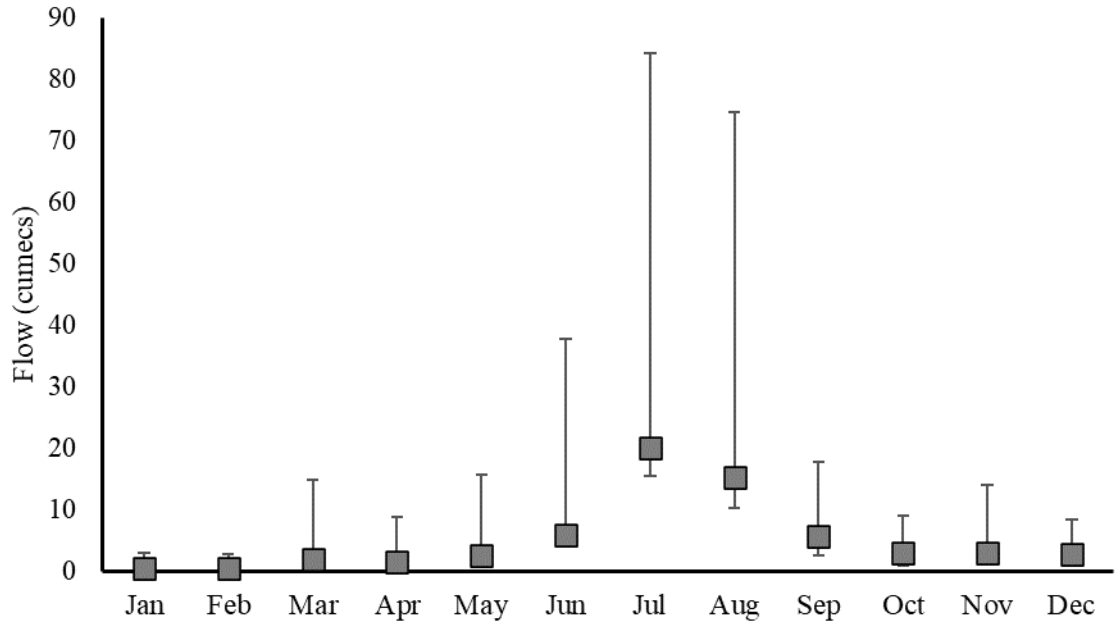


Figure 12: Mean monthly flow (cumecs) with the minimums and maximums (whiskers) for 2018 at site 441-1 St Patricks River @ Nunamara Offtake (data sourced from Water Information Tasmania Web Portal (DPIPWE 2019))

Pre-existing monitoring programs

A series of surveys was conducted by Todd Walsh of Kanunnah Pty Ltd during 2017 and 2018. Two sites were chosen by Mr Wash for sampling that represented "upstream" of the site and "downstream" of the site, see Figure 13. This report demonstrated that the sites (see Figure 13) both upstream and downstream had a rating of "A" and that a range of sensitive taxa were recorded, including 7 families of Trichoptera (Caddis-fly) and 2 families of Ephemeroptera (Mayflies). Overall, it was concluded that '*There is no significant difference in the health of the upstream or downstream sites according to AusRivAS results'* (Walsh, 2019). The full report is available in Appendix 7 and a summary of the results is provided in Table 6.

Overall, the O/E score for both sites is A for all years with scores higher at the downstream site than the upstream site for two out of the three collection periods. Thus, any changes in species composition are having little to no impact on stream health. This is consistent with achievement of both High Conservation Value and Slightly to Moderately Disturbed biological DGVs for the North Esk river catchment.

Figure 13: Location of sites sampled in the AUSRIVAS survey conducted by Walsh (2019) (sourced from DPIPWE (n.d); scale 1:3,385) .

Table 6: Summarised river health assessment data (AUSRIVAS) for St Patricks River riffle sites upstream of MSF site (S01) and downstream of MSF site (S02) (Walsh, 2019).

Site	Season	O/E Taxa	Band	Rating
St Patrick S01	2017 Spring	1.03	A	Similar to reference
	2018 Autumn	1.00	A	Similar to reference
	2018 Spring	0.87	A	Similar to reference
	2019 Autumn	1.06	A	Similar to reference
	2019 Spring	1.13	A	Similar to reference
St Patrick S02	2017 Spring	0.95	A	Similar to reference
	2018 Autumn	1.14	A	Similar to reference
	2018 Spring	0.95	A	Similar to reference
	2019 Autumn	0.87	A	Similar to reference
	2019 Spring	0.95	A	Similar to reference

Water quality monitoring

Water quality monitoring commended in January 2017. Early data from January 2017 to June 2017 was collected fortnightly by staff from AST. Since then water quality samples have been taken by MSF staff at varying time scales from quarterly in 2018, monthly from December 2018 to August 2019 to fortnightly during the production season (November to May) and monthly through winter. Sampling has largely continued with the original sites AST data collection with the exception of the mixing zone site. Originally this site was immediately below the confluence of the flood channel with the St Patrick's river. This site was approximately 110m downstream of the outlet and did not allow for mixing to occur. Data collection for the mixing zone did not occur in 2018/19, with samples taken at the inlet and outlet only. Monitoring of the mixing zone recommenced in November 2019 with the monitoring site moved further downstream to 250m below the outlet. The location of monitoring sites used from November 2019 onwards is shown in Figure 14. This figure shows an additional 'weir sampling site' that has recently been added (Aug 2020) to test the validity of the 'inlet' sampling site as upstream site unimpacted by the fishery.

Figure 14: Mountain stream fishery water quality monitoring sites from 2018 onwards

Grab samples are taken consecutively from the weir, inlet, outlet and 250m downstream site starting at 8am with the last sample taken at around 9am from the 250m site. Water samples are sent to AST labs for analysis. Samples are tested for Conductivity, Total Suspended Solids (TSS), Ammonia, Nitrate, Nitrite, Nitrate+Nitrite, Total Nitrogen, Total Kjeldahl Nitrogen (TKN), Biological Oxygen demand (BOD), Dissolved Reactive Phosphorus (DRP) and Total Phosphorus (TP). Beginning in November 2020 Biological Oxygen Demand will be

discontinued and replaced with Organic Carbon analysis. Table 7 provides summary statistics of this data for inlet, outlet and 250m locations. Figures showing all the data in detail are provided in Appendix 9.

Table 7: Summary statistics for water quality samples from MSF site and mixing zone.

	Inlet				Outlet				250m downstream (mixing site)			
	Min	**Median**	**80th percentile**	**Max**	**Min**	**Median**	**80th percentile**	**Max**	**Min**	**Median**	**80th percentile**	**Max**
Conductivity	30	53	57.8	74	45	55	61	73	47	56	61.2	69
TSS (mg/L)	1	2	4	31	1	3	4.8	7	1	2.5	4.2	5
Ammonia (mg/L)	0.0025	0.006	0.012	0.02	0.0025	0.17	0.386	0.59	0.008	0.125	0.236	0.37
Nitrate (mg/L)	0.063	0.16	0.24	0.4	0.11	0.21	0.298	0.37	0.13	0.22	0.26	0.31
Nitrate + Nitrite (mg/L)	0.065	0.17	0.24	0.4	0.12	0.23	0.32	0.38	0.14	0.225	0.268	0.35
Nitrite (mg/L)	0.001	0.001	0.003	0.006	0.001	0.007	0.012	0.047	0.001	0.005	0.013	0.038
TN (mg/L)	0.28	0.44	0.576	0.78	0.37	0.67	1	1.4	0.38	0.645	0.854	1.3
TKN (mg/L)	0.14	0.22	0.374	0.64	0.16	0.51	0.788	1.1	0.21	0.425	0.656	0.91
DRP (mg/L)	0.002	0.004	0.006	0.007	0.002	0.050	0.092	0.14	0.002	0.028	0.072	0.13
TP (mg/L)	0.005	0.01	0.020	0.04	0.01	0.09	0.134	0.191	0.02	0.046	0.104	0.177
BOD (mg2/L)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5

Protected Environmental Values (PEVs)

The Protected Environmental Values (PEVs) are the current uses and values of the waterway and provide a strategic framework for management, (DPIPWE, 2005). St Patricks River is a part of the North Esk Catchment and the following PEVs relate to surface waters flowing through Private Land:

A: Protection of Aquatic Ecosystems

(ii) Protection of modified (not pristine) ecosystems

a. from which edible fish are harvested

B: Recreational Water Quality & Aesthetics

(i) Primary contact water quality (St Patricks River, North Esk at St Leonards, Dicksons Land, Distillery Creek, Diddleum Plains, Corralinn Bridge, Scout Island at Corralinn, Myrtle Park, Nunamara Bridge, Lady Nelson Creek, Dilston Falls, Waverly Dam, York Town Rivulet)

(ii) Secondary contact water quality

(iii) Aesthetic water quality

C: Raw Water for Drinking Water Supply (Town water offtakes at Nunamara, Distillery Creek and Watery Plains).

(ii) Subject to coarse screening plus disinfection D: Agricultural Water Uses

(i) Irrigation

(ii) Stock watering

E: Industrial Water Supply (Fish farming – North Esk)

That is, as a minimum, water quality management strategies should seek to provide water of a physical and chemical nature to support a healthy, but modified aquatic ecosystem from which edible fish may be harvested; that is acceptable for town drinking water at Nunamara, Distillery Creek and Watery Plains (subject to coarse screening plus disinfection); that is acceptable for irrigation and stock watering purposes; which will allow people to safely engage in primary contact recreation activities such as swimming a St Patricks River, North Esk at St Leonards, Dicksons Land, Distillery Creek, Diddleum Plains, Corralinn, Myrtle Park, Nunamara Bridge, Lady Nelson Creek, Dilston Falls, Waverly Dam, York Town Rivulet and secondary contact recreation activities such as paddling or fishing in aesthetically pleasing waters and which is suitable for fish farming on the North Esk at Corralinn.

5.3 Socio-economic Aspects

There are 33 people who reside in Targa and the average age ranges from 40 to 59. Of the residents in this suburb 82% own their own home versus 18% who rent. It has also been found that 56% of residents are families and 44% are single (sourced from domain.com). There are no special characteristics that may make the region more susceptible to the impacts from the proposal.

Only one property is advertised at the time of preparing this report which is being sold for $195,000 for ½ an acre. There are few local businesses in Targa, which includes a machinery manufacturer and the Myrtle Park Camping ground down the road. The area is considered rural and would not be a hub of activity for businesses that are able to employ locals.

6. Potential Impacts and their Management

6.1 Air Quality

Tarkarri Engineering was commissioned to conduct an air quality assessment as part of this DPEMP. The report addressed the DPEMP guidelines that were issued by the EPA. A summary of the key elements of the report can be found below and the report is attached as Appendix 8.

Air emission assessment summary

Potential odour sources were identified and published emission rates used to model emissions from the hatchery using CALPUFF (see Figure 15 below and Table 4-3 of Appendix 8 for full details). Odour emission rates ranged from 1 OU/s (tanks) to 351 OU/s (sludge tanks). The modelling predicts that the site will not be compliant with the EPPair, however, it has been assessed that environmental nuisance or environmental harm is highly unlikely.

On the southern boundary, the 2 OU criterion is exceeded due to the proximity of the composting windrow however, the adjoining land has no sensitive uses. The maximum predicted odour concentration at the southern boundary was < 6 OU. Control of the composting process to minimise the potential for upset such that the penetration of high odour concentrations onto the adjoining land is minimal and is considered to not unreasonably constrain the use of the adjoining land to the south.

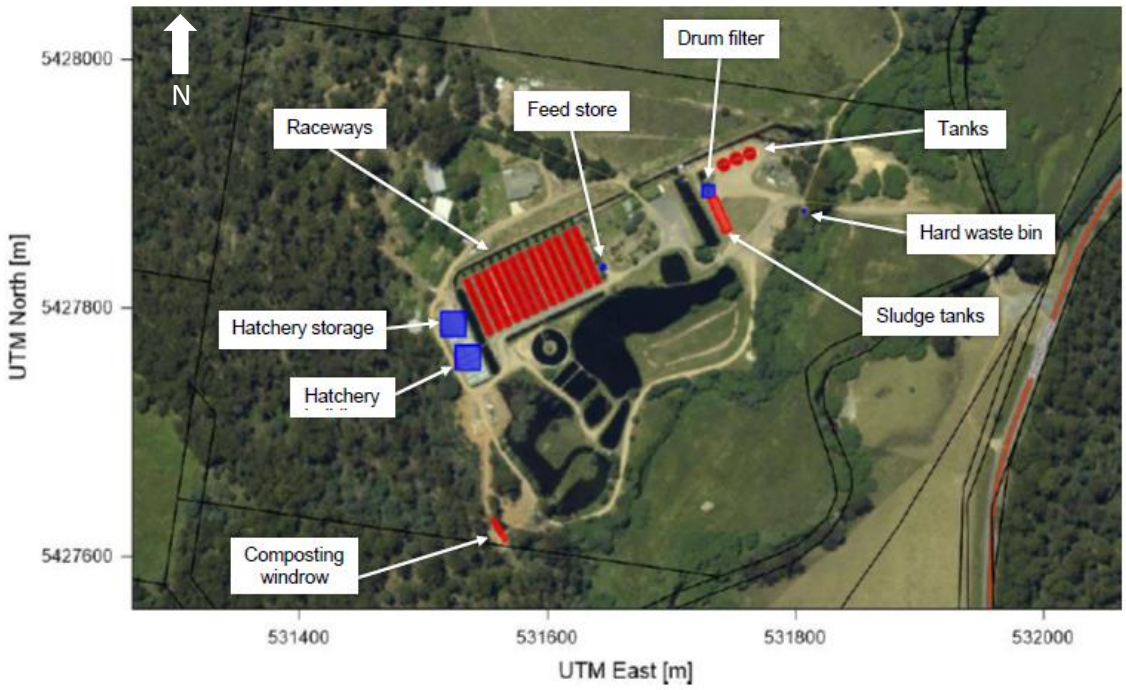


Figure 15: Aerial view showing odour emission source locations.

Predicted odour emission concentrations are below the Tasmanian EPPair criterion level of 2 OUs at or beyond the northern, eastern and western boundaries of the land.

It was also found that:

- The dominant wind directions are Northerly and South-Westerly, year-round.
- Wind speeds are relatively low and show a small drop to typically below 2 m/s during the night.
- Mixing height (height above ground that a pollutant will be mixed) is generally highest in the mid-late afternoon at an average of about 1.5 meters.
- There are relative unstable atmospheric conditions during the day (higher atmospheric motion) and less dispersive conditions at night.

<u>Odour modelling methodology</u>

Dispersion modelling of odour emissions from the MSF hatchery has been undertaken in accordance with the Tasmanian Air Dispersion Modelling Guidelines, utilising model set up parameters outlined in sections 4.2 of this report, to assess the predicted 99.5th percentile ground level concentrations (glc's) of odour (in odour units: OU) as required under schedule three of the Tasmanian EPPair.

CALPUFF was utlised here for the modelling of odour emission from the MSF hatchery and to generate the broad scale meteorological inputs to run CALPUFF, this study has used The Air Pollution Model (TAPM). CALMET is an advanced non-steady-state diagnostic three-dimensional meteorological model with micrometeorological modules for overwater and

overland boundary layers. The model is the meteorological preprocessor for the CALPUFF modelling system.

Three modelling scenarios were considered as follows:

1. Emissions modelled with area sources (runways, tanks, sludge tanks and composting windrows) and volume sources (hatchery, hatchery storage, feed store, drum filter, and hard waste bin), (see Table 4-3 of Appendix 8).
2. Emissions from the compost windrow increased to 30 OU.m2/s across the entire surface area to represent upset conditions.
3. Emissions from runways 12 and 13 and the sludge tanks increased as follows to represent cleaning out of built up sludge.

<u>Odour modelling results</u>

The following figures present odour glc contours for each modelled scenario projected onto an aerial view. All odour sources listed above were modelled. The glc for each contour (in OU) is provided (white number on black background) with the 2 OU (regulatory criterion) contour highlighted in turquoise. The location of the odour sources and nearest discrete receptor are also shown.

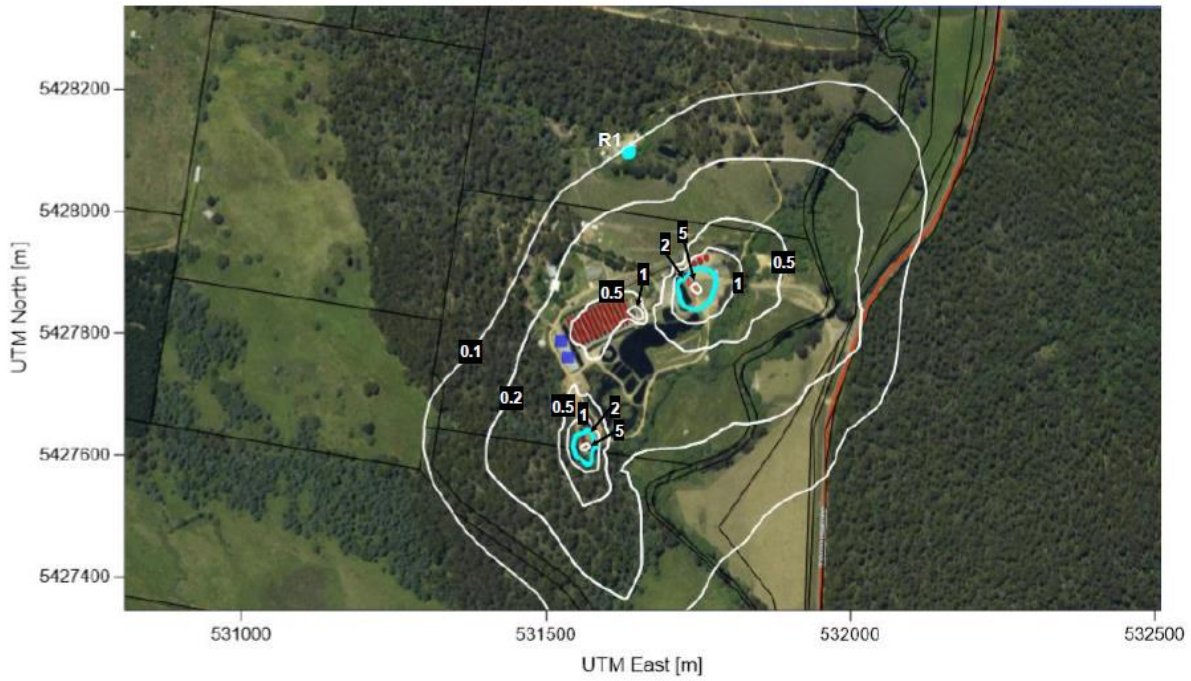


Figure 16: Aerial view showing predicted 99.5th percentile 1-hour average glc odour contours (in OU), scenario 1.

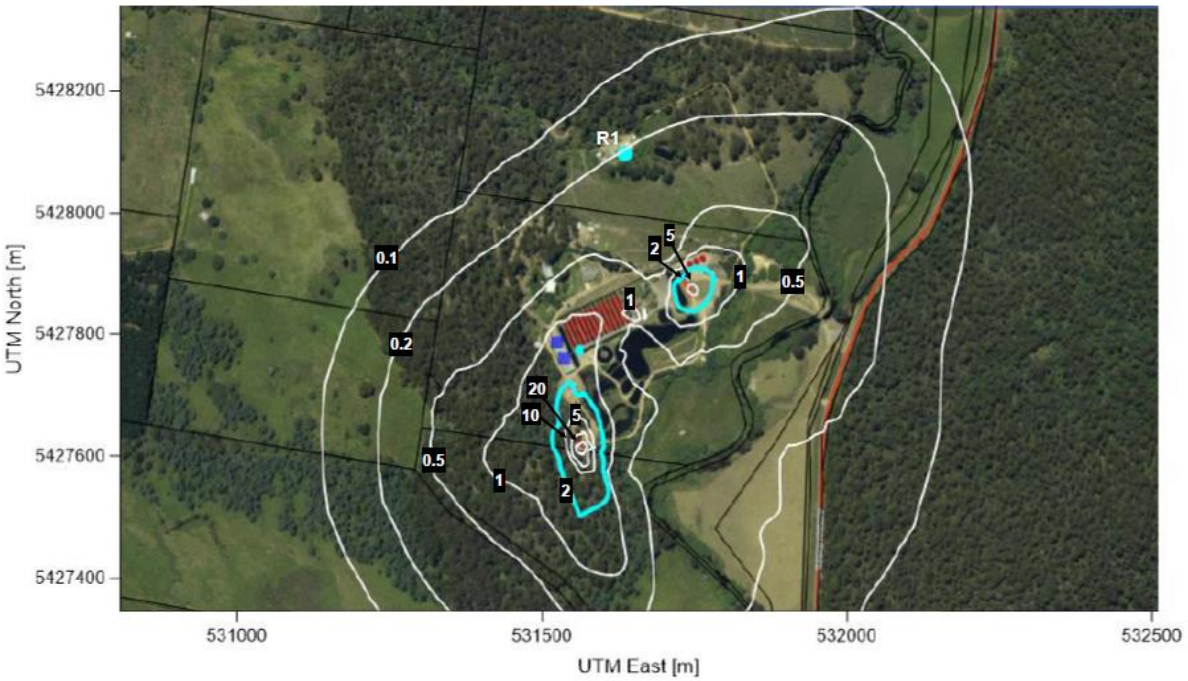


Figure 17: Aerial view showing the predicted 99.5th percentile 1-hour average glc odour contours (in OU), scenario 2.

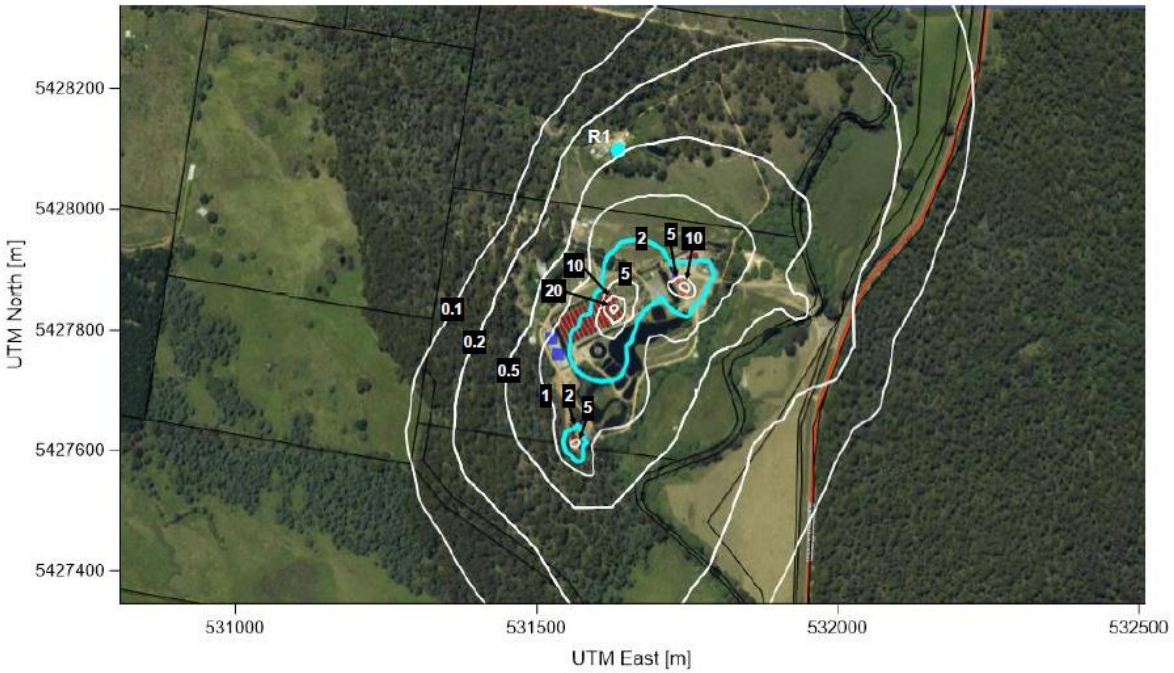


Figure 18: Aerial view showing predicted 99.5th percentile 1-hour average glc odour contours (in OU), scenario 3.

Recommendations

The results of the modelling indicate that the site will not be compliant with the EPPair criterion level of 2 OUs but it is highly unlikely to cause environmental nuisance or harm. On the southern boundary, the 2 OU criterion is exceeded due to the proximity of the composting windrow however, the adjoining land has no sensitive uses. The adjoining land is largely covered in native forest and pasture. The maximum predicted odour concentration at the southern boundary was < 6 OU.

Processes and scenarios with the potential to increase odour emissions from the hatchery above those modelled here are discussed in section 5 of the report (See Appendix 8) and are summarised as follows:

- Collection of sludge via a vacuum truck usually emit odorous air to the atmosphere. Management of this risk include treatment of vented air (i.e. with activated carbon).
- Upset conditions could produce high odour emission levels from the compost windrows. Management of this risk include turning of windrows, and application of water during dry periods to maintain optimal internal temperature, oxygen concentration and moisture content.
- Use of bulking agents (such as wood chips) to allow diffusion of oxygen.
- Nutrient availability of feedstock for optimal CN ratios. Nitrogen would be available from the decomposing fish while carbon would be added via the addition of woodchip.
- pH range for optimal composting is typically between 5.5 to 9. pH is particularly important for composting materials that are high in nitrogen as these have the potential for ammonia generation at high pH. This can be controlled with addition of acidifying agents to reduce pH.

With the success of this application, it is unlikely there will be any new atmospheric discharge points. During the arrival and departure of tankers, short bursts of diesel fumes are likely to be released. Live fish will not be an issue as they are pumped directly into water in the tanker.

Characteristics and potential volumes of each source are provided in Table 8.

Table 8: Characteristics, volumes, emission rates and frequencies of each potential odour source.

Source	Characteristics	Volume	Rates	Frequency	Management
Windrows	Amine "fishy" rotting aromas (cadaverine and putrescine)	~2000kg /year	Annually	Daily (5-6 kg/day)	*Covered straight after collection with minimum 150 mm native wood chipped waste for composting and odour negating*
Trucks and generator	Distillate fumes	Minimal	Annually	Infrequent	*Ensuring vehicles and generators have Diesel particulate filters*
Waste from Drum screen	Fish Faeces	Provided upon commissioning of drum filter.			*Receival tanks will have water locks to contain any odours within the tanks (for more information see Section 6.5).*
Desludging of ponds	Sludge and fish faeces	30 tonnes	As required	Infrequent	*Under discussion.*

6.2 Surface Water Quality

Current water management

Surface water quality is currently managed as follows:

1. Solids that settle out of the water and into pond 22 and the retention dam are removed on an as-required basis: These bodies of water serve to slow the water as it moves through the farm. The suspended solids in the water is made up of fish waste and leftover food particles which will settle through the water column to the bottom. At the bottoms of the ponds, this accumulates in the form of sludge and can be removed as required (see section 6.5 Waste Management for full details on the removal process).
2. Water passes through the wetland system before exiting the farm which allows for plants to absorb nutrients: The wetland system consists of various plants that are suitable for absorbing the dissolved nutrients that exists in the water. The wetland is the final section before exiting the farm at the outlet. With the solids settled out, the roots of the aquatic vegetation are able to absorb the nitrates in a process call denitrification.
3. Oxygen generators are used to add dissolved oxygen to the water: An oxygen generator is stationed onsite next to the raceways with purposed of oxygenating the water. Extra U-tubes are also going to be installed near pond 15 with the ability to pump dissolved oxygen into the water. This will increase the oxygen in the water as it exits the farm as well assist with the denitrification process.

The approval of this DPEMP will allow for MSF to commission the drum filter which will remove solids from the three concrete tanks, and install U-tubes which will be used to increase oxygen in the raceways which will therefore increase DO in the effluent water.

Stormwater is managed through the use of a flood gate at the entrance to MSF. The flood gate is a large galvanised plate door that is fixed between nylex sliders. The door is wound up and down using a large handle on a 25mm threaded mechanism. Typically, movements of 100 mm up or down are used to control water flow. The inlet gate is at approximately 410m elevation above sea level. Water in the dam and ponds is controlled on the lower part of the farm by a levee bank. This has been constructed to engineer standards for a one in one hundred flood event to prevent escapee fish in any major flood event. The outfall pipe, as previously described, is at approximately 407m elevation. A 500 mm rising to 1000 mm high levee bank controls waste and flood waters to the outlet pipe, see Figure 19.

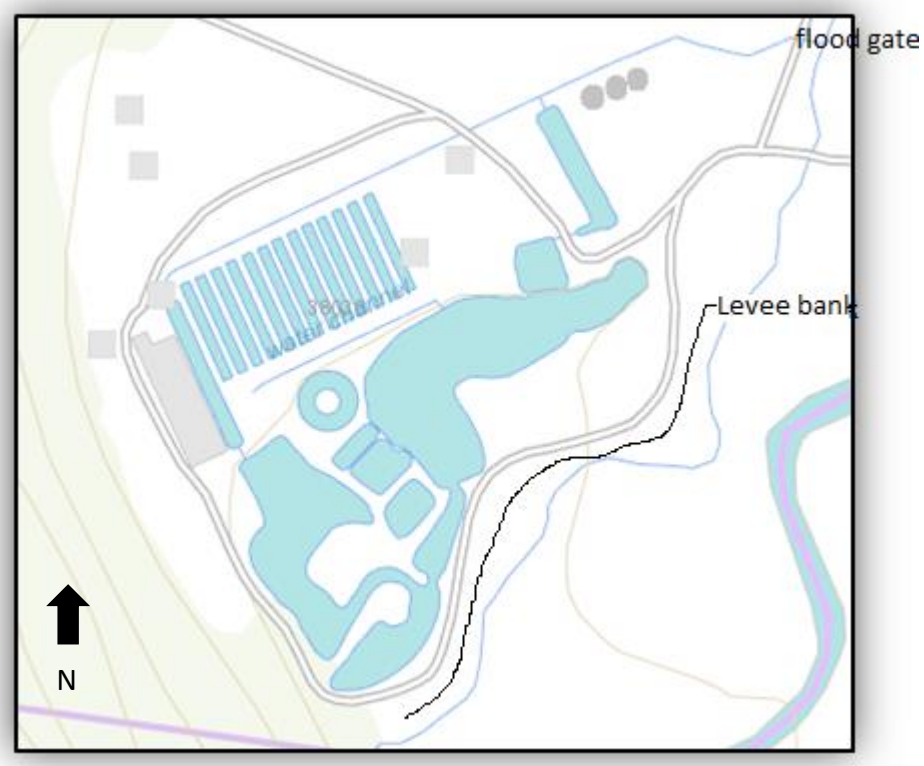


Figure 19: Storm water management map.

Site-specific trigger values

Site specific trigger values were published for the North Esk at Ballroom by DPIW in 2008. More recently slightly modified default guideline values for the North Esk catchment have been released by EPA. These have been compared with the 80th percentile of data collected at the inlet (ie. upstream) of the fishery (see Appendix 9). This comparison found that while there were differences between the 3 sets of values, the inlet provides a reasonable reference condition for the St Patricks River in the vicinity of the fish farm which could be expected to achieve protection of modified aquatic ecosystem values for the river. These trigger values will be refined as more data on background river water quality becomes available through ongoing monitoring at the inlet. Recommended trigger values are given in Table 9. These should continue to be refined as more monitoring data becomes available.

Table 9: Recommended trigger values based on 80TH percentile of inlet concentration unless otherwise noted

Parameter	Recommended trigger value
TN (mg/L)	0.576
Nitrite (mg/L)	0.003
Nitrate (mg/L)	0.24
NOx (mg/L)	0.24
Ammonia (mg/L)	0.012

TP (mg/L)	0.02
DRP (mg/L)	0.006
TSS (mg/L)	4
Dissolved oxygen (%)[1]	91 – 102
pH[2]	6.4 – 7.4
Field conductivity (µs/cm)	57.8

Current water quality

A detailed analysis of monitoring data for the inlet, outlet and mixing site relative to the proposed site- specific trigger values is provided in Appendix 9. This analysis shows:

- The proposed site-specific trigger values are currently met at both the outlet and mixing zone site (250m downstream) for NOx, nitrate, TSS and conductivity. The site acts as a sink for TSS in times of high sediment concentrations in the river.
- TP, TN, TKN, nitrite and nitrate all exceed the proposed sit specific trigger values but are of the same order of magnitude.
- Effluent DRP and ammonia are significantly elevated, with median concentrations an order of magnitude higher than the site-specific trigger value at both the outlet and the mixing zone site.

These results are also reflected in an analysis of load contributions of the farm and catchment. This analysis showed ammonia and DRP loads downstream of the farm are dominated by loads from the MSF site. TP loads from the MSF site are also substantial compared to those from the catchment. MSF loads of other pollutants tend to dominate only on very low flow days when these is little flow and thus load from the catchment, and where farm concentrations are likely to be high due to the use of recirculation within the farm.

Expected impact of management improvements on discharged concentrations

MSF propose to undertake 3 key actions over the next 12 to 18 months to improve the quality of water being discharged from the site:

- Further destocking of non-production fish in the ponds. It is planned that 3.7 tonnes of fish will be removed by the end of 2021.
- Installation of a drum filter with 3 concrete storage tanks where sludge will be stored before being transported off-site. This will treat effluent from 16.5% of fish biomass onsite. This is expected to decrease TSS, TP and dissolved nitrogen effluent concentrations.
- Installation of aeration at various sites within the farm. All ponds except pond 17 and the retention pond will be aerated. This is expected to increase dissolved oxygen and reduce ammonia, nitrate and nitrite discharges.

[1] Based on site specific trigger values for North Esk at Ballroom
[2] Based on site specific trigger values for North Esk at Ballroom

Further detail on the expected impacts of these actions on water quality discharged from the farm is given in Appendix 9.

Effluent quality limits (EQLs)

A staged approach based on continual improvement towards achievement of trigger levels 250m downstream is proposed. This involves:

- Interim EQLs for 24 months based on current water quality are proposed to ensure no degradation of water quality over this period. No limit on BOD is proposed given it remains below the limits of reporting for all days monitoring.
- Assessment of trends towards achievement of trigger values in light of improved management of the farm. The estimated median, 90th percentile and maximum concentrations as a result of improved management provide values against which these trends can be assessed are provided in Appendix 9.
- Revised EQL based on ongoing monitoring including refined estimates of trigger values, trend analysis and considering improvements in water quality that have occurred in response to changes in management over the period.

Proposed interim EQLs are given in Table 9. Note that no EQL is proposed for BOD. Given that BOD has remained below the limits of reporting for all days monitored at all sites it is recommended that future monitoring instead measures Total Organic Carbon (TOC) and Dissolved Organic Carbon (DOC) and that this data is used to assess whether an EQL for either or both of these parameters should be developed when EQLs are being revised. No interim EQLs are proposed for dissolved oxygen and pH but trends in these values should be considered and assessed against site specific trigger values and SMD DGVs for the North Esk.

Table 10: Proposed Interim EQLs for 24 months

Parameter	**Median**	**P90**	**Max**
Nitrate+Nitrite NOx (mg/L)	0.23	0.338	0.38
Nitrite (mg/L)	0.007	0.019	0.047
Nitrate (mg/L)	0.21	0.334	0.37
Ammonia (mg/L)	0.17	0.418	0.59
TKN (mg/L)	0.51	0.888	1.1
TN (mg/L)	0.67	1.2	1.4
DRP (mg/L)	0.050	0.11	0.14
TP (mg/L)	0.09	0.159	0.191
TSS (mg/L)	3	6	7
Conductivity (µS/cm)	55	62	73

Operational monitoring and maintenance needed for wastewater treatment system

MSF is conducting monthly water quality sampling during June to October, November to May fortnightly sampling is the practice. Sampling is at four sites, Weir, Inlet, Outlet and 250 metre mixing zone. These samples will be used to assess compliance with interim trigger values as well as to assess the overall effectiveness of the additional wastewater treatment measures being installed (drum filter and aerators). The weir site will be monitored for 12 months to assess whether or not the inlet site is representative of conditions in the river upstream of the farm or if it is likely to be impacted by activities on the site. A decision about ongoing monitoring at this site and/or the inlet site will be made using this assessment. The Drum filter will operate from October to May and, whilst in operation, daily monitoring of the 100 µm drum filter will be conducted to ensure effective operation. Maintenance of the drum filter will be conducted as per the operational manual and in the event of a break down the quiescent pond will be employed whilst any problems with the drum filter are rectified. The sludge collection tanks will be emptied every 2 months unless peak production exceeds this timeline and then tanks will be emptied as required. The active sludge removal of settling ponds will continue as required.

Annual (autumn/spring) AUSRIVAS studies will continue to determine issues as and if they arise.

Control measures to minimise pollutant discharge will also include:

1. Ongoing training of staff in the correct application of feed into ponds to minimise wastage.
2. Full maintenance schedule on drum filter when not in use. In the event of a breakdown with the drum filter immediate shut down of feeding of the three concrete tanks and divert water to the quiescent pond. Continue to isolate settling ponds and remove sludge with excavator for disposal.

Contingency measures are described in Appendix 10, Mountain Stream's Risk Management document.

Water Quality Management

As outlined in the Mountain Stream Environmental Management Plan, various control measures have been outlined to ensure continual monitoring and management of optimum water quality (Table 11).

Table 11: Management control measures, monitoring and reporting for potential water quality issues.

Issue in detail	Management Control Measure	Management Plan Reference	Monitoring/Reporting
Incoming water quality	Routine water quality monitoring conducted Monthly (winter) fortnightly (summer)	AQM0051	Water monitoring results from Analytical Services Tasmania(AST), 18 St. Johns Avenue, New Town, Tas 7008 (ph 62307000, fax 62307001, astproduction@environment.tas.gov.au)
Maintaining environmental flows	Recirculation of water during periods of low flow	Water Licence issued by Department of Primary Industries, Water and Environment	If required under terms of Water Licence
Flow through water quality	Screen filters on all incoming water; Oxygenation of incoming water; Continuous daily monitoring of DO	ASOP2806 Oxygen Saturators	AQF2201 Daily Feed
Outgoing water quality	Routine water quality monitoring conducted Monthly (winter) fortnightly (summer)	AQM0051	Water monitoring results from Analytical Services Tasmania(AST), 18 St. Johns Avenue, New Town, Tas 7008 (ph 62307000, fax 62307001, astproduction@environment.tas.gov.au)

6.3 Groundwater

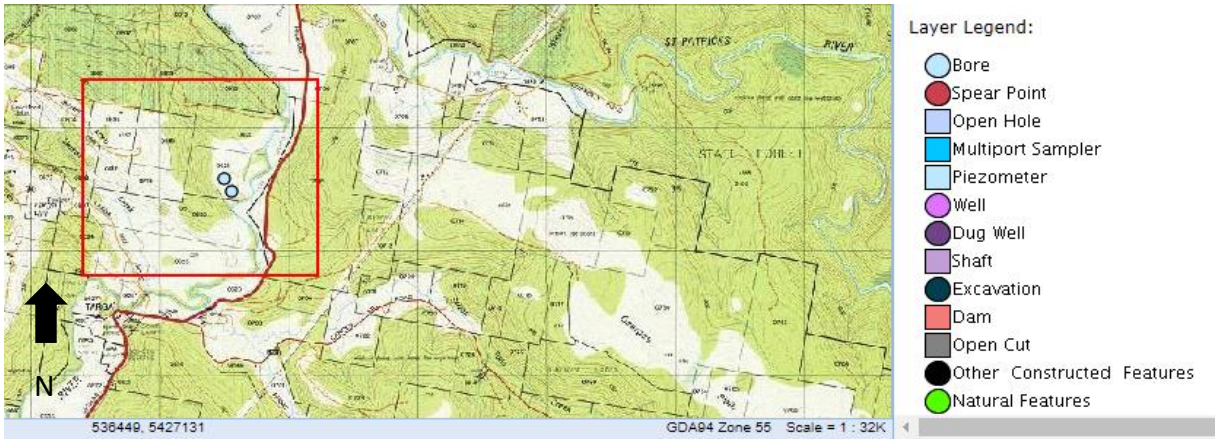


Figure 20: Map of existing groundwater boreholes on the site (source: Groundwater Information Access Portal)

There are two bore points on the site. One of the boreholes is abandoned and 120-150m deep while the other is classified as unknown and is 45-60 m deep. As there will be no changes in infrastructure or access to water. Without modelling the groundwater and river interactions, it is impossible to know the impact of disposing of pond sludge and mulching of small-scale mortalities on the farm. Refer to section 6.5 for full description of waste disposal process.

6.4 Noise Emissions

A noise assessment was conducted by Pitt & Sherry (Operations) Pty Ltd and the main conclusions of the report were as follows:

- The major noise source in the area is traffic on the Tasman Highway.
- The estimated combined noise level was 38.9 dB(A) which is lower than the Tasmanian Environmental Protection Policy guideline indicator level of Leq,8hours = 40 dB(A).
- It may be concluded that noise from the Mountain Stream Fishery, is unlikely to cause loss of amenity or environmental harm to the neighbouring residence.

The characteristics of each potential source of noise is provided in

Table 12 The locations of each source and the nearest neighbour have been identified in Figure 21. For full details see the report (Appendix 11).

Figure 21: Map of noise producing equipment at MSF (Google Maps 2019).

Table 12: Noise sources sourced from the Noise assessment done by Pitt & Sherry (Operations) Pty Ltd, see appendix 11).

Equipment	Installed Inside or Outside?	Level (dB)	d (m)	Lw (dB(A))	NR (dB)	Qty	d (m)	Lp (dB(A))
Pump 1 - Regent F100x80.173-T28H, 15kW	Outside	74	1	81.5		1	310	24.2
Pump 2 - Southern Cross 150x125 - 250, 15kW	Outside	74	1	81.5		1	275	25.2
Pump 3 - Pomona 18.6310, 15kW	Outside	74	1	81.5		1	280	25.1
Pump 4 - Pomona 16.6360, 15kW	Outside	74	1	81.5		1	210	27.6
Oxygen Generator - Airsep ASL 600	Inside	68	5	89.5	15	1	250	19.0
Air Drier - JEMACO Conquest HX426	Included	68	5	89.5		1	250	19.0
Air compressor - Hertz HSC D Freecon 45 Plus	Included With Airsep	68	5	89.5		1	250	19.0
Diesel Generator - Cummins, 330 kVa	Outside	84	1	91.5		1	240	36.4
Truck	Outside	61	7.5	86.0		1	200	32.5

6.5 Waste Management

The management of each type of waste is discussed below and a summary is provided at the end of the section in Table 13. Management control measures outlined in the Mountain Stream Environmental Management Plan are provided in Table 14.

Concrete tank sludge

Current waste management of the three concrete tanks consists of a quiescent pond on the outlet side tanks at the front of the farm. This captures the waste from these tanks and settled water then flows to pond 22. This waste is trucked of site by Veolia 5 -6 times a year times a year to an approximate total of 18 tonnes of sludge annually.

Drum filter

A new drum filter with 100 µm screen will be commissioned upon the approval of this DPEMP.

The drum filter chosen for installation is the Faivre Drum Filter Series 120 with frame that is designed to be installed directly into a canal made of concrete. The mesh size of 100 µm was chosen as it allows for the greatest flow for a water sample with maximum 10 mg/L of waste (see Appendix 12 for the full specification sheet).

The drum filter has a purpose application pump to transfer sludge and water to three 24,000 L tanks located next to the cement tanks (located next to pond 22). They are in a series so that the first tank will capture the most sludge and subsequent tanks will hold less. The third tank will be aerated to assist with oxygen depletion before being returned to the system (the first cement tank stocked with fish).

The sludge from the sludge tanks will be emptied every 2 months and the first one will be a test to see how much will accumulate. The pond 22 itself generated 25-30 cubic meters of sludge in the first year. The sludge will be removed from the bottom of the tank by Veolia trucks at an estimate of approximately 10 m^3 every two months. The tanks are plastic, fully enclosed 24000 litre capacity. They will have a 150mm extraction valve at the base and a water “S” bend trap to contain odor from the settling sludge. The third of these tanks will be aerated to help with oxygen depletion and ammonia break down. The overflow water will return to pond 22 to discharge through the farm wetland. The Veolia trucks are the vacuum loading liquid tankers. Special instructions for disinfected trucks entering the site for sludge removal have been given to minimize odor emissions at extraction times. A copy of this agreement can be found in Appendix 13.

Hard Waste

Solid waste is stored in two 6.2 m^3 skip bins that are emptied on a monthly basis by J.J. Richards Pty Ltd (Toxfree). 90 % of the waste in these skip bins are feed bags from fish food and the other 10% in cardboard and general waste. A copy of this agreement can be found in Appendix 14.

Fish Mortalities

Daily, low numbers of dead fish ("morts") are disposed of in a mulch windrow system found on site. The windrows are on a flat area surrounded by forest at an elevation of 444m (25 m above the farm) and situated at coordinates 41°18´08.50"S 147°22´37.59"E behind the rock quarry on the southern border of the farm, see Figure 22. There is a large quantity of native mulch, supplied by HST tree specialists Pty Ltd, to cover the incidental mortalities. Dead fish are composted on site at a rate of around 5-6 kg per day. The fish range in size from 5 to 500 g on average. Approximately 2 tonnes are buried annually (160kg per month) but it is less in winter and more in summer.

The windrow system is constructed with a thick base layer of sawdust which acts as a source of carbon. Layers of fish waste and saw dust are added in alternating layers on top of the base layer. The ratio of fish waste to sawdust volume is a ratio of 1:2. The windrows are turned annually. Due to the elevation of the windrows and distance from the nearest water body (>100 m), it predicted to have minimal run-off and therefore nil impact on the local waterway. Large amounts of wood chips are added to negate any odours. After a period of time the spent mulch will be used in gardens around the owner's residence (see Figure 22).

MSF is seeking current approval from the EPA for a trial to produce hydrolysate. Upon success of the trial, if a mass mortality event occurs due to environmental factors (low dissolved oxygen or high temperature water), MSF will undertake clean up and macerate the dead fish ready for fermentation and conversion to hydrolysate. The resulting hydrolysate can be filtered and used as high-grade liquid fertilizer.

In the event of a mass mortality caused by a notifiable disease or the suspicion of a notifiable disease, MSF would notify the Chief Veterinary Officer immediately and the CVO would determine the next steps for MSF to take, including the best way to manage mortalities.

Figure 22: Location of mulch windrows on site (highlighted in red) and the location of the mulch spreading (highlighted in blue). (Sources from Google Maps 2019).

Pond sludge

The waste from the hatchery and raceways is settled in the retention dam and wetland serpentine. Ponds 15 and 19 also serve to capture settled waste product and approximately 30 tonnes of sludge are removed during each de-sludging event. De-sludging of the ponds happened when work on the ponds was required. In the last 5 years this has happened twice. The sludge was dried out as much as possible, however the dilution of sludge amongst the soil and rock is high. Ponds were isolated, water was blocked from entering and the ponds were pumped dry to allow evaporation to occur. After a period of days an excavator was employed to extract dry waste sludge which has in the past, been trucked to a section of the farm and spread out and covered with wood chips supplied by HST Pty Ltd. This waste was then transported to an appropriate area of the farm, see Figure 23. Any future sludge removal from the ponds will be trucked offsite in a similar process to the sludge collected from the drum filter (see above).

Figure 23: Location of area for past sludge and rock disposal on site. Future sludge removal will be transported off-site for composting.

Table 13: Overview of waste disposal from site.

Source	Disposal method	Volume	Frequency	Operator	Receiving Site
Dead fish- daily	Mulching on site	Approximately 2 tonnes	Annually	MSF	Residence gardens
Dead fish- mass mortalities	Mulching off-site	Unknown	As required	George Town Seafoods	George Town Seafoods
Hard waste	Skip bins	2 x 4.5 m^3	Monthly	J.J. Richards	Local depot
Pond sludge	Off- site	30 tonnes	As needed	MSF	Dulverton composting facility
Tank sludge *(current method)*	Sludge is left to settle in ponds (refer to 'Pond Sludge for disposal')				
Drum filter *(proposed method)*	Off-site	10 m^3	Every 2 months	Veolia	Dulverton composting facility

Table 14: Management control measures, monitoring and reporting for potential waste issues.

Issue in detail	Management Control Measure	Management Plan Reference	Monitoring/Reporting
Dead fish – Morts.	Morts collected, composted, and subsequently spread on paddocks where there is not possibility of run-off or seepage into adjacent waterways or production units	Veterinary Health Plan (Section 5.8); ASOP2809 Mass Mortality	AQF0103 Hatchery Mort Sheet; AQF2201 Daily Feed
Nutrients from flow-through water	Settling pond with routine water monitoring of outgoing water	Fish Farm Licence and associated Licence Conditions	Water monitoring results from Analytical Services Tasmania (AST), 18 St. Johns Avenue, New Town, Tas 7008 (ph 6230 7000, fax 6230 7001, astproduction@environment.tas.gov.au).
		AQM0051 Sampling and Testing	
Feed bags	Landfill.	Toxfree (PH: (03) 63412200)	
Greywater/blackwater	Enviro-cycle	Toxfree (PH: (03) 63412200)	
Paper	Landfill.	Toxfree (PH: (03) 63412200)	

Plastic packaging	Landfill	Toxfree (PH: (03) 63412200)
Cardboard	Landfill	Toxfree (PH: (03) 63412200)
Out of date chemicals/veterinary chemical waste	Removal from site	Toxfree (PH: (03) 63412200)
Empty chemical containers	Landfill	Toxfree (PH: (03) 63412200)

6.6 Dangerous Goods and Environmentally Hazardous Materials

All chemical and fuel storage areas are bunded as required, see Figure 24. There are three locations where fuel, chemicals and oxygen are stored on site, see Figure 25.

Material Safety and Data Sheets (MSDS) are available on site for the handling of each chemical. Spill kits, fire extinguisher and PPE are available for all staff to use.

In the event of accidental release/spill of chemicals or fuels a spill kit will be deployed around the spill area. For small occurrences absorbent material are disposed of in alignment with MSDS guidelines. Larger spills will require notification of relevant authorities, EPA, Municipal Council, DPIPWE Water Management Branch and fire department and require deploying of major spill kit. Isolation of contaminate by closing water flow in relevant part of farm, this is achieved by inserting plastic barriers across inlet and outlet grates to ponds and in extreme cases closing of the inlet flood gate and outlet pipe. A summary of the potential pollution issues as highlighted in the Mountain Stream Environmental Management Plan are provided in Table 15.

Figure 24: Bunding of chemicals in the hatchery at MSF.

Table 15: Management control measures, monitoring and reporting for potential pollution issues.

Issue in detail	Management Control Measure	Management Plan Reference	Monitoring/Reporting
Fuel	Fuel storage either bunded or located away from immediate hatchery site where any spillage is directed away from	AQM0081	Substantial spills posing a threat to waterways or environment need to be reported to the Environmental

	ponds, tanks, or water courses. Spill kit is to be used in the event of a fuel spill.		Protection Authority (EPA) Helpline 1800 005 171.
Chemicals	Chemical Storage and Handling Procedure. Spill kit is to be used in the event of a chemical spill.	AQM0081	Substantial spills posing a threat to waterways or environment need to be reported to the Environmental Protection Authority (EPA) Helpline 1800 005 171.

Currently, the only chemical use in the hatchery is limited to virkon at 1% solution for disinfection of equipment and biosecurity purposes in footbaths and formalin. Virkon is not returned to any waterway. Footbaths are replaced every 2 days and the remaining liquid is disposed of into the Enviro-cycle septic tank. Formalin is used in the control of *Saproleginia* outbreaks, in the incubating eggs, under industry standards. In the past 3 years that MSF has not used formalin. Eyed eggs arrive and hatch within a 5-7 day interval. Fungal outbreaks do not occur in this period. If formalin is required a solution of 0.167% is mixed under controlled conditions and diluted further into the egg trays. This formalin is collected into one thousand litre ICB's and is disposed of appropriately offsite. See Appendix 15 for use of formalin 10% in aquatic systems. Fish are individually vaccinated with tetravalent vaccine at 40g average size negating the use of prescribed antibiotics.

Figure 25: Site map with locations of fuel and chemical storage, **1)** diesel fuel storage, **2)** Oxygen generation shed, **3)** main chemical storage

6.7 Biodiversity and natural values

A detailed biosecurity plan was last finalised on 23rd November 2018, see page 11 of the Fish Farm Management Plan (Appendix 16). The main components of the biosecurity plan that relate to potential risks impacting on natural values are summarised in Table 16.

MSF has also developed a Risk Assessment for the site that covers all possible risks that relate to environment and biodiversity (other risks are included, see Section 6.11 for details). These include two main areas: nutrient load, wastewater, and solids polluting the waterway; and release of stock due to flooding or pond wall/bank erosion. The former is mitigated with the use of a settlement pond and monitored with routine water monitoring on outgoing water. The latter is prevented with pond maintenance, the use of an adjustable height gate to control the flow of water into the broodstock ponds and the use of fish escape SOPs. For full details, refer to Appendix 10.

These issues are reiterated in the summary of the management control measures for biodiversity and predator issues, as per the Mountain Stream Environmental Management Plan, found in Table 15.

Table 16: Key components of the Biosecurity Management Plan that outline the potential risks for the spread of disease offsite and methods for mitigation.

Potential Risks	Mitigation Factors
Live fish movements, including the water in which they are transported	No fish showing clinical signs of disease, or suspected to be carrying a disease, will be transferred from the hatchery. To ensure this does not occur, as with inwards fish movements, fish transfers out of the Mountain Stream facility will require at a minimum the 4 documents below (see details in section 7.1); 1. IFS Transport Approval 2. Veterinary Certificate (Document Code: AQF0101) 3. A Stock Health Certificate (Document Code: AQF0101.1) 1. 4. Vehicle Disinfection Documentation (Document Code: AQF0105)
Effluent water (St Patricks River)	Water discharging the Mountain Stream facility is returned to the St. Patricks River after passing through retention dam and wetlands. Wastewater: All wastewater passes through retention dam. Effluent water quality testing is conducted quarterly with results held on site. Solids: Solid wastes will be concentrated within the sites settlement ponds which are regularly drained and excavated to remove excess sludge settlement with the sludge spread on land owned by Mountain Stream Fishery.
Mortalities Management	Mortalities will be removed before they start to decompose as this considerably increases the opportunity for dissemination of disease organisms. Mortalities will be transported in secure containers to prevent leakage and disposed of in an appropriate manner that avoids potential release of disease organisms back into the aquatic environment. Mortality composting must occur in a secure site away from production units where run-off or seepage into adjacent waterways or hatchery production units is prevented. At the Mountain Stream Facility, mortalities are removed and composted on site.

Potential Risks	Mitigation Factors
Equipment transferred to other sites	Mountain Stream Fishery should be self-sufficient with regards to operational equipment to avoid the need for equipment transfers. However, if equipment transfer becomes necessary, this will be approved by Huon Aquaculture's Veterinarians or delegate based on assessment of risk and provided the equipment is thoroughly cleaned and disinfected.
Staff, contractors, and visitors	Upon leaving the Biosecurity Area of the Mountain Stream site, visitors and contractors will; • Use the disinfectant footbath and then remove visitor gumboots and any other PPE provided at the entry/exit point to the Biosecurity Area • Sign out of the visitor's book

Table 17: Management control measures, monitoring and reporting for biodiversity and predator management issues.

Issue in detail	Management Control Measure	Management Plan Reference	Monitoring/Reporting
Wastewater, nutrient and solids output entering local waterways impacting native flora and fauna	Settlement pond; Routine water quality monitoring conducted quarterly; Macro/micro invertebrate monitoring	AQM0051	Quarterly water monitoring results from Analytical Services Tasmania (AST), 18 St. Johns Avenue, New Town, Tas 7008 (ph 62307000, fax 62307001, astproduction@environment.tas.gov.au).
Fish escapes	Screens on outlet regularly monitored and cleaned; Mitigation procedures for flood conditions	Fish Farm Licence and associated Licence Conditions; ASOP2707 Preventing Accidental Release	
Birds	Monitoring of interactions; Duty of care for injured wildlife	AQM0130 Environmental Management Plan	Immediate transfer of injured animals to recovery centres (vets, wildlife refuges).
Mammals (wallaby, wombat, echidna, platypus)	Abundant in hatchery environment; Pond erosion damage from platypus monitored and repaired as required; Ponds fenced to prevent entry by mammals.		
Cormorants	Fencing of ponds prevents access by birds		
Water rats	Fencing of ponds prevents access by water rats.		

Giant freshwater crayfish (*Astacopsis gouldi*) have been found in St Patricks river but are considered 'Translocated Population' which means they have been introduced to the river and established a population but have not existed there historically (DoEE, 2017). The species is found only in Tasmania and has been given a status of 'Vulnerable' under the Threatened Species Protection Act 1995 and the Environment Protection and Biodiversity Conservation Act 1999 (Threatened Species Section, 2019a). Giant freshwater crayfish have been found at MSF.

Advice provided to reduce the impact on the giant freshwater crayfish include preventing stock grazing in riparian areas and burning and clearing of streamside vegetation (Threatened Species Section, 2019a). It is also recommended to avoid using chemicals and fertilizers. The intended activity that will occur on the site will not require any of these things to occur and is considered to have minimal impact in that regard.

The Hydrobiid snail (*Beddomeia ronaldi*) has only been found so far in three streams flowing into St Patricks River. It is considered endangered under the Threatened Species Protection Act 1995 and the Environment Protection and Biodiversity Conservation Act 1999 (Threatened Species Section, 2019b). Similar to the giant freshwater crayfish, protection methods include preventing the clearing or burning of streamside vegetation and use of chemicals or fertilisers.

The following species have been identified and recorded on or near the site: platypus (*Ornithorhynchus anatinus*); water rat (*Hydromys chrysogaster*); eastern barred bandicoot (*Perameles gunnii*); Bennetts Wallaby (*Macropus rufogriseus*); Tasmanian pademelon (*Thylogale billardierii)* and common brushtail possum (*Trichosurus vulpecula*), see Figure 26. With trucks using of the Tasman Highway to access the site, the only possible impact foreseen at this stage could be the increased chance of striking an animal on the road.

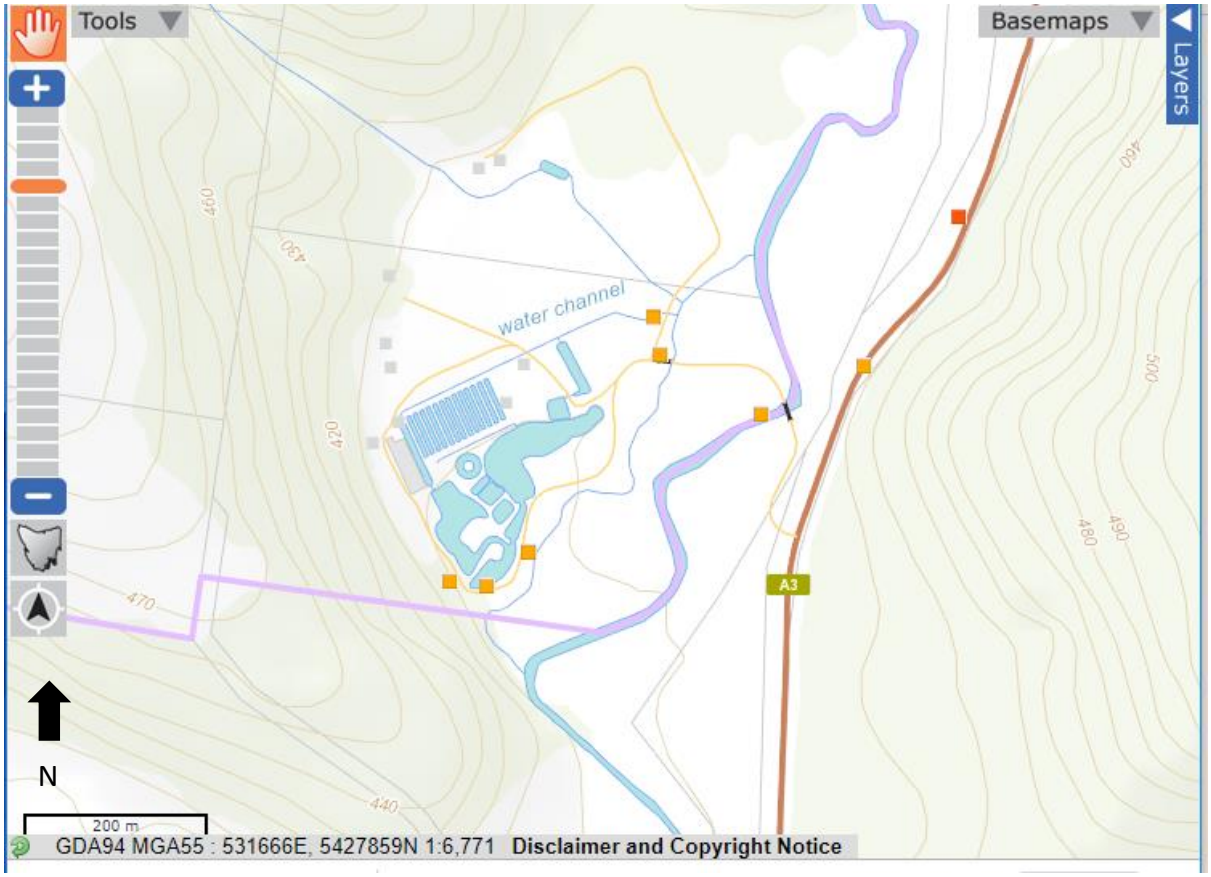


Figure 26: Location of threatened (red dots) and protected (orange dots) species recorded on or near the site (DPIPWE, n.d).

Staff are trained in the identification of aquatic weed species for reporting and removal as outlined in Section 11 of the Mountain Stream Fish Farm Management Plan (FFMP). Terrestrial weeds are dealt with by staff on as when required basis. Weeds are controlled by following the DPIPWE Invasive Species Guidelines.

Through the preparation of this application, a Weed and Disease Management Plan has been initiated and Mountain Stream Fishery aim to complete this document in a timeframe deemed appropriate, see Appendix 17. So far, three species deemed a priority under the Tasmanian Weed Management Act 1999: Ragwort, *Jacobaea vulgaris*, Blackberry *Rubus fructicosus* and weeping willow, *Salix babylonia*. The approximate locations on site can be seen in Figure 27.

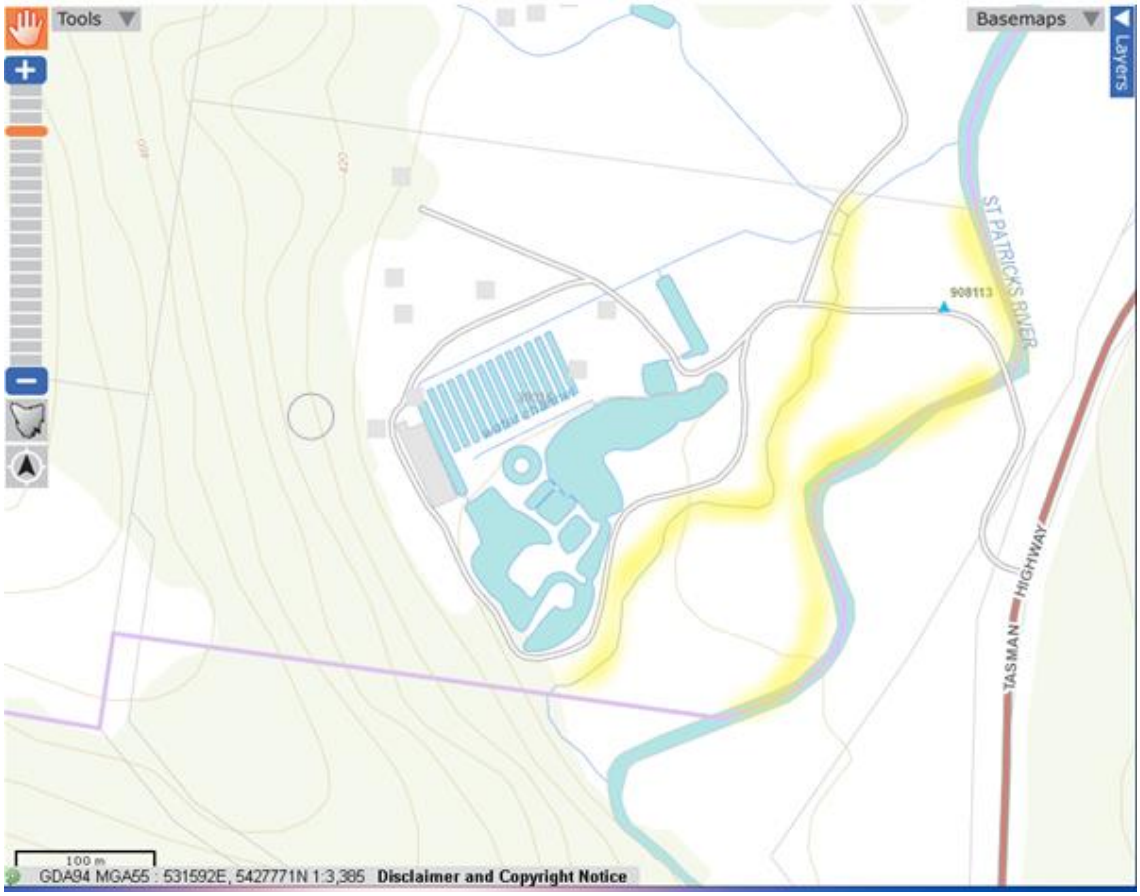


Figure 27: Location of Ragwort, *Senecio Jacobaea* (blue triangle), weeping willow, *Salix babylonia* and Blackberry *Rubus fructicosus* (both highlighted yellow) recorded on site (DPIPWE, n.d).

The site is covered in what is classified as 'extra-urban miscellaneous' vegetation and surrounded by a selection of Eucalyptus species, see Figure 28. There is a section of weeds that crossed the site and a species of weed (*Senecio jacobaea*) has been identified on the driveway to the property.

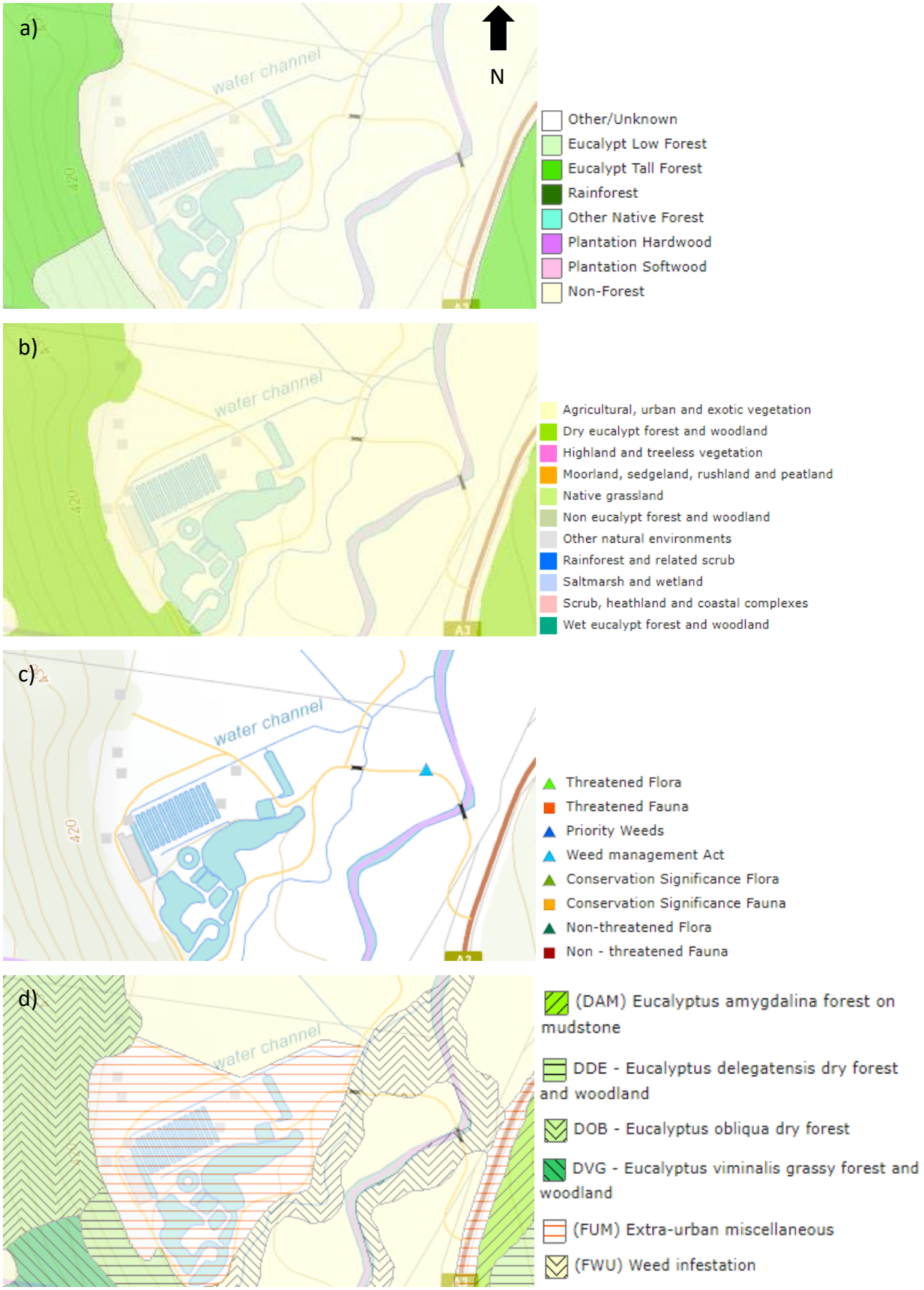


Figure 28: Maps of existing vegetation types are defined by ListMap layers a) Forest Groups b) TasVeg 3.0 Groups c) Weeds Watchlist Point d) TasVeg Live (DPIPWE, n.d).

According to the Conservation of Freshwater Ecosystem Values (CFEV) database (using the CFEV layers on ListMap (DPIPWE, n.d)), St Patricks River has an 'RS Conservation Management Priority' classification of medium. However, the section of the river directly upstream of the site and a section of river 700 m downstream of the river has been classified as a high RS Conservation Management Priority.
There is no foreseen impact on any sites of Geoconservation significance. The nearest sites are approximately 5 km to the west and to the north and include the Mt Arthur Dolerite Periglacial System; North-east Tasmanian Dolerite Horst Mountains; Mt Arthur Slump Complex; and Lisle Ring Structure.

The closest conservation covenant is located approximately 900 meters to the west of the site, and it is unlikely that there will be an impact on this area.

As discussed in Section 5.2, there are no High Wilderness Areas located near the site as defined by the Tasmanian Regional Forest Agreement.

There is no clearing associated with construction and maintenance planned for this application and as such there will be no impact on native vegetation. This also means there is currently no rehabilitation planned for 'disturbed areas'. In the event of the closure of MSF a full rehabilitation and filling of raceways would be undertaken.

For full details on the potential movement of weed species to and from the site, refer to the Weed and Disease Management Plan in Appendix 17. For full details on the prevention of transmitting animal diseases see the Biosecurity Management Plan on page 11 of the Fish Farm Management Plan, Appendix 16.

There is no foreseen impact for the movement of vehicles as they will continue to use the pre-existing roads that are on the site.

6.8 Marine and Coastal

The location of the site is at least 30 km from the nearest coastal area. This means there is likely to be no effect of the development proposal on coastal or marine areas.

6.9 Greenhouse Gases and Ozone Depleting Substances

Calculations on Greenhouse gases were conducted using an online calculator (Carbon Neutral, n.d.), resulting in a carbon emission of 35.25 tonnes per annum. The 180 tonnes of fish feed purchased has an additional 9 tonnes of carbon emissions used during the manufacturing of the feed. MSF owns approximately 520 hectares of forest at Watery Plains Road, Blessington. This property has 242 hectares of CAR (comprehensive, adequate, and representative) Forest reserve and the balance of land is dry sclerophyll eucalypt forest. This represents significant carbon offset for any emissions produced by MSF.

6.10 Socio-Economic Issues

As there are no major changes to infrastructure or the running of the business, there will be no major capital investment needed for farming the larger amount of fish each year.

MSF has traditionally employed 3 full time employees it has increased that to 4 full time and 4 casuals employed for weekend and known employment requirements. The casuals represent a further 1.5 FTE's in total.

There will not be any anticipated impact on the upstream/downstream industries, social amenities, recreational, cultural, health and sporting facilities and services.

The extra fish that will be farmed on site are sourced from another Tasmanian aquaculture business and the extra trucks needed to transport fish are all local business. Fish load out times have remained the same with the only impact of 3 more trucks per day during May. These trucks begin impacting the Tasman Highway from 2 am through to 11 am over a two-week period in May. Local engineering, electrical and agricultural supplies businesses are impacted with downstream acquisitions and equipment modifications.

6.11 Hazard Analysis and Risk Assessment

The possibility of risks and hazards and the planned contingency measures for the site are outlined in Appendix 10. They include risks associated with food safety, environment and biodiversity, animal health and welfare, hygiene, food defence, water quality, biosecurity, mortality and waste. For more details on the environmental risks see Section 6.7 of this report.

6.12 Fire Risk

Nearest fire station is the St Patricks River Fire Brigade which is 6 km down the road from site.

A fire has been recorded 380 m north of the site in 2016 that measured 1.1 hectares.

The potential causes of fire on site include flammable sources such as diesel fuel and oxygen. Roads and fire breaks circle the site and water covers much of the site (in particular, the flood channel and St Patricks River running down the eastern side). This combination of factors provides reasonable deduction that this site is relatively low risk.

The manager is the current fire response officer and one employee is an active member of the Lilydale Rural Fire Brigade. MSF has a policy of clearing and maintaining the grass lands around the residence and buildings. Inflammable products (diesel and gasoline) are contained in adequate, bunded metal containers. The oxygen generator is only producing oxygen whilst turned on, in the event of fire this equipment would be turned off. MSF has four submersible firefighting pumps that would be deployed. All staff are regularly trained in the event of fire, the mustering area is at the junction of the Tasman highway and the entrance to the property.

6.13 Infrastructure and Off-site Ancillary Facilities

There will be no changes to off-site ancillary facilities. It is likely that there will be 20% more trucks accessing the site across the year due to the higher production. Currently the trucks entering the highway, apart from transporting fish at loading in May, is 3-4 per month.

6.14 Environmental Management Systems

MSF is aware of the potential impacts that it may cause through its operations as a fish farm. The management is at all times reviewing and planning for the lessening of outputs into the St Patricks River system. The installation of the drum filter will reduce the impact of fish waste upon the retention dam and consequently the river system. A slow but steady destocking of surplus fish has significantly reduced the detrimental contaminants in the discharge water. A comprehensive environmental management plan and risk assessment has been completed and the management plan has been adopted as best practise at MSF.

Employees report through to management of any issues and manager reports to owner and, depending on severity of issue, the EPA., see Figure 29.

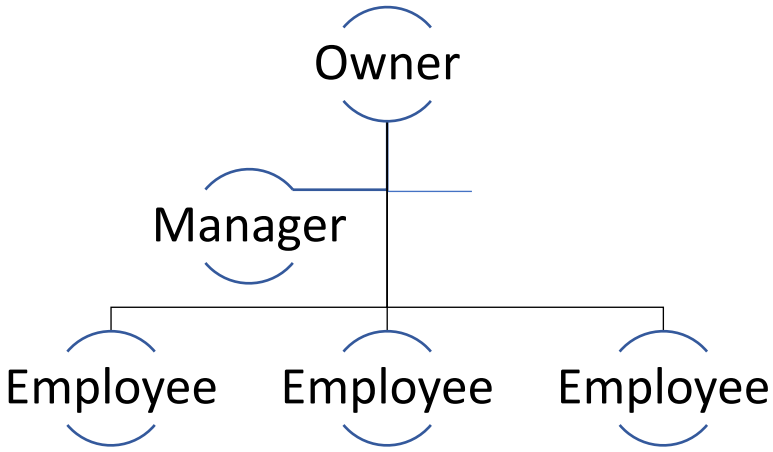


Figure 29: Organisation structure for MSF.

All new staff are inducted into the MSF business. Procedures and instructions are clearly explained, and a reporting process is clearly outlined to new employees. Ongoing training and refreshers are conducted on a quarterly basis or as required. This is all in line with the Fish Farm Management Plan which includes the Environmental Management Plan. As a privately run 'local' company, Mountain Stream Fishery bases its environmental responsibilities both on sustainable expansion of its operations and working closely with the local community to promote understanding and awareness of environmental issues associated with the fish farming industry.

Complaints or concerns regarding biodiversity and environmental issues are handled as per the Corrective and Preventive Action Procedure (AQM0092) (see Appendix 18) and recorded in the Complaints Database.

Mountain Stream Fishery operates with full staff Monday to Friday 8am to 4:30 pm. Weekends a casual crew of feeders operate from 8am till midday in winter and 4:30pm the rest of the year. The owners or a caretaker is onsite outside of business hours.

Contractors and transport providers are briefed as they enter the property as to their responsibilities with regard to environmental best practice.

6.15 Cumulative and Interactive Impacts

Current data collected in 2017 and 2019 is indicating that the cumulative and interactive impacts is decreasing due to changes in management systems at MSF. An ongoing commitment to improvement in environmental discharges and destocking of surplus fish is continuing the lessening of impacts on the St Patricks River.

6.16 Traffic Impacts

Staff and owner vehicles have minimal impact upon the highway. Feed delivery trucks supply MSF on a monthly basis. The higher than normal impact period is for two weeks at the beginning of May each year when ten trucks per day six days a week turn off and re-enter the highway at 38036 Tasman Highway.

The road that is currently being used by the trucks accessing the property is the Tasman Highway and the driveway to the property. There is no intention for this to change with the approval of this application.

7. Monitoring and Review

7.1 Site Specific Guideline Values (SSGV) Limits for Receiving Waters

Requirement states: "*SSGVs in receiving waters need to be established and limits set for potential contaminants of concern. To assess potential impacts, a review of available receiving water quality and biological survey data is required as a minimum. Preferably 12 months of ambient water quality monitoring data should be collected to support the DPEMP. Where no site-specific data is available or limited, draft water quality objectives (draft water quality objectives) should be nominated (information on draft water quality objectives is available from EPA Tasmania*)"

Refer section 6.2.

7.2 Biological Surveys

Requirement states: "*Where no recent biological survey of the receiving environment has been conducted, a survey should be conducted in support of the DPEMP*."

The most recent biological survey conducted on St Patricks River at sites both above and below the MSF site were AUSRIVAS surveys conducted in Spring and Autumn of 2017 and 2018. The results of this study have been summarised in Section 5.2 and full report can be found in Appendix 7. MSF are waiting for direction from EPA as to whether more studies are required.

7.3 Ongoing Water Quality Monitoring

Requirement states: "*As a minimum, ongoing wastewater quality monitoring and upstream and downstream ambient water quality monitoring is required. Additional water quality monitoring in relation to any requested mixing zone will also be expected*."

MSF currently conducts fortnightly water sampling at the inlet, outlet and mixing zone site (250m) of the farm to assess the impact of its operations upon the river system. An initial test for thermotolerant *E.coli* and enterococci has shown very low levels and reduced levels at the outfall. This suggests MSF is a sink for these bacteria. MSF has undertaken to conduct tests for these bacteria on a quarterly basis. If levels of *E.coli* and enterococci rise close to trigger levels monthly testing will occur.

On site water quality monitoring is done. MSF has considered picking up an extra sampling location at the discharge point of the soon to be installed drum filter. Upstream and downstream monitoring will continue as currently done.

7.4 Water Sampling Program

The current water quality monitoring program includes sites upstream, downstream and on the property. Mountain Stream Fishery will commit to the sampling program (the frequency and timing of the samples taken can be found in Table 18). Water sampling will involve:

- Grab sample monitoring at the weir, inlet, outlet and 250m downstream sites, fortnightly from November to May and monthly during winter. Samples will be analysed for pH, Conductivity, TSS, Turbidity, Ammonia, Nitrate, Nitrate + Nitrite, Nitrite, Dissolved Phosphorus, Total Nitrogen, TKN, Total Phosphorus. BOD will no longer be reported. Instead samples will be analysed for TOC and DOC. Dissolved oxygen will also be recorded at all 3 sites when grab samples are taken.
- Flow monitoring will be established in the river and at the outlet of the farm.
- Routine operation monitoring will be undertaken consisting of:
    - Dissolved Oxygen and temperature (measured either at specific times each day or with continuous recording probes).
    - Water chemistry driven by events such as fish mortalities or water discolouration etc

- Rainfall and flooding.
- Periods of recirculation within the farm.

- Monitoring to assess the effectiveness of the drum filter and aerators including:
  - Nutrient and sediment concentrations of water before and after treatment by the drum filter.
  - Dissolved oxygen data within ponds and at the inlet and outlet. Records will include information about whether aerators are operational when observations are taken. Pre-aeration data will be taken and used for comparison.

Table 18: List of all sampling locations with timing and frequency

Site name	GPS easting and northing	Timing	Frequency	Analysis done on sample
Mt Stream weir	531936, 5428002	During work hours	Fortnightly	pH, Conductivity, TSS, Turbidity, Total Alkalinity, Ammonia, Nitrate, Nitrate + Nitrite, Nitrite, Dissolved Phosphorus, Total Nitrogen, TKN, Total Phosphorus, total organic carbon (TOC), dissolved organic carbon (DOC), dissolved oxygen (DO %sat and mg/L).
Mt Stream inlet	531829, 5427940	During work hours	Fortnightly	pH, Conductivity, TSS, Turbidity, Total Alkalinity, Ammonia, Nitrate, Nitrate + Nitrite, Nitrite, Dissolved Phosphorus, Total Nitrogen, TKN, Total Phosphorus, total organic carbon (TOC), dissolved organic carbon (DOC), dissolved oxygen (DO %sat and mg/L).
Mt Stream Outlet	531609, 5427621	During work hours	Fortnightly	pH, Conductivity, TSS, Turbidity, Total Alkalinity, Ammonia, Nitrate, Nitrate + Nitrite, Nitrite, Dissolved Phosphorus, Total Nitrogen, TKN, Total Phosphorus, total organic carbon (TOC), dissolved organic carbon (DOC), dissolved oxygen (DO %sat and mg/L).
Mt Stream 250m D/S	531774, 5427417	During work hours	Fortnightly	pH, Conductivity, TSS, Turbidity, Total Alkalinity, Ammonia, Nitrate, Nitrate + Nitrite, Nitrite, Dissolved Phosphorus, Total Nitrogen, TKN, Total Phosphorus, total organic carbon (TOC), dissolved organic carbon (DOC), dissolved oxygen (DO %sat and mg/L).

8. Decommissioning and Rehabilitation

In the unlikely event that Mountain Stream Fishery will be decommissioned, the rehabilitation will be the responsibility of the proponent, Mr Taras Malahoff, and will involve consultation with the relevant authorities.

9. Commitments

Should this application be approved, Mountain Stream Fishery puts forward a selection of commitments that have arisen during the preparation of this document, see Table 19.

Table 19: Table of commitments.

Number	Relevant Section	Commitments
1	2.2	Construction of drum filter and three sludge tanks
2	3.0	A list of alternative wastewater treatment options will be explored (Table 3).
3	4.0	The DPEMP will be made available to the public.
4	6.1	Any odour complaints will be logged and made available upon request.
5	6.2	Continue with current water sampling program and work towards increasing DO and decreasing ammonia to acceptable levels.
6	6.2	Destocking of non-production fish in the ponds
7	6.2	Installation of 20 aeration units at various sites within the farm
8	6.5	Apply to conduct a Hydrolysate trial as an alternative mortality disposal method.
9	6.7	A Weed and Disease Management Plan has been started and will be completed by a due date to be agreed on.
10	7.4	MSF commits to the sampling program and will add in an additional site 250 m downstream.

10. Conclusion

MSF has changed management systems to show an improvement in water quality whilst there was significant increase in fish production over the last season. MSF is striving towards further improvements with the installation of a drum filter for fish faeces collection, destocking superfluous fish, detailed improvements to wetland and increasing of the area and volume of settling ponds. MSF is committed to further improvements to water quality with the approval of this development application.

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12. Appendices

Table 20: List of attached documents

Appendix	Item
1	Permit DA5.97.160
2	Fish Farm licence 52
3	Water Licence Number 8089
4	Environmental Licence 9835/1
5	Sustainable Hatchery Feed Technology
6	ASOP2807 Preventing Accidental Release
7	AusRIVAS Surveys of St Patricks River and Mountain Stream Fishery Final Report- January 2019 report.
8	Air Dispersion Modelling Report
9	Detailed analysis of water quality data and impacts of fishery discharges on water quality in the St Patricks River
10	Mountain Stream Fishery Risk Assessment
11	Mountain Stream Fishery Noise Assessment Report
12	Rotoclean 120 Specifications Sheet
13	Waste Management Agreement with Veolia
14	Waste Management Agreement with J.J. Richards
15	Chemical Permit No. PER83525
16	Fish Farm Management Plan (with the Biosecurity Management Plan page 11- 28)
17	Weed and Disease Management Plan
18	AQM0092 Corrective and Preventative Action Procedure