AGENCY OF NATURAL RESOURCES
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WATERSHED MANAGEMENT DIVISION
ONE NATIONAL LIFE DRIVE, DAVIS BUILDING, 3RD FLOOR
MONTPELIER, VT 05620-3522

FACT SHEET FOR PERMIT
December 2022

Permit Number: 3-0361
PIN: RU96-0030
NPDES Number: VT0120098

Facility Name: VT Fish & Wildlife
Salisbury Fish Culture Station

Facility Address: 646 Lake Dunmore Road
Salisbury, VT 05769

Facility Coordinates: Lat: 43.92578 Long: -73.09855

Facility Classification: Industrial, Certified Operator Not Required

Receiving Water: Tributary 10 of Halnon Brook

I. Facility and Proposed Action

The Secretary of the Vermont Agency of Natural Resources (hereinafter referred to as "the Secretary") received a renewal application for the permit to discharge into the designated receiving water from the above-named applicant on November 7, 2011. The facility's previous permit was issued on November 28, 2006 with an effective date of April 1, 2007. The previous permit (hereinafter referred to as the "current permit") has been administratively continued, pursuant to 3 V.S.A. § 814, as the applicant filed a complete application for permit reissuance within the prescribed time period per the Vermont Water Pollution Control Permit Regulations Section 13.5(b). At this time, the Secretary has made a tentative decision to reissue the discharge permit.

The facility is engaged in the production of fish and is classified as a Non-Major NPDES Wastewater Treatment Facility (WWTF).

A map showing the location of the facility, outfalls, and the receiving water is provided in the Reasonable Potential Determination (Attachment A).

II. Statutory and Regulatory Authority

Congress enacted the Clean Water Act (CWA or Act), "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters." CWA § 101(a). To achieve this objective, the CWA makes it unlawful for any person to discharge any pollutant into the waters of the United States from any point source, except as authorized by specified permitting sections of the Act, one of which is § 402. CWA §§ 301(a), 402(a). Section 402 establishes one of the CWA's principal permitting programs, the National Pollutant Discharge Elimination System (NPDES). Under this section of the Act, the U.S. Environmental Protection Agency (EPA) may "issue a permit for the discharge of any pollutant, or combination of pollutants" in accordance with certain conditions. CWA § 402(a). The State of Vermont has been approved by the EPA to administer the NPDES Program in Vermont. NPDES permits generally contain discharge limitations and establish related monitoring and reporting requirements. CWA § 402(a)(1) - (2).

Section 301 of the CWA provides for two types of effluent limitations to be included in NPDES permits: "technology-based" limitations and "water quality-based" limitations. CWA §§ 301, 303, 304(b); 40 C.F.R. Parts 122, 125, 131. Technology-based limitations, generally developed on an industry-by-industry basis, reflect a specified level of pollutant-reducing technology available and economically achievable for the type of facility being permitted. CWA § 301(b). As a class, WWTFs must meet performance-based requirements based on available wastewater treatment technology. CWA § 301(b)(1)(B). The performance level for WWTFs is referred to as "secondary treatment." Secondary treatment is comprised of technology-based requirements expressed in terms of BOD_5, TSS, and pH; 40 C.F.R. Part 133.

Water quality-based effluent limits, on the other hand, are designed to ensure that state water quality standards are achieved, irrespective of the technological or economic considerations that inform technology-based limits. Under the CWA, states must develop water quality standards for all water bodies within the state. CWA § 303. These standards have three parts: (1) one or more "designated uses" for each water body or water body segment in the state; (2) water quality "criteria," consisting of numerical concentration levels and/or narrative statements specifying the amounts of various pollutants that may be present in each water body without impairing the designated uses of that water body; and (3) an antidegradation provision, focused on protecting high quality waters and protecting and maintaining water quality necessary to protect existing uses. CWA § 303(c)(2)(A); 40 C.F.R. § 131.12.

A permit must include limits for any pollutant or pollutant parameter (conventional, non-conventional, toxic, and whole effluent toxicity) that is or may be discharged at a level that causes or has "reasonable potential" to cause or contribute to an excursion above any water quality standard, including narrative water quality criteria. See 40 C.F.R. § 122.44(d)(1). An excursion occurs if the projected or actual instream concentration exceeds the applicable criterion. A NPDES permit must contain effluent limitations and conditions in order to ensure that the discharge does not cause or contribute to water quality standard violations.

Receiving stream requirements are established according to numerical and narrative standards adopted under state law for each stream classification. When using chemical-specific numeric criteria from the State's water quality standards to develop permit limits, both the acute and chronic aquatic life criteria are used and expressed in terms of maximum allowable instream pollutant concentrations. Acute aquatic life criteria are generally implemented through maximum daily limits and chronic aquatic life criteria are generally implemented through average monthly limits.

Where a state has not established a numeric water quality criterion for a specific chemical pollutant that is present in the effluent in a concentration that causes or has a reasonable potential to cause a violation of narrative water quality standards, the permitting authority must establish effluent limits in one of three ways: based on a "calculated numeric criterion for the pollutant which the permitting authority demonstrates will attain and maintain applicable narrative water quality criteria and fully protect the designated use"; on a "case-by-case basis" using CWA § 304(a) recommended water quality criteria, supplemented as necessary by other relevant information; or, in certain circumstances, based on an "indicator parameter." 40 C.F.R. § 122.44(d)(1)(vi)(A-C).

The state rules governing Vermont's NPDES permit program are found in the Vermont Water Pollution Control Permit Regulations (Environmental Protection Rule, Chapter 13).

III. Permit Limit and Condition Formulation

A. Reasonable Potential Determination

In determining whether this permit has the reasonable potential to cause or contribute to an impairment, the Secretary has considered:

1) Existing controls on point and non-point sources of pollution as evidenced by the Vermont surface water assessment database;

2) Pollutant concentration and variability in the effluent as determined from the permit application materials, monthly discharge monitoring reports (DMRs), or other facility reports;

3) Receiving water quality based on targeted water quality and biological assessments of receiving waters, as applicable, or other State or Federal water quality reports;

4) Toxicity testing results based on the Vermont Toxic Discharge Control Strategy, and compelled as a condition of prior permits;

5) Available dilution of the effluent in the receiving water, expressed as the instream waste concentration. In accordance with the applicable Vermont Water Quality Standards (Environmental Protection Rule, Chapter 29A), available dilution for rivers and streams is based on a known or estimated value of the lowest average flow which occurs for seven (7) consecutive days with a recurrence interval of once in ten (10) years (7Q10) for aquatic life and human health criteria for non-carcinogens, or at all flows for human health (carcinogens only) in the receiving water. For nutrients, available dilution for stream and river discharges is assessed using the low median monthly flow computed as the median flow of the month containing the lowest annual flow. Available dilution for lakes is based on mixing zones of no more than 200 feet in diameter, in any direction, from the effluent discharge point, including as applicable the length of a diffuser apparatus; and

6) All effluent limitations, monitoring requirements, and other conditions of the draft permit.

The Reasonable Potential Determination for this facility is attached to this Fact Sheet as Attachment A.

B. Anti-Backsliding

Section 402(o) of the CWA provides that certain effluent limitations of a renewed, reissued, or modified permit must be at least as stringent as the comparable effluent limitations in the current permit. EPA has also promulgated anti-backsliding regulations which are found at 40 C.F.R. § 122.44(l). Unless applicable anti-backsliding exemptions are met, the limits and conditions in the reissued permit must be at least as stringent as those in the current permit.

C. Receiving Water Classification

All uses Class B with a waste management zone. Class B waters are suitable for swimming and other primary contact recreation; irrigation and agricultural uses; aquatic biota and aquatic habitat; good aesthetic value; boating, fishing, and other recreational uses; and suitable for public water source with filtration and disinfection or other required treatment. A waste management zone is a specific reach of Class B(1) or B(2) waters designated by a permit to accept the discharge of properly treated wastes that prior to treatment contained organisms pathogenic to human beings.

The receiving water for this discharge is Tributary 10 of Halnon Brook, a designated Cold Water Fish Habitat. At the point of discharge, the stream has a contributing drainage area of 0.28 square miles. The summer 7Q10 flow of the river is estimated to be 0.026 cubic feet per second (CFS), and the summer Low Median Monthly flow is estimated to be 0.092 CFS. The instream waste concentration at the summer 7Q10 flow is 0.987 (98.7%) and the instream waste concentration at the summer Low Median Monthly flow is 0.957 (95.7%).

In addition, Halnon Brook drains into Lake Champlain, which is impaired for phosphorus and is subject to a Total Maximum Daily Load (TMDL) for phosphorus. This is discussed further in Section V.C.5. of this Fact Sheet.

D. Waste Management and Mixing Zones

A Waste Management Zone (WMZ) is a specific reach of Class B waters designated by a permit to accept the discharge of properly treated wastes that contained organisms pathogenic to human beings prior to treatment. Throughout the receiving waters, water quality criteria must be achieved but increased health risks exist in a WMZ due to the authorized discharge.

The Secretary may establish a WMZ as part of the issuance of a discharge permit as described in 10 V.S.A. § 1252. The model used to determine the WMZ is based upon three precepts of domestic wastewater treatment facility discharges: 1) the use of coliform bacteria as an indicator of pathogenic organisms; 2) despite proper operation and maintenance disinfection failures may occur; and 3) a reasonably sized waste management segment provides a "buffer zone" downstream of the wastewater discharge in which contact recreation is not recommended. If a disinfection failure should occur at the WWTF, the time of travel through this zone will provide time during which some pathogen die-off will occur and may also allow time for public notification. A WMZ is not a Mixing Zone. The facility currently does not have a WMZ.

A Mixing Zone is a length or area within Class B waters required for the dispersion and dilution of waste discharges adequately treated to meet federal and state treatment requirements and within which it is recognized that specific water uses or water quality criteria associated with the assigned classification for such waters may not be realized. A mixing zone shall not extend more than 200 feet from the point of discharge and must meet the terms of 10 V.S.A. § 29A-204. For a mixing zone to be applicable to a discharge it must be authorized within the discharge permit. The Secretary has made the determination that conditions due to discharges of waste within any mixing zone shall:

a. not result in a significant increase in public health risk when evaluated using reasonable assumptions about exposure pathways;

b. not constitute a barrier to the passage or movement of fish or prevent the full support of aquatic biota, wildlife, and aquatic habitat uses in the receiving waters outside the mixing zone;

c. not kill organisms passing through;

d. protect and maintain the existing uses of the waters;

e. be free from materials in concentrations that settle to form objectionable deposits;

f. be free from floating debris, oil, scum, and other material in concentrations that form nuisances;

g. be free from substances in concentrations that produce objectionable color, odor, taste, or turbidity; and

h. be free from substances in concentrations that produce undesirable aquatic life or result in a dominance of nuisance species. (Vermont Water Quality Standards § 29A-204(a)).

This facility currently does not have a mixing zone.

IV. Facility History and Background

The Vermont Department of Fish and Wildlife owns and operates the Salisbury Fish Culture Station. The facility is a primary salmonid egg supplier for the Vermont Fish and Wildlife fish culture program. The following species are at the facility at various life stages from egg to adult: Brook trout, Brown trout, Rainbow trout, Steelhead trout (rainbow), and Lake trout. Approximately three million eggs are distributed annually to other fish culture stations for rearing and stocking. In addition to the eggs, approximately 30,000-40,000 adult fish are produced annually for stocking directly into streams and waterways. Most fish are stocked as one year olds with a small portion of two year olds.

The source of process water for the station consists of groundwater from two, on-site, gravel packed wells. There are 19 outdoor raceways and 16 indoor start tanks at the facility. Most of these raceways are supplied with serially reused water. Some of the outdoor raceways also utilize partial recirculation loops to increase flows and conserve water. After leaving the raceways, the process wastewater enters a polishing pond, where it mixes with stormwater and runoff from an adjacent parcel. Effluent is discharged to Tributary 10 of Halnon Brook, which flows for approximately ½ mile until it reaches the confluence with Halnon Brook.

V. Monitoring

A. Flow – The draft permit maintains the annual average flow limitation of 1.31 MGD. This facility maintains a constant discharge and continuous flow monitoring is required.

B. Conventional Pollutants

1. Biochemical Oxygen Demand (BOD_5) – The annual "monitor only" sampling requirement for BOD_5 is unchanged from the current permit. Sampling shall be conducted in **September**.

2. Total Residual Chlorine (TRC) – The Total Residual Chlorine (TRC) limitation is 0.02 mg/L monthly average and 0.02 mg/L daily maximum. The RPD established effluent limits of 0.019 mg/L daily maximum and 0.011 mg/L monthly average, which is equal to the Vermont Water Quality Standards (VWQS) acute and chronic criteria for protection of aquatic biota. These calculated limits are less than the detection limit of the currently approved version of Standard Methods for the Examination of Water and Wastewater (Method 4500 CL-E and G).

The draft permit specifies a compliance level of 0.02 mg/L for TRC. A compliance level is specified because the limitations for TRC are below the minimum level (ML) for analysis of TRC using Method 4500-Cl G, N, N-diethyl-p-phenylenediamine (DPD) colorimetric, of 0.02 mg/L. This approach is consistent with EPA's Technical Support Document for Water Quality-based Toxics Control (EPA-505-2-90-001, March 1991), page 111, which recommends, "the compliance level be defined in the permit as the minimum level (ML)." See Standard Methods for the Examination of Water and Wastewater for the full text of these test methods.

The only chlorine containing product the facility uses is Chloramine-T, which is used rarely and only when approved by the fish hatchery pathologist to treat potential disease outbreaks. Chloramine-T has only been used by the facility once in the last five years. Due to this information, the previous narrative permit requirements established for use of Chloramine-T remains in the permit and a compliance level of 0.02 mg/L for TRC was added with the requirement of monitoring twice a month when the chemical is in use, with the grab samples accounting for detention time throughout the system. The Permittee shall report the monitoring results, the dates the product is used, and quantities of product used on the WR-43 reporting form.

3. pH – The monthly "monitor only" pH sampling requirement from **April to October** is unchanged from the current permit.

4. Total Suspended Solids (TSS) – The effluent limitations (5 mg/L monthly average and 15 mg/L daily maximum) remain unchanged from the current permit. Monthly sampling shall be conducted from **April to October.**

C. Nutrients Monitoring

1. Total Nitrogen (TN) – A monthly "monitor only" requirement for TN has been included in the draft permit. TN is acalculated value based on the sum of NO_x and TKN, and, shall be reported as pounds, calculated as:

TN (mg/L) x Total Daily Flow x 8.34

where, TN (mg/L) = TKN (mg/L) + NO_x (mg/L)

Per EPA, excess nitrogen (N) and phosphorus (P) are the leading cause of water quality degradation in the United States. Historically, nutrient management focused on limiting a single nutrient—phosphorus or nitrogen—based on assumptions that production is usually phosphorus limited in freshwater and nitrogen limited in marine waters. Scientific research demonstrates this is an overly simplistic model. The evidence clearly indicates management ofboth phosphorus and nitrogen is necessary to protect water quality. The literature shows that aquatic flora and fauna have differing nutrient needs, some are P dependent, others N dependent and others are co-dependent on these two nutrients.

Like P, N promotes noxious aquatic plant and algal growth. High concentrations of P and N together cause greater growth of algae than P alone. The relative abundance of these nutrients also influences the type of species within the community. Furthermore, a high N-to-P ratio may exacerbate the growth of cyanobacteria, while elevated levels of nitrogen increase toxicity in some cyanobacteria species. Given the dynamic nature of all aquatic ecosystems, for the State to fully understand the degradation to water quality it is necessary to limit P and monitor bioavailable N (including nitrate, ammonium, and certain dissolved organic nitrogen compounds).

Facilities with a design flow greater than 1 MGD will complete monthly monitoring unless more frequent sampling is already required by the current permit. The current permit does not require TN sampling; therefore, a new monthly monitoring requirement is included in the draft permit.

2. Nitrate/Nitrite (NO_x) – Nitrite Plus Nitrate as Nitrogen (NO_x) – Nitrite (NO2-) and Nitrate (NO3-) are oxidized forms of Nitrogen. NO_x is needed to calculate Total Nitrogen (TN). To gather data on the amount of Total Nitrogen in this discharge, Nitrite (NO2-) plus Nitrate (NO3-) monitoring is proposed in the renewed permit. The sum of Nitrite (NO2-) and Nitrate (NO3-) is represented as NO_x to simplify the notation in wastewater chemistry. The x represents the number of Oxygen atoms (2 or 3) and the negative charge notation (-) is dropped. This notation is also used in atmospheric chemistry where other oxidation states are possible.

$$NO2^- + NO3^- = NO_x$$

Test results are reported in terms of Nitrogen (N) because water quality standards are generally expressed in terms of Nitrogen for simplicity and consistency. This constituent (NO_x) is sometimes also shown as (NO2/NO3), NO_x, Nitrate/Nitrite Nitrogen, and Nitrite Plus Nitrate Total 1 Det. (As N). To gather data on the amount of NO_x in this discharge and its potential impact on the receiving water, a monthly “monitor only” sampling requirement is included in the permit.

3. Total Kjeldahl Nitrogen (TKN) – TKN is the sum of nitrogen in the forms of ammonia (un-ionized (NH3) and ionized ($NH4^+$)), soluble organic nitrogen, and particulate organic nitrogen. To gather data on the amount of TKN in this discharge and its potential impact on the receiving water, a monthly “monitor only” sampling requirement has been included in the draft permit.

4. Total Ammonia Nitrogen (TAN) – Total Ammonia Nitrogen (TAN) (NH3-N) is the sum of the free ammonia-nitrogen plus the amount of nitrogen from ammonia that has combined with chlorine. To gather data on the amount of TAN in this discharge and its potential impact on the receiving water, a monthly "monitor only" sampling requirement has been included in the draft permit.

5. Total Phosphorus (TP) – Excess phosphorus entering Lake Champlain from a variety of sources has impaired the lake's water quality. The Lake Champlain Total Maximum Daily Load (LC TMDL), issued June 17, 2016, places a cap on the maximum amount of phosphorus from point and non-point sources that is allowed to flow into the lake while still meeting Vermont's water quality standards. The EPA developed phosphorus TMDLs for the twelve Vermont segments of Lake Champlain in collaboration with the Vermont Agency of Natural Resources, Department of Environmental Conservation and the Vermont Agency of Agriculture, Food, and Markets, and released the document titled "Phosphorus TMDLs for Vermont Segments of Lake Champlain" (June 2016). The 2016 LC TMDL specifies allowable phosphorus loads, or waste load allocations (WLA), expressed as metric tons per year (mt/yr), for each of the 59 WWTFs that discharge to the Lake Champlain watershed. The Secretary will issue discharge (NPDES) permits in accordance with the permit issuance schedule in the Lake Champlain TMDL Phase 1 Implementation Plan (Chapter 3, page 46). The Secretary will follow this schedule unless special circumstances are raised by the facility that warrant the issuance of the permit sooner (e.g., planned facility upgrades), and the Wastewater Management Program has sufficient staff capacity to handle the request.

Reductions in WLAs are targeted only to WWTFs in those lake segment watersheds where the currently permitted wastewater load represents a 10% or greater portion of the total phosphorus load to that segment from all sources (Main Lake, Shelburne Bay, Burlington Bay, St. Albans Bay) or where wastewater upgrades would meaningfully reduce the phosphorus reduction burden placed on non-wastewater (non-point) sources (Missisquoi Bay). Therefore, WWTFs discharging to the Port Henry, Otter Creek, Mallets Bay, Northeast Arm, Isle LaMotte, and the South Lake A/B lake segments were not assigned a new waste load allocation. The EPA also determined that wastewater facilities with a design flow of < 0.1 million gallons per day (MGD) would be given the same allocations as in the 2002 TMDLs due their minor contribution of phosphorus loading.

The LC TMDL establishes new annual WLAs for WWTFs with a design flow capacity above 0.1 MGD that discharge to the Main Lake, Shelburne Bay, Burlington Bay, St. Albans Bay, and Missisquoi Bay lake segments. Specifically, WWTFs with a design flow capacity of 0.1 to 0.2 MGD were assigned WLAs based on a 0.8 mg/L effluent phosphorus concentration at permitted flow while WWTFs with design capacity of > 0.2 MGD were assigned WLAs based on a 0.2 mg/L effluent phosphorus concentration at permitted flow.

In the LC TMDL, EPA acknowledged and supported the Secretary's commitment to employ flexible approaches to implementing the WWTF WLAs including "providing a period of time for optimization to be pursued and the corresponding load reduction results to be realized, and then commencement of the process to upgrade phosphorus treatment facilities will be required when actual phosphorus loads reach 80% of the LC TMDL limits." The Wastewater Management Program maintains a tracking system for phosphorus loading from Vermont WWTFs so facilities approaching or over the 80% threshold can be identified. The 80% phosphorus load threshold is calculated by comparing the

individual WWTF phosphorus WLA established in the LC TMDL to the actual phosphorus discharge load from the WWTF over last 12 months:

WWTF Annual TP Load / LC TMDL WLA × 100

There are currently WWTFs in the Lake Champlain watershed with existing discharged loads of phosphorus already at, or above, 80% of allowable loads. To ensure facilities are operating as efficiently as possible, all reissued wastewater discharge (NPDES) permits under the LC TMDL will specify a period of 12 months for optimization to be pursued and the corresponding load reduction results to be realized, prior to evaluating where a facility ranks relative to the 80% trigger. Discharge permits will specify that after the optimization period, when an existing facility reaches 80% of its WLA for phosphorus (evaluated as a rolling, 12-month load), the Permittee will have to develop and submit a projection of whether the facility will exceed its WLA during the permit term and if it is projected to do so, then the facility will be required to develop a Phosphorus Elimination/Reduction Plan (PERP) that will ensure the facility continues to comply with its WLA.

Effluent TP limits in permits are expressed as:

(1) total annual mass loads, and

(2) for facilities that currently have an existing monthly effluent concentration limit for TP in their NPDES permit, as monthly effluent concentration limits.

Phosphorus Limit in Draft Permit:

The current discharge permit for this facility includes a mass-based, effluent limit of 399 pounds of TP per year. This annual mass limitation was based on an allocation of 0.181 metric tons established in the 2002 Lake Champlain Phosphorus TMDL.

The proposed draft permit contains a phosphorous mass effluent limit of 152 total pounds, annual limitation (0.0689 metric tons per year). Tributary 10 of Halnon Brook is on the State of Vermont 2016 303(d) list of impaired waters due to elevated nutrients affecting aquatic biota. Since there is reasonable potential to contribute to this impairment, the Clean Water Act requires the imposition of effluent limitations necessary to address the facility's portion of the impairment. The draft permit includes a mass based effluent limitation of 152 pounds of TP per year. The annual mass limitation was based on an allocation of 0.0689 metric tons and was established in the Reasonable Potential Determination (RPD) for the facility (Attachment A). The proposed annual mass limitation will cap the facility's contribution to the impairment of Tributary 10 of Halnon Brook and is well within the LC TMDL allocation of 0.181 metric tons (399 lbs./year) that was established in the 2016 LC TMDL.

This new, annual WLA represents an 89% reduction (247 pounds) from the current permit and is equivalent to setting the effluent TP limit at 0.04 mg/L at the design capacity of the WWTF (1.31 MGD). To convert units of the WLA from metric tons to pounds for the annual, mass-based TP permit limit, the following equation was used and the resulting WLA rounded down to the nearest

pound:

(0.0689 mt/yr) (2204.62 lbs/mt) = 152 lbs/yr

The LC TMDL includes WLAs for WWTFs expressed as total annual mass loads. Compliance with the annual limit will be calculated each month using the Running Total Annual Pounds Calculation (Condition I.C.2.c. of the permit), rather than once at the end of the calendar year. The LC TMDL does not include monthly average concentration effluent limits for WWTFs. State law (10 V.S.A. 1266a) requires that, "No person directly discharging into the drainage basins of Lake Champlain or Lake Memphremagog shall discharge any waste that contains a phosphorus concentration in excess of 0.80 milligrams per liter on a monthly average basis." While the WLA in the TMDL was calculated based on a TP effluent monthly average limit concentration of 0.04 mg/L, the permit does not include 0.04 mg/L as the concentration effluent limitation because a Permittee may not need to consistently achieve 0.04 mg/L to ensure compliance with the WLA established in the TMDL. However, a 0.8 mg/L monthly average concentration limit for TP is included as required by 10 V.S.A. § 1266a.

Monthly sampling for total phosphorus is required from November to May. Sampling is required twice per month from June to October.

Condition I.C.3.c. of this draft permit requires the submission of monitoring reports to the Secretary specific to tracking TP in the discharge. A report that documents the annual TP discharged from the facility, summarizes phosphorus removal optimization and efficiencies, and tracks trends relative to the previous year shall be attached to the applicable WR-43 form. The annual and monthly TP loads discharged from the facility shall also be reported electronically with other required parameters.

Analysis in Support of Phosphorus Limit:

The numeric criteria for TP to protect Aquatic Biota Use in Small High Gradient stream types are exceeded when calculated at this facility's full design flow and with the receiving water at low-medium monthly (LMM) flow conditions. This facility has reasonable potential to violate VWQS due to exceeding the narrative and numeric criteria for TP. Therefore, a revised annual WQBEL load of 152 lbs./year was developed for this permit.

The load was reduced to a value that would represent a 20 µg/L average TP effluent reduction, based on the facility's operating conditions in the last 5 years, that will result in measurable improvements to the biological community. This was based on the best professional judgement from the VT DEC Monitoring and Assessment Program biologists.

Phosphorus Optimization Plan (POP) / Best Management Practices (BMP) Plan:

To ensure that the facility is operating as efficiently as possible for purposes of phosphorus removal, Condition I.C.3. of the draft permit requires that within 120 days of the permit effective date, the Permittee shall develop and submit to the Secretary a POP/BMP Plan to increase the facility's phosphorus removal efficiency by implementing optimization techniques that achieve phosphorus reductions using primarily existing facilities

and equipment and describes how the Permittee will comply with each of the technology-based effluent limitations under Condition I.A.4. of the draft permit.

Phosphorus Elimination and Reduction Plan (PERP):

Since the new annual WLA of 152 lbs./year is less than 80% of the LC TMDL WLA of 399 lbs./year, the Permit does not contain a requirement to submit a PERP detailing projected future phosphorus loadings and permit compliance if 80% of the LC TMDL WLA is exceeded.

6. Total Phosphorus (TP) and Dissolved Phosphorus (DP) Instream Monitoring

To evaluate the effectiveness of the adaptive management strategy being developed to reduce total phosphorus concentrations discharged, instream water quality monitoring shall be conducted. Monthly instream sampling for TP and DP at Halnon Tributary 10 River Mile (RM) 0.1, RM 0.2, and RM 0.5 shall occur between November 1 and May 31. Twice monthly sampling shall occur between June 1 and October 31. Sampling shall be conducted following approval of the sampling plan and updated Quality Assurance Project Plan (QAPP).

If snow, ice, or flooding preclude instream sampling, that information shall be included in that month's eDMR.

Should the Wainwright dam downstream of the facility be removed, the permit shall be reopened to assess the instream monitoring locations.

7. Formalin – A new daily maximum effluent limit of 7.2 mg/L and monthly average effluent limit of 3.6 mg/L is included in the draft permit. Monitoring shall occur twice a month when the chemical is in use, with the grab samples accounting for detention time throughout the system. The amount of formalin used, treatment concentrations, duration of treatments, dates, masses, and calculated effluent concentration of formalin for each treatment shall be included as an attachment of the monthly Discharge Monitoring Report (DMR) form WR-43.

This limit and monitoring frequency does not apply to formalin treatments at the Hatch House, which is sectioned off from the rest of the facility and when mixed with the facility flow, does not have reasonable potential to violate water quality standards for formalin.

3. <u>Discharge Special Conditions</u>

Permit Schedule Items

A. Macroinvertebrate Monitoring

To evaluate the effectiveness of the adaptive management strategy being developed to reduce total phosphorus concentrations discharged, instream biological monitoring shall be conducted. Macroinvertebrate monitoring shall be conducted between the months of August-October in 2024 and 2026. Sampling locations include

Tributary 10 of Halnon Brook RM 0.1 and RM 2.5. Sampling shall be conducted following approval of the sampling plan and updated Quality Assurance Project Plan (QAPP).

B. Whole Effluent Toxicity (WET) Testing Acute/Chronic

40 C.F.R. Part 122.44(d)(1) requires the Secretary to assess whether the discharge causes or has the reasonable potential to cause or contribute to an excursion above any narrative or numeric water quality criteria. Per these federal requirements, the Permittee shall conduct WET testing and toxic pollutant analyses according to Condition I.E. outlined in the draft permit. If the results of these tests indicate a reasonable potential to cause an instreamtoxic impact, the Secretary may require additional WET testing, establish a WET limit, or require a Toxicity Reduction Evaluation.

In the event this permit is administratively continued pursuant to 3 V.S.A. § 814, the Permittee shall maintain the WET testing frequency established in Condition I.E.10. during such continuance, starting with WET test sampling during August-October 2027 with results due by 12/31/2027.

C. Metals Scan

Due to the lack of monitoring data for metals, it was not possible to assess reasonable potential for metals (Al, Sb, As, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, Ag, Tl, and Zn). Metals monitoring concurrently with WET tests is required to support future assessments. The Metals Scan shall be conducted concurrently with the WET tests outlined in Condition I.E. of the draft permit.

In the event this permit is administratively continued pursuant to 3 V.S.A. § 814, the Permittee shall conduct and include the results of the Metals Scan with each WET test conducted during continuance.

D. Quality Assurance Report / Proficiency Testing

To ensure there are adequate laboratory controls and appropriate quality assurance procedures, the Permittee shall conduct an annual laboratory proficiency test for the analysis of all pollutant parameters performed within their facility laboratory and reported as required by their NPDES permit. Proficiency Test samples must be obtained from an accredited laboratory or as part of an EPA DMR-QA study. Results shall besubmitted to the Secretary by December 31, annually, beginning in **2023.**

VI. General Conditions

A. Electronic Reporting

The National Pollution Discharge Elimination System (NPDES) Electronic Reporting Rule (eRule) modernized Clean Water Act reporting for municipalities, industries, and other facilities by converting to an electronic data reporting system. The eRule requires the inclusion of electronic reporting requirements in NPDES permits that become effective after December 21, 2015. The rule requires that NPDES regulated entities that are required to submit discharge monitoring reports (DMRs), including majors and nonmajors, individually permitted or covered by a general permit, must do so electronically after December 21, 2016. The Secretary has created an electronic reporting system for DMRs and has trained facilities in its use. As of December 21, 2020, these NPDES facilities must also submit additional information electronically as specified in Appendix A in 40 C.F.R. Part 127.

B. Noncompliance Notification

As required by 10 V.S.A. § 1295, a Noncompliance Notification has been included in the draft permit. Section 1295 requires the Permittee to provide public notification of untreated discharges from wastewater facilities. The Permittee is required to post a public alert within one hour of discovery and submit to the Secretary specified information regarding the discharge within 12 hours of discovery.

C. Reopener - The draft permit includes a reopener clause whereby the Secretary reserves the right to reopen and amend the permit to implement an integrated plan to address multiple Clean Water Act obligations.

VII. Final Determinations

The public comment period for receiving comments on this draft permit was from October 28, 2022 to November 28, 2022, during which time interested persons could submit their written views on the draft permit. No comments were received during the public comment period.

ATTACHMENT A.

REASONABLE POTENTIAL DETERMINATION

Agency of Natural Resources
Department of Environmental Conservation
Watershed Management Division
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MEMORANDUM

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Date: October 14, 2022

Subject: WQBEL Permit Limit Review and Calculations for the Vermont Fish and Wildlife Salisbury Fish Hatchery (3-0361)

I. Introduction

This memo serves as a record of the review and calculation of Water Quality Based Effluent Limits (WQBEL) and is intended to supplement the Reasonable Potential Determination memo prepared for the subject facility. The memo is broken into the following parts:

- An introduction
- A description of new or revised permit limit requirements.
- A description of the methodology used to develop WQBEL permit limits
- Narrative justifications for any new permit limits

The spreadsheet used to perform these calculations is available upon request.

II. New Permit Limits

	WQBEL Discharge Limitations									
Effluent Characteristics (Constituents)	Annual Average	Annual Limit	Monthly Average	Weekly Average	Maximum Day	Monthly Average	Weekly Average	Maximum Day	Instanteous Maximum	Sampling Frequency
		lbs/year	Mass (lbs/day)			Concentration (mg/L)				(per month)
Total Phosphorus		152				MO				Monthly November 1 - May 31; 2x per month June 1 - October 31
Total Phosphorus (Instream)						MO				Monthly November 1 - May 31; 2x per month June 1 - October 31; Concurrently with Effluent TP sampling; Location: downstream at RM 0.1, 0.2 and 0.5
Dissolved Phosphorus (Instream)						MO				Monthly November 1 - May 31; 2x per month June 1 - October 31; Concurrently with Effluent TP sampling; Location: downstream at RM 0.1, 0.2 and 0.5
Formalin					3.6			7.2		2x per month when formalin is used in raceways
Total Residual Chlorine						0.02		0.02		2x per month when Chloramine-T is used
Total Nitrogen			MO			MO				Monthly
Total Kjeldahl Nitrogen			MO			MO				Monthly
Nitrate/Nitrite Nitrogen			MO			MO				Monthly
Total Ammonia Nitrogen			MO			MO				Monthly
Metals Scan									MO	4x in permit term with WET test
Acute and Chronic WET Test									MO	4x in permit term (2x in summer months and 2x in winter months)

The constituents shown above in Table 1 were developed in order to ensure that the proposed discharge is protective of Vermont Water Quality Standards (VWQS) in the receiving water.

The following constituents were not analyzed as WQBELs: Flow, BOD, TSS, and pH. These constituents are subject to TBELs.

III. WQBEL calculation methodology

The Water-Quality Based Effluent Limitations (WQBELs) for pollutants of concern were assessed via the mass balance steady state model method outlined in the Chapter 4 of the EPA's Technical Support Document for Water Quality-Based Toxics Control (TSD) (page 86). Results were then compared to the current permit limit. The recommended permit limit was selected by comparing applicable Technology-Based Effluent Limits (TBELs), current WQBELs, and WQBELs calculated based on 2017 VWQS acute and chronic criteria.

The steady-state mass balance method produces a Waste Load Allocation (WLA), the critical effluent pollutant concentration based on the VWQS acute and chronic critical thresholds for the constituent(s) of concern. The method assumes complete mixing of the pollutant within the receiving water. The resulting WLA is the WQBEL for each acute and chronic VWQS criteria dilution assessed.

Per the TSD method, WLA results were used to calculate the Long-Term Average (LTA) for each criteria type using methods provided in Table 5-1 (TSD page 102). WLA multipliers are picked from the 99th percentile column. The most conservative LTA is then used to determine the Maximum Daily Limit (MDL) or Average Monthly Limit (AML) using the calculation shown in Table 5-2 (TSD page 103). The 99th percentile column is used for the MDL calculation and the 95th percentile columns are used for the AML calculation.

In this process, data for the facility and receiving waters is used. When necessary, values for VWQS were calculated based upon the methods described in their appendices and footnotes. Monitoring frequency are taken from the existing permit or assigned for new pollutants based upon similar facilities. In the absence of ambient receiving water data, a value of 5% of the VWQS has been generally assumed for the upstream concentration. Please see the individual calculation tabs for specific analyses.

The resulting MDL and AML are compared with the existing permit limits, any applicable TBELs including TMDLs, and any legislated limits to determine the final effluent limits that are protective of quality standards. The proposed limits are entered into the spreadsheet and Table 1 (above) and a short narrative is prepared justifying the limits. Those narratives are presented in the next section.

IV. Justification of Proposed WQBELs

1. Total Phosphorus

This facility is subject to the 2016 Lake Champlain Phosphorus TMDL. That document states the facility's Annual Waste Load Allocation is 399 lbs./year. The numeric criteria for TP to protect Aquatic Biota Use in Small High Gradient stream types are exceeded when calculated at this facility's full design flow with and without the TSD method, and with the receiving water at LMM conditions. This facility has reasonable potential to violate VWQS due to exceeding the narrative and numeric criteria for TP. Therefore, a revised annual WQBEL load of 152 lbs./year was developed for this permit. The monthly

average of 0.8 mg/L applies per 10 V.S.A. § 1266a. This permit includes monthly sampling for TP between November 1 and May 31 and sampling twice a month for TP between June 1 and October 31.

The load was reduced to a value that would represent a 20 µg/L average TP effluent reduction, based on the facility's operating conditions in the last 5 years, that will result in measurable improvements to the biological community in the receiving water. This was based on the best professional judgement from the VT DEC Monitoring and Assessment Program biologists. The load calculation was performed as follows:

Annual Load (152 lbs) = (Allowable TP from WWTF (0.038 mg/l)) x (Facility Design Flow (1.31 MGD)) x 8.34 x 365.25

1) The RPD limit calculation used a reduced flow of 1.0 MGD to calculate the annual load based on a monthly average concentration limit of 0.05 mg/L. In order to maintain the design flow that is included in the facility's application and apply the recommended annual load, the monthly concentration limit was reduced to 0.038 mg/L.
2) 8.34 is the conversion from pounds to gallons of water.
3) 365.25 days/year were used to account for leap years. Leap years were not accounted for in the RPD calculation.

To evaluate the effectiveness of the adaptive management strategy being developed to reduce total phosphorus concentrations discharged, instream biological and water quality monitoring shall be conducted. A sampling plan shall be developed and submitted to DEC for approval. Once the sampling plan is approved, a QAPP shall be submitted to DEC for approval.

Instream sampling for Total Phosphorus and Dissolved Phosphorus shall coincide with effluent Total Phosphorus monitoring. Sampling shall occur downstream at Halnon Trib 10 RM 0.1, 0.2, and 0.5.

Macroinvertebrate monitoring shall be conducted during the months of August-October in 2024 and 2026 at Halnon Trib 10 at RM 0.1 and Halnon RM 2.5.

2. Formalin

The previous permit did not include a formalin monitoring frequency or limit and only required reporting of dates and quantities of all chemicals used in the WR-43. Based on the WR-43s, and confirmed by the facility, formalin is the main chemical used at the hatchery for control of pathogens and disease. A new Maximum Day limit of 7.2 mg/l and new Monthly Average limit of 3.6 mg/l has been added to this permit.

Currently there are no acute and chronic aquatic life criteria for either formalin or formaldehyde in the state water quality standards for Massachusetts, New Hampshire, or Vermont. Hohreiter and Rigg derived acute and chronic aquatic life formaldehyde criteria of 4.58 mg/L and 1.61 mg/L, respectively, in Draft AQUAGP 2020 Fact Sheet Page 26 in accordance with EPA's Guidelines for Deriving Numerical

National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses. For the limit calculation, these values were converted to acute and chronic formalin criteria (assuming formalin is 37% formaldehyde) by multiplying by 2.7; resulting in 12.36 mg/L formalin (acute) and 4.34 mg/L formalin (chronic).

It was clarified by the facility in a July 26, 2022 letter that more frequent formalin treatments occur in an area of the facility, the Hatch House, that is sectioned off from the rest of the facility. More sporadic treatment of formalin occurs in the raceways, as clarified in a September 21, 2022 letter from the facility.

An RPD for the Hatch House formalin use calculated the resultant formalin concentration in the facility's 1.31 MGD flow before discharge and after mixing with the Hatch House's 40 gallon/day maximum formalin treated water. The resultant concentration was 0.05 mg/L, well below the acute and chronic formalin criteria. Therefore, there is no reasonable potential for formalin from the Hatch House to violate water quality standards based on the method of formalin use described by the facility. The limits and monitoring requirements do not apply to formalin use in the Hatch House.

The RPD for formalin use in the raceways determined reasonable potential and assigned limits based on multiplying the acute and chronic formalin criteria by the facility's instream waste concentration (IWC) of 0.98. The RPD calculation does not follow TSD method described in the WQBEL calculation methodology section above. When applying the TSD method, the resulting limits are a Maximum Day limit of 7.2 mg/l and a Monthly Average limit of 3.6 mg/l, and these are included in the permit. These limits apply only to formalin use in the raceways.

This permit contains a requirement to report Formaldehyde concentrations, calculated effluent Formalin concentrations, the date the product is used, and quantities of product used for each treatment. Monitoring shall consist of a single grab sample twice a month when the chemical is in use in the raceways. Grab samples shall be collected to account for detention time throughout the system.

3. Total Residual Chlorine

The RPD stated limits for total residual chlorine should be established as 0.019 mg/L daily maximum and 0.011 mg/L monthly average. These limits are equal to the VWQS acute and chronic criteria for protection of aquatic biota. The suggested sampling was twice per month during months when chlorine products are used.

The facility clarified that the only chlorine containing product they use is Chloramine-T, which is used very rarely and only when approved by the fish hatchery pathologist to treat potential disease outbreaks. Chloramine-T has only been used by the facility once in the last five years. Due to this updated information, the previous narrative permit requirements established for use of Chloramine-T shall remain in the permit and a compliance level of 0.02 mg/L for TRC will be included in this permit.

The previous permit authorizes use of Chloramine-T in concentrations up to 20ppm for up to 60 minutes on the fish in the start tank and raceways and treatment shall be limited such that no more than one half of the facility's design flow receives treatment at any one time. Treatments may be made for up to three consecutive days for bacteria control or up to 21 days for parasite control.

The compliance level of 0.02 mg/L is specified because the limitations of 0.019 and 0.011 mg/L for TRC are below the minimum level (ML) for analysis of TRC using Method 4500-Cl G, N, N-diethyl-p-phenylenediamine (DPD) colorimetric, of 0.02 mg/L. This approach is consistent with EPA's Technical Support Document for Water Quality-based Toxics Control (EPA-505-2-90-001, March 1991), page 111, which recommends, "the compliance level be defined in the permit as the minimum level (ML)." See Standard Methods for the Examination of Water and Wastewater for the full text of these test methods.

Given the magnitude, frequency and duration of Chloramine-T use and the detention time of the polishing pond, TRC measurements of 0.02 mg/L and less will be considered in compliance.

4. Total Ammonia Nitrogen

This facility has an IWC great enough to have potential Total Ammonia Nitrogen toxic effects in the receiving water. The previous permit included an annual monitor only requirement and there is insufficient data available to determine RP for summer and winter. In order to collect data to calculate the reasonable potential for this facility to violate VWQS for Total Ammonia Nitrogen this permit has increased from an annual to a monthly monitor only requirement. Both concentrations and loads should be monitored.

5. Total Nitrogen, Kjeldahl Nitrogen and Nitrate/Nitrite Nitrogen

Total Nitrogen monitoring should be conducted in support of the 2016 Lake Champlain Total Phosphorus TMDL. A monthly monitor only condition has been added to this permit. The monthly monitoring frequency has been chosen based upon the high IWC. Both concentrations and loads shall be monitored. Total Nitrogen (TN), Total Kjeldahl Nitrogen (TKN) and Nitrate/Nitrite Nitrogen (NOx) should each be reported using an appropriate combination of CWA approved methods and arithmetic (TN = TKN +NOx).

Historically, nutrient management focused on limiting a single nutrient—phosphorus or nitrogen—based on assumptions that production is usually phosphorus limited in freshwater and nitrogen limited in marine waters. Scientific research demonstrates this is an overly simplistic model. The evidence indicates management of both phosphorus and nitrogen is necessary to protect water quality.

6. Whole Effluent Toxicity (WET)

In order to provide additional data for future assessments of WET reasonable potential, this permit requires four 1-species (*Ceriodaphnia dubia)* 48 hour acute/ 7-day chronic tests be conducted during

the permit term, two during the summer (August-October 2022 and 2024) and two during the winter (January-February 2023 and 2025). Concurrent sampling for TAN and the Metals Scan shall be conducted with each of these tests.

7. Metals

This facility has an IWC of 0.987 at 7Q10. This value exceeds the IWC described in the Reasonable Potential Determination Decisions Trees prepared by the VT DEC Wastewater Program in conjunction with the Monitoring and Assessment Program for facilities to have potential RP for Metals toxicity.

This permit includes a requirement for conducting a Metals Scan four times during the permit term, concurrently with each WET test. The Metals Scan includes those metals listed in Appendix J, Table 2 of 40 CFR Part 122 and Aluminum.

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MEMORANDUM

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Date: May 18, 2022

Subject: Reasonable Potential Determination for the VT Fish & Wildlife - Salisbury Fish Culture Station

I. Facility Information

VT Fish & Wildlife - Salisbury Fish Culture Station (FCS)
646 Lake Dunmore Rd, Salisbury, VT 05769
Permit No. 3-0361
NPDES No. VT0120098
Facility Location: 43.92643, -73.0999 (NAD 83)
Approximate Outfall Location: 43.9256, -73.1008 (NAD 83)

II. Hydrology

Receiving water: Halnon Brook Trib 10
Facility Design Flow: 1.310 MGD = 2.027 CFS
Estimated 7Q10[1] = 0.026 CFS
Estimated LMM[2] = 0.092 CFS
Instream Waste Concentration at 7Q10 Flow (IWC-7Q10) = 0.987 (>10%)
Instream Waste Concentration at Low Median Monthly Flow (IWC-LMM) = 0.957 (>10%)

The Vermont Department of Fish and Wildlife owns and operates the VT Fish & Wildlife - Salisbury Fish Culture Station (FCS). The Salisbury FCS treats the water used to rear fish by applying baffles to capture solid wastes which are then removed with a vaccuum before the flows enter a settling pond.

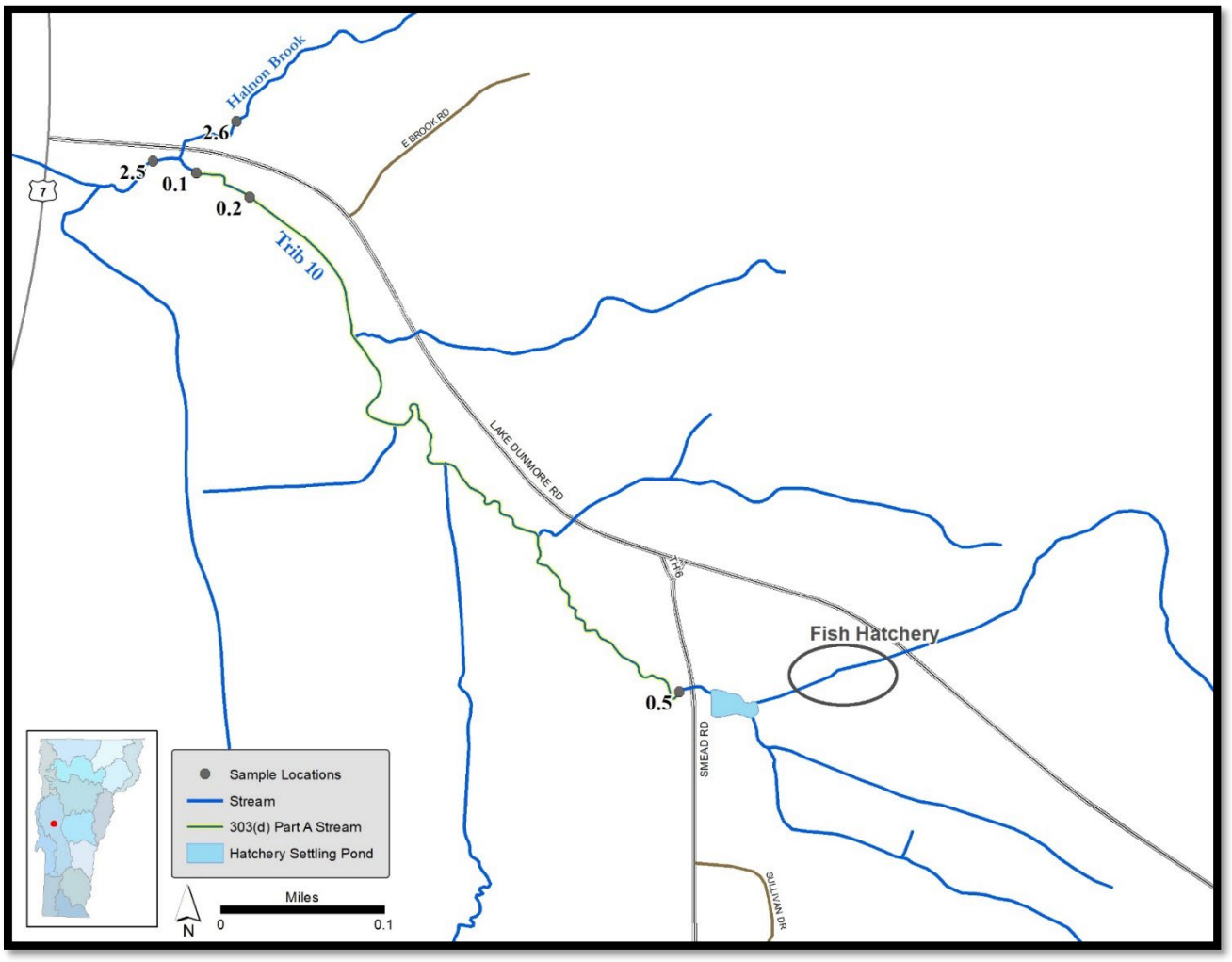
The VT Fish & Wildlife - Salisbury FCS discharges to Halnon Brook Trib 10, a Class B (2) water which is designated as Cold Water Fish Habitat. B(2) streams "shall be managed to achieve and maintain good biological

[1] Using daily mean stream flows, the flow of the receiving water equal to the minimum mean flow for seven consecutive days, that has a 10% probability of occurring in any given year.

[2] "Low Median Monthly Flow". Using daily mean stream flows, the median monthly flow of the receiving water for that month having the lowest median monthly flow.

integrity" (VWQS, 2017, § 29A-306 (a)(3)(c)). At the point of discharge, the stream has a contributing drainage area of 0.28 square miles. There is no existing permitted waste management zone or mixing zone. See Figure 1 for site monitoring locations.

Figure 1. Map of Halnon Brook and Trib 10 sampling sites



This memo is organized into the following sections:

- Summary of Effluent Data for the VT Fish & Wildlife - Salisbury FCS
- Biological Assessments Downstream of the VT Fish & Wildlife - Salisbury FCS
- Summary of Instream Ambient Chemistry Data for Trib 10 to Halnon Brook
- Assessment of Reasonable Potential of the VT Fish & Wildlife - Salisbury FCS Discharge to Exceed Vermont Water Quality Standards (VWQS)
- Summary of Reasonable Potential Determinations

III. Effluent Data for the VT Fish & Wildlife - Salisbury FCS

A. Effluent Data Summary

Table 1a. Effluent Data for the VT Fish & Wildlife - Salisbury FCS from 2/28/2017 to 12/31/2021.

Parameter Name	Limit	Units	Min	Average	Max	Count	Violations
BOD, 5-DAY (20 DEG. C) - Effluent Gross Value Monthly Average	MO	mg/l	1.1	2.4	4.7	5	N/A
TOTAL SUSPENDED SOLIDS (TSS) - Effluent Gross Value Daily Maximum	15	mg/l	0.9	1.4	4	35	0
TOTAL SUSPENDED SOLIDS (TSS) - Effluent Gross Value Average	5	mg/l	0.9	1.4	4	35	0
pH - Effluent Gross Value Maximum	8.5	SU	7.3	7.7	8	35	0
pH - Effluent Gross Value Minimum	6.5	SU	7.3	7.7	8	35	0
PHOSPHORUS, TOTAL (AS P) - Effluent Gross Value Monthly Average	MO	mg/l	0.037	0.07	0.17	20	N/A
PHOSPHORUS, TOTAL (AS P) - See Comments (annual total, prev #) Annual Average	399	lbs/day	104.2	191.8	257.9	5	0
FLOW, IN CONDUIT OR THRU TREATMENT PLANT - Effluent Gross Value Monthly Average	1.31	MGD	0.75	0.88	1.24	58	0
NITROGEN, AMMONIA TOTAL (AS N) - Effluent Gross Value	MO	mg/l	0.40	0.48	0.50	5	N/A

B. Whole Effluent Toxicity (WET) Data Summary

This facility does not have any Whole Effluent Toxicity (WET) data on record. No WET limits were included in the previous permit.

This facility has a 7Q10 IWC of 0.987 (>10%). This value exceeds the IWC described in the RPD Decision Trees for facilities to have potential RP for Total Ammonia Nitrogen (TAN) toxicity and for Priority Pollutant Metals toxicity. These tables were developed for domestic WWTFs, but due to the very high IWC it is appropriate to monitor for these toxic substances.

40 CFR Part 122.44(d)(1) requires the Secretary to assess whether the discharge causes or has the reasonable potential to cause or contribute to an excursion above any narrative or numeric water quality criteria. This facility has a high instream waste concentration and therefore has the potential to contribute significant toxicity to the receiving water. However, there is a lack of sufficient WET testing data or toxicological pollutant data. In order to provide additional data for future assessments of WET reasonable potential, it is recommended that four 1-species (*Ceriodaphnia dubia)* 48 hour acute/ 7-day chronic tests be included in the draft permit, two during the

summer (August/October 2022 and 2024) and two during the winter (January/February 2023 and 2025). It is also suggested that concurrent sampling for TAN and the priority metals be conducted with each of these tests.

WET testing of *Pimephales promelas* or other fish has been determined to be unnecessary due to the nature of the facility; this facility hatches and raises salmonids; therefore no reasonable potential exists for fish toxicity under ordinary operational conditions.

IV. Biological Assessments for the Trib 10 to Halnon Brook Downstream of the VT Fish & Wildlife - Salisbury Fish Culture Station

The 2017 Vermont Water Quality Standards (VWQS) § 29A-306 outlines Use-specific Management Objectives and Criteria by Class for Aquatic Biota. Halnon Brook and Halnon Brook Trib 10 in Salisbury, Vermont are designated as Class B(2) streams. B(2) streams "shall be managed to achieve and maintain good biological integrity" (VWQS, 2017, § 29A-306 (a)(3)(c)).

In 2012, Halnon Brook Trib 10 was added to the 303(d) List of Impaired Waters based on 2009 and 2010 biological assessments conducted at Trib 10 River Mile (RM) 0.1, which indicated failure to meet B(2) Aquatic Biota criteria. The principal pollutant of concern was identified as phosphorus and the dominant source of nutrients was determined to originate at the outfall of the Salisbury FCS.

Subsequent bioassessments at Trib 10 RM 0.1 conducted in 2012, 2019, 2020 and 2021 continued to indicated failure to meet Class B(2) VWQS for Aquatic Biota Use criteria in the receiving water, Halnon Brook Trib 10.

The potential impacts of the phosphorus discharge from the Salisbury FCS to the receiving water have been assessed in relation to the nutrient criteria in §29A-302(2)(A) of the 2017 VWQS and the combined numeric nutrient criteria in §29A-306(a)(3)(c). The combined numeric nutrient criteria rely on numeric phosphorus concentrations in combination with response criteria related to eutrophication and aquatic biota use criteria.

To interpret current and future attainment with these criteria, the Watershed Management Division (WSMD) examines TP concentrations in relation to all available information for the response criteria in §29A-306(a)(3)(c) of the VWQS for streams that can be assessed using macroinvertebrate biocriteria. Using these criteria, the WSMD can make a positive finding of compliance with the criteria when numeric nutrient criteria are attained, or when specific nutrient response variables: pH, turbidity, dissolved oxygen, and aquatic biota use, all display compliance with their respective criteria in §29A-306(a)(3)(c). If total phosphorus concentrations are exceeded but response variables are met, the VWQS nutrient criteria are met. If phosphorus concentrations are exceeded and response variables are not met, it is a violation of the VWQS.

Halnon Brook Trib 10 RM 0.1 was evaluated using the Small High Gradient (SHG) Stream Type for Class B(2) streams. To apply nutrient criteria, nutrient concentrations for the applicable Class and Stream Type must be met, or all Nutrient Response Variables must be met. In-stream total phosphorus concentration is the nutrient criteria identified by the VWQS for the three stream types.

MAP maintains the VTDEC assessment database, an EPA-required database which describes the conditions of Vermont's surface waters with respect to their attainment of VWQS. For the Halnon Brook Trib 10 segment to which this facility discharges, the database indicates the receiving water does not support all designated uses. This segment is on Part A of the 303(d) List of Impaired Waters, with Halnon Brook Trib 10 impaired use of aquatic life support due to elevated nutrients affecting aquatic biota.

Applying the combined nutrient criteria for aquatic biota, Halnon Brook Trib 10 does not meet VWQS. The total phosphorus concentration of <12 ug/l for Class B(2) SHG streams is greatly exceeded and macroinvertebrate assessments conducted in 2009, 2010, 2012, 2019, 2020 and 2021 have not met VWQS (Figure 2).

In 2006 the Wastewater Management Division established the compliance point for the Salisbury FCS at Trib 10, RM 0.5, immediately downstream from the hatchery settling pond. Wastewater discharge permit conditions apply at the identified compliance point (Trib 10 RM 0.5). As such, water quality assessments conducted at Trib 10 (RM 0.1 & RM 0.2) are appropriate locations and representative of well mixed flow. Trib 10 (RM 0.1) is just above the confluence with the mainstem of Halnon Brook, 0.4 miles below the compliance point (RM 0.5).

Biological Assessments:

Biomonitoring locations are presented in Table 2 and Figure 1. Within the receiving water of Halnon Brook Trib 10, macroinvertebrate samples have been collected at RM 0.2 and 0.1. These sample locations represent two stream types, transitioning from slow low gradient to small high gradient, allowing for assessments of both communities.

Trib 10 at RM 0.1 is a Small High Gradient (SHG) stream type, and biological assessments were conducted at this site in 2009, 2010, 2012, 2019, 2020 and 2021. As previously described these assessments did not meet VWQS. Results for sampling at Trib 10 RM 0.1 are presented in Figure 2.

Trib 10 RM 0.2 is a Slow Low Gradient (SLG) stream type, with biological assessments conducted in 2012 and 2019. These assessments also indicated failure to meet Class B(2) Aquatic Biota Use as specified in VWQS Appendix G for SLG stream types. Results are presented in Figure 3.

The mainstem of Halnon Brook is a SHG stream type and was sampled at RM 2.5 & RM 2.6 in 2001, 2009, 2019, 2020 and 2021. Halnon Brook RM 2.5 is approximately 100 meters below the confluence with Trib 10 and RM 2.6 is approximately 75 meters upstream of the confluence.

Halnon Brook RM 2.6 consistently received passing assessments using the scoring guidelines for Stream Type SHG and WQ Class B(2) from 2001-2019. Samples collected in 2020 and 2021 at Halnon Brook RM 2.6 indicated degradation and do not meet VWQS. Since there is no upstream location on Halnon Brook Trib 10, Halnon Brook RM 2.6 was used as a control for Trib 10 until the recent degradation of the biological community. The average phosphorus concentration during base flow from 2009-2020 at Halnon Brook RM 2.6 was 7.5 ug/L, well below nutrient criteria for the SHG stream type. The recent degradation of the aquatic community is due to the recruitment of nutrient tolerant amphipods from Halnon Trib 10 to the Halnon Brook upstream (RM 2.6) and downstream (RM 2.5) sites.

Halnon Brook RM 2.5 has been steadily degrading since 2001 when it received a passing assessment. Halnon Brook RM 2.5 met B(2) VWQS for Aquatic Biota Use in 2020, but failed to meet in 2019 and 2021. Results for Halnon Brook RM 2.5 & RM 2.6 are presented in Figures 4 & 5 respectively.

Table 2. Biomonitoring sample location information

Location Name	River Mile	Location Description	Stream Type	Drainage Area (km2)	Latitude	Longitude	Elevation (ft)
Halnon Brook	2.6	Located above Halnon Brook Trib 10 and Route 53 bridge 50m.	SHG	8.76	43.9306	-73.1066	390
Halnon Brook	2.5	Located below Halnon Brook Trib 10 confluence approximately 100m.	SHG	12.05	43.9302	-73.1076	385
Halnon Brook Trib 10	0.2	Located approximately 50m upstream from breached dam. This tributary was previously known as Trib 1, changed to a more accurate description of Trib 10 in Dec 2016.	SLG	3.26	43.9299	-73.1064	395
Halnon Brook Trib 10	0.1	Located immediately above confluence with Halnon Brook below old dam. This tributary was previously known as Trib 1, changed to a more accurate description of Trib 10 in Dec 2016.	SHG	3.25	43.9301	-73.1071	390

Macroinvertebrate Community Metrics:
Bioassessments conducted at Trib 10 (RM 0.1 & 0.2) and Halnon Brook (RM 2.5) show a typical fingerprint of nutrient enrichment as the primary stressor. This is represented by an elevated Biotic Index (BI) and the proliferation of nutrient tolerant taxa causing a departure from the streams natural condition, shown by the Percent Model Affinity of Orders (PMA-O) metric. In addition, the functional feeding groups shifted to collector gatherers instead of scrapers, predators, and leaf shredders, which are more typical of a Small High Gradient stream as shown in the PPCS-F metric (Figure 2 and Figure 3).

The macroinvertebrate community assessments on Trib 10 (RM 0.1 & RM 0.2) represent a significant alteration to the biological community and exceed "moderate change: to the aquatic community", thereby violating Vermont Water Quality Standards. The Salisbury FCS discharge to Trib 10 is significant; at low median monthly flow conditions, the hatchery effluent comprises more than 95 percent of the stream flow.

Because Halnon Brook Trib 10 does not meet Vermont Water Quality Standards (VWQS), it has been on Part A of the Federal Clean Water Act 303 (d) list of impaired waters since 2012. Any waterbody on Part A is "assessed as impaired due to one or more pollutants for which a TMDL is required to be developed." The pollutant is described as nutrients impairing aquatic life support (ALS). The surface water quality problems are described as "elevated nutrients affecting aquatic biota". The most recent permit for the hatchery discharge expired on March 31, 2012, however the facility has continued operation with a Title 3 Section 814 administrative continuation since that date.

Figure 2. Macroinvertebrate site summary for Halnon Brook Trib 10 RM 0.1 using Small High Gradient (SHG) criteria

Macroinvertebrate Site Summary

Location: Halnon Brook Trib 10, 0.1
Town: Salisbury
Description: Located immediately above confluence with Halnon Brook below old dam. Previous coordinates: 43.929722, 73.10778. This site previously known as Trib 1, changed to Trib 10 in Dec 2016.
Stream Type: Small High Gradient

Date	Density	Richness	EPT Richness	PMA-O	B.I.	Oligo.	EPT/EPT + Chiro	PPCS-F	Community Assessment
10/2/2009	3202	24.5	9.5	31.4	5.37	0.00	0.58	0.32	Does not Meet WQS
9/29/2010	4992	32.0	13.0	47.4	4.99	0.00	0.58	0.35	Does not Meet WQS
10/2/2012	2748	25.0	10.0	53.1	4.74	0.00	0.80	0.31	Does not Meet WQS
10/11/2019	3592	24.0	7.0	39.7	4.81	0.45	0.27	0.35	Does not Meet WQS
10/06/2020	3860	28.0	12.0	37.0	5.25	0.31	0.80	0.35	Does not Meet WQS
10/1/2021	2748	27.0	14.0	47.0	4.65	0.44	0.99	0.39	Does not Meet WQS
Full Support	≥ 300	≥ 27	≥ 16	≥ 45	≤ 4.5	≤ 12	≥ 0.45	≥ 0.4	
Indeterminate	≥ 250	≥ 26	≥ 15	≥ 40	≤ 4.65	≤ 14.5	≥ 0.43	≥ 0.35	
Non-Support	< 250	< 26	< 15	< 40	> 4.65	> 14.5	< 0.43	< 0.35	

*Scoring Guidelines for Stream Type SHG and WQ Class B(2).

Figure 3. Macroinvertebrate site summary for Halnon Brook Trib 10 RM 0.2 using Slow Low Gradient (SLG) criteria

Macroinvertebrate Site Summary

Location: Halnon Brook Trib 10, 0.2
Town: Salisbury
Description: Located approximately 50yds upstream from breached dam.
Stream Type: Slow Low Gradient

Date	Density	EOT Rich-ness	BCG Intol-erant Richness	PMA-O	B.I.	Amphipod + Isopod - Hyallela	EOT/ EOT+C	PPCS-F	Sensitive COTE %	EOT Density	Community Assessment
10/2/2012	14392	3.0	4.0	19.4	5.81	90.4	0.003	0.065	0.056	4.0	Does Not Meet WQS
10/11/2019	4664	3.0	2.0	18.8	5.88	91.3	0.148	0.121	0.086	52.0	Does Not Meet WQS
IBI 5	≥ 500	≥ 15	≥ 10	≥ 65	≤ 5.5	0	≥ 0.5	≥ 0.5	≥ 20	≥ 500	
IBI 4	≥ 400	≥ 11	≥ 7	≥ 57	≤ 6	≤ 1	≥ 0.36	≥ 0.42	≥ 14	≥ 350	
IBI 3	≥ 300	≥ 8	≥ 5	≥ 50	≤ 6.5	≤ 5	≥ 0.23	≥ 0.34	≥ 9	≥ 200	
IBI 2	≥ 200	≥ 5	≥ 2	≥ 40	≤ 7	≤ 25	≥ 0.11	≥ 0.29	≥ 3	≥ 100	
IBI 1	≥ 0	≥ 0	≥ 0	≥ 0	>7	>25	≥ 0	≥ 0	≥ 0	≥ 0	

Figure 4. Macroinvertebrate site summary for Halnon Brook River Mile 2.5 using Small High Gradient (SHG) criteria

Macroinvertebrate Site Summary									
Location:	Halnon Brook, 2.5								
Town:	Salisbury								
Description:	Located below Salisbury Fish Hatchery tributary 200m.								
Stream Type:	Small High Gradient								
Date	**Density**	**Richness**	**EPT Richness**	**PMA-O**	**B.I.**	**Oligo.**	**EPT/EPT + Chiro**	**PPCS-F**	**Community Assessment**
10/4/2001	4270	43.5	23.0	75.3	3.28	0.04	0.94	0.58	Meets WQS
10/2/2009	2932	42.5	21.0	69.3	3.74	0.14	0.94	0.54	Meets WQS
10/11/2019	2380	39.0	17.0	37.9	4.00	0.34	0.77	0.43	Does Not Meet WQS
10/6/2020	3188	36.0	19.0	56.4	3.97	0.13	0.96	0.58	Meets WQS
10/1/2021	1402	25.5	13.0	50.5	3.59	0.28	0.95	0.45	Does Not Meet WQS
Full Support	≥ 300	≥ 27	≥ 16	≥ 45	≤ 4.5	≤ 12	≥ 0.45	≥ 0.4	
Indeterminate	≥ 250	≥ 26	≥ 15	≥ 40	≤4.65	≤ 14.5	≥ 0.43	≥ 0.35	
Non-Support	< 250	< 26	< 15	< 40	>4.65	> 14.5	< 0.43	< 0.35	

*Scoring Guidelines for Stream Type SHG and WQ Class B(2).

Figure 5. Macroinvertebrate site summary for Halnon Brook River Mile 2.6 using Small High Gradient (SHG) criteria

Macroinvertebrate Site Summary									
Location:	Halnon Brook 2.6								
Town:	Salisbury								
Description:	Located above Trib 10 (Salisbury Fish Hatchery receiving water) and Route 53 bridge 50m.								
Stream Type:	Small High Gradient								
Date	**Density**	**Richness**	**EPT Richness**	**PMA-O**	**B.I.**	**Oligo.**	**EPT/EPT + Chiro**	**PPCS-F**	**Community Assessment**
6/14/1990	1930	43.0	23.0	75.5	3.40	0.10	0.79	0.54	Meets WQS
10/4/2001	4052	44.0	21.0	66.3	2.59	0.69	0.94	0.55	Meets WQS
10/2/2009	1134	44.0	23.5	62.7	2.98	0.52	0.93	0.54	Meets WQS
10/11/2019	1000	41.0	22.0	61.6	3.24	2.67	0.91	0.49	Meets WQS
10/6/2020	700	29.0	14.0	39.2	3.52	0.62	0.97	0.33	Does Not Meet WQS
10/1/2021	1073	24.5	12.0	31.6	4.59	0.45	0.97	0.39	Does Not Meet WQS
Full Support	≥ 300	≥ 27	≥ 16	≥ 45	≤ 4.5	≤ 12	≥ 0.45	≥ 0.4	
Indeterminate	≥ 250	≥ 26	≥ 15	≥ 40	≤ 4.65	≤ 14.5	≥ 0.43	≥ 0.35	
Non-Support	< 250	< 26	< 15	< 40	> 4.65	> 14.5	< 0.43	< 0.35	

*Scoring Guidelines for Stream Type SHG and WQ Class B(2).

V. Ambient Chemistry Data

Water chemistry measures of relevant parameters for this assessment are summarized in Tables 3a and 3b. The most recent ambient chemistry data available for Halnon Brook Trib 10 is from 10/16/2021, downstream of the hatchery outfall at RM 0.1. The most recent data available from Halnon Trib 10 RM 0.5 is from 10/06/2020, which is approximately 0.05 miles or 250 feet below the discharge. No upstream data is available because Trib 10 is created by wells pumping groundwater into the fish hatchery.

Data representativeness are assessed by evaluating the observed flow conditions from field sheets, whether measured or qualitatively described, when samples were collected. Other contemporaneous streamflow data, such as the U.S. Geological Survey stream gage network, are also taken into consideration where proximal and representative of the hydrologic conditions at the time (e.g., unimpacted by artificial flow regulation). The RM 0.1 downstream sampling location at this site is the most sensitive location, and the sampling results are determined to be representative of low flow based on a review of available streamflow observations. Thus, the data presented below are relevant for inclusion in this analysis.

Data used to evaluate in-stream chemistry is collected under low flow conditions (typically August or September) when turbidity is generally low, and no precipitation has been observed for three days. Low flow conditions are indicated by a flow type of base and a flow level of low or moderate. Freshet flow type or high flow levels are not appropriate for determining compliance with VWQS.

Table 3a. Surface-water quality sampling results at the VT Fish & Wildlife - Salisbury FCS.

Visit Date	Location Name	RM	Flow Level	Flow Type	Total Aluminum (ug/l)	Total Antimony (ug/l)	Total Arsenic (ug/l)	Total Barium (ug/l)	Total Beryllium (ug/l)	Total Cadmium (ug/l)	Total Calcium (mg/l)	Total Chromium (ug/l)	Total Cobalt (ug/l)	Total Copper (ug/l)	Total Iron (ug/l)	Total Lead (ug/l)	Total Magnesium (mg/l)	Total Manganese (ug/l)	Total Molybdenum (ug/l)	Total Nickel (ug/l)	Total Potassium (mg/l)	Total Selenium (ug/l)	Total Silver (ug/l)	Total Sodium (mg/l)	Total Strontium (ug/l)	Total Sulfate (mg/l)	Total Thallium (ug/l)	Total Uranium (ug/L)	Total Vanadium (ug/l)	Total Zinc (ug/l)
10/2/2012	Halnon Brook Trib 10	0.5	Moderate	Freshet	--	--	--	--	--	--	43.3	--	--	--	--	--	21.0	--	--	--	1.29	--	--	19.3	--	11.0	--	--	--	--
10/2/2012	Halnon Brook Trib 10	0.2	Moderate	Freshet	--	--	--	--	--	--	45.7	--	--	--	--	--	22.0	--	--	--	1.49	--	--	18.6	--	11.3	--	--	--	--
10/2/2012	Halnon Brook Trib 10	0.1	Moderate	Freshet	--	--	--	--	--	--	45.2	--	--	--	--	--	21.8	--	--	--	1.49	--	--	18.4	--	11.1	--	--	--	--
8/8/2016	Halnon Brook Trib 10	0.2	Low	Base	841	<10	<1	24.8	<1	<1	44.2	<5	<1	<10	934.7	<1	21.0	33.6	<5	<5	1.36	<5	<1	17.9	89.0	--	<1	<1	<25	<50
8/15/2019	Halnon Brook	2.6	Low	Base	20	--	--	--	--	--	37.0	--	--	--	130.0	--	15.8	26.3	--	--	1.01	--	--	17.0	--	5.8	--	--	--	--
8/15/2019	Halnon Brook	2.5	Moderate	Base	152	--	--	--	--	--	43.3	--	--	--	238.0	--	20.0	21.4	--	--	1.20	--	--	19.1	--	7.9	--	--	--	--
8/15/2019	Halnon Brook Trib 10	0.5	Moderate	Base	<20	--	--	--	--	--	48.1	--	--	--	<50	--	22.6	<5	--	--	1.27	--	--	21.1	--	9.0	--	--	--	--
8/15/2019	Halnon Brook Trib 10	0.1	Moderate	Base	194	--	--	--	--	--	45.2	--	--	--	251.0	--	21.4	14.5	--	--	1.23	--	--	19.2	--	8.9	--	--	--	--
10/11/2019	Halnon Brook	2.6	Moderate	Base	20	--	--	--	--	--	33.9	--	--	--	133.0	--	15.0	28.0	--	--	1.18	--	--	16.6	--	6.2	--	--	--	--
10/11/2019	Halnon Brook	2.5	Moderate	Base	92	--	--	--	--	--	37.7	--	--	--	193.0	--	17.1	24.2	--	--	1.21	--	--	17.7	--	7.5	--	--	--	--
10/11/2019	Halnon Brook Trib 10	0.5	Moderate	Base	29	--	--	--	--	--	45.1	--	--	--	51.5	--	21.5	7.9	--	--	1.22	--	--	20.6	--	9.2	--	--	--	--
10/11/2019	Halnon Brook Trib 10	0.1	Moderate	Base	263	--	--	--	--	--	46.3	--	--	--	385.0	--	22.0	27.7	--	--	1.33	--	--	21.0	--	9.9	--	--	--	--
10/6/2020	Halnon Brook	2.6	Moderate	Base	25	--	--	--	--	--	40.0	--	--	--	134.0	--	17.7	25.6	--	--	1.27	--	--	19.2	--	6.0	--	--	--	--
10/6/2020	Halnon Brook	2.5	Moderate	Base	111	--	--	--	--	--	44.4	--	--	--	236.0	--	20.3	24.6	--	--	1.39	--	--	20.2	--	7.3	--	--	--	--
10/6/2020	Halnon Brook Trib 10	0.5	Moderate	Base	<20	--	--	--	--	--	43.5	--	--	--	<50	--	20.5	<5	--	--	1.21	--	--	19.7	--	8.8	--	--	--	--
10/6/2020	Halnon Brook Trib 10	0.1	Moderate	Base	273	--	--	--	--	--	43.1	--	--	--	449.0	--	20.5	37.5	--	--	1.38	--	--	18.9	--	8.7	--	--	--	--

Table 3b. Surface-water quality sampling results at the VT Fish & Wildlife - Salisbury FCS.

Visit Date	Location Name	RM	Flow Level	Flow Type	Alkalinity (mg/l)	Conductivity (umho/cm)	Dissolved Inorganic Carbon (mg/l)	Dissolved Organic Carbon (mg/l)	Dissolved Oxygen (mg/l)	Dissolved Oxygen Saturation (%)	pH (None)	Temp (deg C)	Total Chloride (mg/l)	Total Color measured using the visual method (PCU)	Total Hardness (mg/l)	Total Ammonia Nitrogen (mg/l)	Total Nitrate Nitrogen (mg/l)	Total Nitrate/Nitrite Nitrogen (mg/l)	Total Nitrite Nitrogen (mg/l)	Total Nitrogen (mg/l)	Dissolved Phosphorus (ug/l)	Total Phosphorus (ug/l)	Total Suspended Solids (mg/l)	Turbidity (NTU)
10/2/2012	Halnon Brook Trib 10	0.5	Moderate	Freshet	175	442	--	--	8.8	79	7.8	9	38.8	--	--	--	--	--	--	0.91	--	84.9	--	1.2
10/2/2012	Halnon Brook Trib 10	0.2	Moderate	Freshet	176	432	--	--	9.3	85	7.8	11	41.9	30	205.0	--	--	--	--	0.86	--	116.0	--	23.0
10/2/2012	Halnon Brook Trib 10	0.1	Moderate	Freshet	174	432	--	--	7.6	69	7.9	10	28.8	20	204.0	--	--	--	--	0.81	--	89.5	--	9.2
8/8/2016	Halnon Brook Trib 10	0.2	Low	Base	--	451	--	--	9.4	98	7.6	17	30.6	--	196.9	0.22	--	--	--	1.03	--	129.0	--	26.1
8/15/2019	Halnon Brook	2.6	Low	Base	141	371	31.4	3.2	--	--	8.0	12	31.3	20	157.3	0.05	--	0.62	--	0.71	6.0	5.0	--	0.3
8/15/2019	Halnon Brook	2.5	Moderate	Base	161	417	39.0	2.6	--	--	7.4	11	32.9	20	190.5	0.05	--	0.61	--	0.78	25.0	30.0	--	6.4
8/15/2019	Halnon Brook Trib 10	0.5	Moderate	Base	180	467	42.4	2.3	--	--	7.4	10	35.9	15	213.3	0.09	--	0.59	--	0.80	37.0	41.0	--	1.0
8/15/2019	Halnon Brook Trib 10	0.1	Moderate	Base	181	466	43.0	3.2	--	--	7.9	10	35.2	30	201.0	0.07	--	0.60	--	0.82	37.0	54.0	--	9.1
10/11/2019	Halnon Brook	2.6	Moderate	Base	129	340	29.5	4.2	10.5	97	7.8	9	27.4	15	146.6	0.05	--	0.49	--	0.61	5.0	7.0	--	1.7
10/11/2019	Halnon Brook	2.5	Moderate	Base	147	386	33.3	4.4	10.0	92	6.8	9	30.8	15	164.6	0.10	--	0.54	--	0.77	19.0	31.0	--	3.6
10/11/2019	Halnon Brook Trib 10	0.5	Moderate	Base	180	464	42.4	5.1	10.1	95	7.8	10	36.5	12.5	201.1	0.31	--	0.61	--	1.14	61.0	82.0	--	2.3
10/11/2019	Halnon Brook Trib 10	0.1	Moderate	Base	178	465	41.9	5.0	9.9	94	7.7	10	36.6	20	206.3	0.21	--	0.61	--	1.03	51.0	77.0	--	9.4
9/17/2020	Halnon Brook	2.6	--	Base	134	358	--	--	--	91	8.3	12	32.0	--	--	0.08	0.72	--	<0.02	--	12.0	6.0	<2	0.0
9/17/2020	Halnon Brook	2.5	--	Base	139	381	--	--	--	86	7.9	12	32.0	--	--	0.08	0.75	--	0.03	--	32.0	39.0	3.0	4.4
9/17/2020	Halnon Brook Trib 10	0.1	--	Base	155	403	--	--	--	77	8.1	11	33.0	--	--	0.08	0.77	--	0.04	--	58.0	74.0	8.0	5.5
10/2/2020	Halnon Brook	2.6	--	Freshet	143	334	--	--	--	96	7.9	11	30.0	--	--	0.08	0.59	--	<0.02	--	6.0	11.0	4.0	0.0
10/2/2020	Halnon Brook	2.5	--	Freshet	155	351	--	--	--	92	8.1	11	31.0	--	--	0.08	0.60	--	<0.02	--	24.0	36.0	5.0	2.4
10/2/2020	Halnon Brook Trib 10	0.1	--	Freshet	158	382	--	--	--	91	7.8	10	33.0	--	--	0.12	0.63	--	<0.02	--	60.0	86.0	12.0	17.5
10/6/2020	Halnon Brook	2.6	Moderate	Base	162	420	39.2	4.1	10.4	102	8.3	12	32.3	18	173.0	0.05	--	0.73	--	0.68	6.6	7.6	6.2	0.6
10/6/2020	Halnon Brook	2.6	Moderate	Base	162	341	--	--	--	96	8.0	12	31.0	--	--	0.08	0.64	--	<0.02	--	5.0	12.0	<1.9	--
10/6/2020	Halnon Brook	2.5	Moderate	Base	175	445	41.2	5.8	10.3	99	7.8	11	32.8	29	194.0	0.08	0.69	0.75	<0.02	0.90	30.4	47.7	5.4	5.9
10/6/2020	Halnon Brook Trib 10	0.5	Moderate	Base	181	468	21.0	2.2	10.8	102	7.9	10	34.2	20	193.0	0.25	--	0.80	--	1.25	75.3	92.9	<2.5	0.8
10/6/2020	Halnon Brook Trib 10	0.1	Moderate	Base	186	474	48.7	7.3	9.5	91	8.1	11	33.9	18	192.0	0.14	--	0.94	--	1.15	57.0	97.4	13.5	15.3
10/6/2020	Halnon Brook Trib 10	0.1	Moderate	Base	171	385	--	--	--	89	7.5	11	33.0	--	--	0.21	0.73	--	<0.02	--	50.0	89.0	15.0	15.3
10/13/2020	Halnon Brook	2.6	--	Freshet	141	391	--	--	--	98	8.0	10	29.0	--	--	0.08	0.56	--	<0.02	--	17.0	20.0	<1.9	0.5
10/13/2020	Halnon Brook	2.5	--	Freshet	147	420	--	--	--	97	7.9	10	31.0	--	--	0.09	0.59	--	<0.02	--	35.0	54.0	11.0	6.6
10/13/2020	Halnon Brook Trib 10	0.1	--	Freshet	153	458	--	--	--	92	7.6	10	33.0	--	--	0.14	0.63	--	<0.02	--	62.0	91.0	13.0	12.2
9/3/2021	Halnon Brook	2.6	--	Base	112	435	--	--	--	103	8.0	13	21.0	--	--	0.08	0.51	--	<0.02	--	5.0	8.0	3.0	0.0
9/3/2021	Halnon Brook	2.5	--	Base	139	498	--	--	--	92	8.1	12	25.0	--	--	0.08	0.55	--	0.02	--	25.0	41.0	6.0	3.7
9/3/2021	Halnon Brook Trib 10	0.1	--	Base	162	596	--	--	--	92	8.0	12	31.0	--	--	0.12	0.60	--	0.05	--	52.0	90.0	27.0	12.1
9/13/2021	Halnon Brook	2.6	--	Base	117	617	--	--	--	102	7.9	15	21.0	--	--	0.08	0.49	--	<0.02	--	11.0	12.0	<2	0.0
9/13/2021	Halnon Brook	2.5	--	Base	155	707	--	--	--	100	8.1	14	25.0	--	--	0.08	0.51	--	<0.02	--	26.0	38.0	<2	1.1
9/13/2021	Halnon Brook Trib 10	0.2	--	Base	165	--	--	--	--	--	--	--	31.0	--	--	<0.08	0.54	--	0.03	--	59.0	78.0	7.0	--
9/13/2021	Halnon Brook Trib 10	0.1	--	Base	--	841	--	--	--	98	7.9	14	--	--	--	--	--	--	--	--	--	--	--	13.7
9/24/2021	Halnon Brook	2.6	--	Freshet	101	257	--	--	--	94	7.8	16	17.0	--	--	0.12	0.24	--	<0.02	--	12.0	27.0	159.0	38.0
9/24/2021	Halnon Brook	2.5	--	Freshet	108	288	--	--	--	93	7.8	15	21.0	--	--	0.14	0.36	--	<0.02	--	60.0	250.0	117.0	41.0
9/24/2021	Halnon Brook Trib 10	0.1	--	Freshet	114	308	--	--	--	89	7.6	15	26.0	--	--	0.24	0.56	--	0.04	--	140.0	260.0	60.0	55.0
10/16/2021	Halnon Brook	2.6	--	Freshet	115	324	--	--	--	91	7.9	15	20.0	--	--	0.08	0.32	--	<0.02	--	9.0	53.0	20.0	7.6
10/16/2021	Halnon Brook	2.5	--	Freshet	128	359	--	--	--	90	7.8	15	23.0	--	--	0.08	0.37	--	<0.02	--	35.0	150.0	53.0	57.6
10/16/2021	Halnon Brook Trib 10	0.1	--	Freshet	144	421	--	--	--	89	7.7	15	28.0	--	--	<0.08	0.45	--	0.02	--	75.0	170.0	23.0	17.5

VI. Fish Hatchery

The hatchery uses well water to raise fish for distribution across the state. The wells provide a large supply of consistently cold, clean water that has a relatively high amount of carbonate in it. The well water provides over 95 percent of the flow in the Trib. 10 to Halnon Brook, and this continuous flow from the facility has the potential to impact the fluvial morphology of the stream.

Assessment of Reasonable Potential of the VT Fish & Wildlife - Salisbury FishCulture Station (FCS) discharge to exceed Vermont Water Quality Standards

A. Methodology and Assumptions

A steady-state mass balance approach was used to assess reasonable potential for the potential pollutants of concern based on the methods described in the Technical Support Document for Water Quality-based Toxics Control (TSD; EPA/505/2-90-001). The expected receiving water concentrations (RWC; C_r) of pollutants were calculated according to Equation 1 at critical conditions. If the expected receiving water concentration determined exceeds the applicable Vermont Water Quality Standard, limits must be included in the permit. Tables 4 and 5 present this analysis for TAN and total phosphorus for the VT Fish & Wildlife - Salisbury FCS .

$$\text{Equation 1.} \quad C_r = \frac{(Q_e)(C_e)+(Q_s)(C_s)}{Q_r}$$

Where:
C_r = resultant expected receiving water pollutant concentration (mg/L or ug/L)
Q_e = maximum permitted effluent flow (cfs).
C_e = critical effluent pollutant concentration (mg/L or ug/L)
Q_s = stream flow upstream of the point of discharge (cfs). Low Median Monthly flow for nutrients, 7Q10 for applying toxics criteria. When applicable, 30Q10 is used for chronic Total Ammonia Nitrogen assessments.
C_s = upstream pollutant concentration (units dependent on parameter, typically mg/L or ug/L).
$Q_r = (Q_s + Q_e)$ = resultant in-stream flow, after discharge (cfs)

NPDES regulations at §122.44(d)(1)(ii) require that permit writers consider the variability of the pollutant in the effluent when determining the need for Water Quality-Based Effluent Limits (WQBELs). EPA guidance for permit writers on how to characterize effluent concentrations of certain types of pollutants using a limited data set and accounting for variability is detailed in the TSD. The current analysis uses the TSD procedure to project a critical effluent concentration (C_{etsd}) of the 95th percentile of a lognormal distribution of observed effluent concentrations over 5 years. The 95th percentile is calculated from the effluent data set using the number of available effluent data points (n) for the measured concentration of the pollutant and the coefficient of variation (CV) of the data set to predict the critical pollutant concentration in the effluent. When less than 10 data points are available, the CV is set to 0.6. For less than 10 items of data, the uncertainty in the CV is too large to calculate a standard deviation or mean with sufficient confidence (TSD). The CV and n are used to determine the factor (TSD pg 54) that is multiplied by the maximum observed effluent concentration (C_e) to determine C_{etsd}.

$$\text{Equation 2.} \quad C_{etsd} = TSD_{factor} \times C_e$$

Where:
C_{etsd} = Effluent concentration adjusted to 95th percentile value (mg/L or ug/L)
TSD_{factor} = Factor based upon EPA TSD Table 3-2, pg 54
C_e = critical (maximum observed) effluent pollutant concentration (mg/L or ug/L)

The Instream Waste Concentration (IWC) is a measure of the effluent dilution and is also used as an estimate of the facility's potential to cause or contribute to an excursion of the VWQS. The IWC equation is the

simplification of the flow portion of the mass balance equation (Equation 1) and is shown below in Equation 3:

Equation 3. $$IWC = \frac{(Q_e)}{(Q_r)}$$

The critical effluent pollutant concentration (C_e) can be multiplied by the IWC to approximate the resultant receiving water concentrations (C_r).

The equations above are generally used to prepare Reasonable Potential Determinations. In some cases, there may not be sufficient data to utilize all the equations.

This analysis of reasonable potential used the following data and assumptions:

- Average values of observed in-stream chemical data were used for most calculations; exceptions are described below.
- In-stream pollutant concentrations (C_s) and effluent concentrations (C_e) were set equal to one half the method detection limit when data were censored at the detection limit.
- Effluent pollutant concentrations (C_{etsd}) were set to the maximum observed effluent concentrations * TSD 95th percentile multiplier over the last 5 years of data collected.
- TAN analyses were divided into summer (June 1- October 31) and winter (November 1 – May 31). Five data points were used to characterize the effluent under winter conditions and 5 during summer (see Table 4). Summer defaults of 20 ºC for coldwater fish habitat streams and 25 ºC for warmwater fish habitat streams were used in summer months while winter water temperature was assumed to be 5 ºC. The highest observed downstream values were used for both winter and summer pH. Oncorhynchus spp. are assumed to be present.
- Hardness, used for determining hardness-dependent metal criteria, is based upon the lowest observed downstream concentration.

The spreadsheet used for these calculations is part of the permit record and available upon request.

A. Metals

This facility does not have any priority metals data available for the effluent. Calculations are not performed in the absence of effluent data.

This facility has an IWC of 0.987 at 7Q10. This value exceeds the IWC described in the Reasonable Potential Determination Decisions Trees prepared by the VT DEC Wastewater Program in conjunction with the Monitoring and Assessment Program for facilities to have potential RP for Metals toxicity.

It is suggested the permit include a requirement for testing priority metals three times. Testing should be conducted concurrently with any WET testing.

B. Total Nitrogen

TN is the sum of nitrate, nitrite, ammonia, soluble organic nitrogen, and particulate organic nitrogen.
TN is a calculated value based on the sum of NOx and TKN, and shall be reported as pounds, calculated as:

Average TN (mg/L) x Total Daily Flow (MGD) x 8.34 = Pounds TN/day where, TN (mg/L) = TKN (mg/L) + NOx (mg/L)

Due to the lack of effluent data and upstream monitoring data it was impossible to perform a mass balance of Total Nitrogen around the facility.

Per EPA excess nitrogen (N) and phosphorus (P) are the leading cause of water quality degradation in the United States. Historically, nutrient management focused on limiting a single nutrient—phosphorus or nitrogen—based on assumptions that production is usually phosphorus limited in freshwater and nitrogen limited in marine waters. Scientific research demonstrates this is an overly simplistic model. The evidence clearly indicates management of both phosphorus and nitrogen is necessary to protect water quality. The literature shows that aquatic flora and fauna have differing nutrient needs, some are P dependent, others N dependent and others are co-dependent on these two nutrients.

Like P, N promotes noxious aquatic plant and algal growth. High concentrations of P and N together cause greater growth of algae than P alone. The relative abundance of these nutrients also influences the type of species within the community. Furthermore, a high N-to-P ratio may exacerbate the growth of cyanobacteria, while elevated levels of nitrogen increase toxicity in some cyanobacteria species. Given the dynamic nature of all aquatic ecosystems, for the State to fully understand the degradation to water quality it is necessary to limit P and monitor bioavailable N (including nitrate, ammonium, and certain dissolved organic nitrogen compounds).

To gather data on the amount of Total Nitrogen (TN) in this discharge and its potential impact on the receiving water, monthly “monitor only” requirements for Total Nitrogen (TN), Nitrate/Nitrite (NOx), and Total Kjeldahl Nitrogen (TKN) are suggested for inclusion in this permit. The monthly monitoring frequency has been chosen based upon the high IWC.

Total Ammonia Nitrogen (TAN):
The mass balance for summer and winter TAN downstream of the VT Fish & Wildlife - Salisbury FCS is presented below in Table 4.

Table 4. Mass balance of TAN downstream of the VT Fish & Wildlife - Salisbury FCS.

	TAN - Summer (mg/L)	**TAN - Winter (mg/L)**	**Notes**
Qs (cfs)	0.03		*Estimated 7Q10 flow*
Qe (cfs)	2.031		*permitted effluent discharge*
Qr = Qs + Qe (cfs)	2.06		*Qs+Qe*
7Q10 IWC	0.987		*Qe/(Qs+Qe)*
Cs	0.00	0.00	*upstream pollutant concentration*
Max Observed Ce	0.500	0.500	*effluent pollutant concentration without adjustment by TSD factor*
Cetsd	2.30	2.30	*effluent pollutant concentration adjusted by TSD factor*
Number of Observations	5.00	5.00	*Only 5 values are available and comparison made to both Summer and Winter conditions.*
Min. No. of Observations for RP	10.00	10.00	
Cr = (CsQs+CeQe)/Qr	0.49	0.49	*resultant pollutant concentration in receiving water without TSD adjustment*
Cr = (CsQs+CetsdQe)/Qr	2.27	2.27	*resultant pollutant concentration in receiving water with TSD method*
VWQS TAN Criteria (2017) @ pH 8.1			
Protection of Aquatic Biota - Acute	3.2	4.6	
Protection of Aquatic Biota - Chronic	1.67	3.75	
Exceedance Calculated?			
Protection of Aquatic Biota - Acute without TSD adjustment	NO	NO	
Protection of Aquatic Biota - Chronic without TSD adjustment	NO	NO	
Protection of Aquatic Biota - Acute with TSD adjustment	NO	NO	
Protection of Aquatic Biota - Chronic with TSD adjustment	YES	NO	
Sufficient Data to Determine RP?	NO	NO	

This facility has a 7Q10 IWC of 0.987 (>10%). This value exceeds the IWC described in the RPD Decision Trees for facilities to have potential RP for TAN toxicity. Insufficient data is available to determine RP for either summer (June 1 to October 31) or winter (November 1 to May 30) TAN. The available data suggests that summer TAN may be exceeded, but a minimum of 10 data points are needed to determine RP for this parameter.

40 CFR Part 122.44(d)(1) requires the Secretary to assess whether the discharge causes or has the reasonable potential to cause or contribute to an excursion above any narrative or numeric water quality criteria.

To provide additional data for future assessments of TAN reasonable potential, it is recommended that monthly TAN monitoring with a monitor only condition be included in the next permit. This analysis should be conducted concurrently with any WET testing included in the permit.

C. Total Phosphorus

The potential impacts of phosphorus discharges from this facility to the receiving water have been assessed in relation to the narrative criteria in §29A-302(2)(A) of the 2017 VWQS, which states:

In all waters, total phosphorous loadings shall be limited so that they will not contribute to the acceleration of eutrophication or the stimulation of the growth of aquatic biota in a manner that prevents the full support of uses.

To interpret this standard, the Secretary relies on a framework which examines TP concentrations in relation to existing numeric phosphorus criteria and response criteria in §29A-306(a)(3)(c) of the VWQS, for streams that can be assessed using macroinvertebrate biocriteria. Under this framework, a positive finding of compliance with the narrative standard can be made when nutrient criteria are attained, or when specific nutrient response variables: pH, Turbidity, Dissolved Oxygen, and aquatic biota use, all display compliance with their respective criteria in the Water Quality Standards.

The results of mass balance calculations for Total Phosphorus using Equation 1 are presented in Table 5.

Table 5. Mass Balance of Phosphorus below the VT Fish & Wildlife - Salisbury FCS.

	Total Phosphorus (ug/l)	**Notes**
Qs (cfs)	0.09	*Estimated LMM flow*
Qe (cfs)	2.031	*permitted effluent discharge*
Qr = Qs + Qe (cfs)	2.12	*Qs+Qe*
LMM IWC	0.9567	*Qe/(Qs+Qe)*
Cs	No Data	*upstream pollutant concentration (average)*
Ce	170	*maximum effluent pollutant concentration observed*
Cetsd	221	*effluent pollutant concentration adjusted by TSD method.*
Cr = (CsQs+CeQe)/Qr	NA- Calculation not possible.	*calculated resultant downstream pollutant concentration without TSD factor of safety*
Cr = (CsQs+CetsdQe)/Qr	NA - Calculation not possible	*calculated resultant downstream pollutant concentration*
Stream Type	B(2) Small High Gradient	
Calculated Instream Contribution from Effluent without TSD method	163	*calculated resultant downstream concentration attributable to discharge . Without TSD method*
Calculated Instream Contribution from Effluent with TSD method	211	*calculated resultant downstream concentration attributable to discharge. With TSD Method*
VWQS Criteria (2017)		
Threshold Criteria	12	
Threshold Exceeded without TSD method?	YES	
Threshold Exceeded with TSD method?	YES	

Total Phosphorus Numeric Analysis:

The 2017 VWQS present Combined Nutrient Criteria for Aquatic Biota and Wildlife in Rivers and Streams in Table 2 of § 29A-306. To interpret this standard, MAP examines nutrient concentrations in relation to existing numeric phosphorus criteria and response criteria in §29A-306(a)(3)(c) of the VWQS for streams that can be assessed using macroinvertebrate biocriteria.

Halnon Brook Trib 10

The VWQS combined nutrient criteria for SHG stream types such as Trib 10 (RM 0.1) is 12 µg/L-TP. Surface water chemistry monitoring conducted at Trib 10 (RM 0.1) during base flow conditions from 2019-2021 indicate that the average instream total phosphorus (TP) concentration was 80 µg/L-TP and

values ranged from 54 µg/L – 97.4 µg/L-TP. (TP values recorded before 2019 were collected under either unknown or freshet flows). During freshet flows from 2012-2020, the average TP was 139.3 µg/L-TP, with a range of 86-260 µg/L-TP. See Table 3 for Trib 10 water quality sampling results. The total phosphorus values clearly exceed Vermont's numeric nutrient standard of 12 µg/L for Class B(2) SHG streams under base flow conditions to represent low median monthly flows from June-October.

The instream TP concentrations at Trib 10 (RM 0.1) are consistent with Salisbury FCS effluent TP monitoring data. Recent effluent TP monitoring data for the period of 2017 – 2021 indicate the average concentration was 70 µg/L and ranged from 37 µg/L – 170 µg/L-TP. The instream waste concentration of Trib 10 at low median monthly flows is 95.7 percent, indicating that the receiving water is effluent dominated (available dilution is extremely limited). As such, the receiving water concentrations of TP are very similar to the effluent concentrations of TP at these flow conditions.

The expired permit for Salisbury FCS relies on the 2002 Lake Champlain Maximum Daily Load established mass loading allocation which utilized an effluent concentration of 0.1 mg/L-TP (100 µg/L) at the design flow of 1.31 MGD. The phosphorus loading relates to 399 pounds per year, and compliance relies on quarterly TP effluent monitoring. As discussed above, the TP effluent monitoring and permit conditions illustrate the ongoing operating discharge conditions, and the permit limit for TP effluent concentrations (100 µg/L) greatly exceeds thresholds established to protect Aquatic Biota Use in SHG stream types.

Halnon Brook

Total phosphorus concentrations at Halnon 2.5 (downstream of the confluence with Trib 10) ranged from 30 µg/L to 49 µg/L between 2009-2021 under base flow conditions (Table 3). These concentrations exceed the VWQS of 12 µg/L for SHG streams. The most recent water quality data from 09/03/2021 indicates TP concentrations greatly exceeded nutrient criteria thresholds in Halnon Trib 10 at RM 0.1 (90 µg/L-TP) and Halnon Brook RM 2.5 (41 µg/L-TP). On average TP values in Halnon Brook increased by 31 µg/L-TP between RM 2.6 and 2.5 (average base flow concentration of 8 and 39 µg/L-TP respectively from 2019-2021) downstream from the confluence of Halnon Brook Trib 10. Upstream of the confluence with Trib 10, at Halnon RM 2.6, the TP levels were very low (average of 8 µg/L-TP), well below the TP threshold for SHG stream types, clearly illustrating Trib 10 and the Salisbury FCS effluent as the source of the elevated phosphorus.

Surface water monitoring above and below the confluence with Trib 10, at Halnon Brook RM 2.6 & 2.5, clearly illustrate that Trib 10 is contributing excess phosphorus to Halnon Brook RM 2.5. However, up until 2019, the macroinvertebrate community passed at Halnon 2.5, therefore the combined VWQS nutrient criteria were met. In 2019, the macroinvertebrate community declined, receiving a non-attainment assessment. The elevated phosphorous concentrations from Halnon Trib 10 are degrading the biological community, resulting in nonattainment of VWQS at Halnon Brook RM 2.5 for combined nutrient criteria when most recently sampled in 2021.

The calculated in-stream TP concentration attributable to the Salsibury FCS is 212 ug/L using the TSD method adjusted effluent data and is 162.6 ug/L without the TSD adjustment. This calculation is presented above in Table 5.

Total Phosphorus Nutrient Response Conditions Analysis:

The Combined Nutrient Response Conditions for Aquatic Biota and Wildlife in Rivers and Streams at Halnon Trib 10 RM 0.1 below the hatchery on 09/13/2021 are summarized in Table 6. The compliance point for this facility is at RM 0.5.

Table 6. Assessment of Phosphorus Response Variables Halnon Brook and Halnon Trib. 10 below the VT Fish & Wildlife - Salisbury FCS

Response variable (VWQS reference)	Target Value for Cold Water Fish Habitat	Halnon RM 2.5 (Downstream of confluence with Trib 10) 10/01/2021	Halnon Trib 10, RM 0.1 (Downstream of Salisbury FCS) 10/01/2021
pH (§3-01.B.9)	6.5-8.5 s.u.	*8.1*	*7.9*
Turbidity (§3-04.B.1)	< 10 NTU at low mean annual flow	*1.1*	***12.1***
Dissolved Oxygen (min) (§3-04.B.2)	>6 mg/L and 70% saturation	*10.3 mg/L / 99%*	*9.5 mg/L / 91% (10/6/2020)*
Aquatic biota, based on macroinvertebrates.	Attaining an assessment of good, or better.	*Fails to Meet WQS*	***Fails to Meet WQS***

Total Phosphorus Reasonable Potential Determination:

This facility is subject to the 2016 Lake Champlain Phosphorus TMDL. That document maintains the facility's Annual Waste Load Allocation of 0.181 mt/year or 399 lbs./year. The numeric criteria for TP are exceeded when calculated at this facility's full design flow using the TSD method, and with the receiving water at LMM conditions. The numeric criteria are also exceeded (163 µg/L vs 12 µg/L) without using the TSD method. This facility has reasonable potential to violate VWQS due to exceeding the narrative and numeric criteria for TP.

The existing TP monthly average concentration limit of 0.1 mg/L should be reduced to 0.05 mg/L. Based on best professional judgment, DEC biologists feel that this reduction in total phosphorus from the Salisbury FCS will result in measurable improvements to the biological community. Ongoing biological monitoring will determine if these TP reductions result in Halnon Trib. 10 meeting the WQS or if additional TP reductions through adaptive management are necessary. In order to achieve a lower average TP concentration, the Salisbury FCS could lower their DF from 1.31 MGD to 1.0 MGD. Compared to facility operations during 2017 -2021, as reported in effluent data and flows (Table 1a), this would result in a 35 lb/year reduction in TP.

Recommended TP Limit for Salisbury:
1.0 MGD X 0.05 mg/L X 8.34 = 0.417 lbs /day X 365 = 152 lbs/year.

This recommended limit represents a 20 µg/L-TP effluent reduction (average) based on how the Salisbury FCS has operated for last 5 years. Maximum flow reported during 2017 – 2021 was 1.24 MGD. Permit conditions described above would result in an average monthly TP concentration of 50 µg/L and average monthly flow of 1.0 MGD.

Monthly effluent and in-stream sampling for TP and DP should occur between November 1 and May 31. Effluent and in-stream sampling for TP between June 1 and October 31 should be conducted twice a month.

Additional data is also required to evaluate Total Phosphorus in Trib. 10 to Halnon Brook, including additional macroinvertebrate sampling in 2024 and 2026. This sampling frequency will allow the biological community time to respond to reductions in nutrient loading and inform the adaptive management approach.

Following the continuance of the permit issued in 2006, Vermont Department of Fish and Wildlife hired VHB to conduct monitoring downstream of the hatchery and to develop an adaptive management strategy to better identify and address the potential for water quality impacts related to the discharge of hatchery effluent. This monitoring includes macroinvertebrate and chemical sampling at an increased frequency compared to historical monitoring efforts. The monitoring efforts and development of nutrient control strategies including changes to food formulations and the capture and diversion of solid fish wastes away from the settling pond are ongoing efforts, and the permit should incorporate a requirement to follow the management strategies developed.

D. Fishery Chemicals for the Prevention and Control of Pathogens and Disease

The use of fishery chemicals has been reviewed as part of this analysis, and when used as the draft permit conditions and limits described should not pose any potential risk to receiving waters. The fishery chemicals will be used in accordance with the U.S. Food and Drug Administration for the prevention and control of fish pathogens and disease. Concentrations and treatment durations shall not exceed specific product label, or Investigative New Animal Drug (INAD) authorization, or the terms and conditions of this permit. Results of specified monitoring will be reported on the monthly Discharge Monitoring Report (DMR).

Formalin:
Aquaculture facilities commonly use biocides, the most common of which are formalin products such as Paracide-F, Formalin-F or Parasite-S, which contain approximately 37 percent by weight of formaldehyde gas. Formalin is used for the therapeutic treatment of fungal infections on the eggs of finfish and to control certain external protozoa and monogenetic trematodes on all finfish species. Because it is formulated to selectively kill or remove certain attached organisms, but not the finfish themselves when properly applied, formalin is more toxic to invertebrate species than to vertebrates.

When setting the necessary permit limits to protect the receiving water's aquatic environment from the effects of formalin in a discharge, it is more important to develop limits to protect invertebrate species because they are more sensitive to the effects of formaldehyde. In the receiving waters, these invertebrates are an integral part of the food chain for finfish. Formalin use must be consistent with U.S. Food and Drug Administration (USFDA) labeling instructions as per 21 CFR §529.1030. While the prophylactic use of formalin (i.e., drugs and chemicals used to prevent specific disease(s) in the absence of their symptoms) is not mentioned in those USFDA regulations, EPA allows its use only under the extra-label provisions of the Federal Food, Drug and Cosmetic Act as a BMP to control the excessive use of drugs.

The Salisbury Fish Hatchery has a reasonable potential to cause or contribute to an exceedance of the narrative toxicity criterion for formaldehyde based on the historic use of formalin at this facility and WQBELs for formaldehyde (expressed as formalin) should be developed.

Currently there are no acute and chronic aquatic life criteria for either formalin or formaldehyde in the state water quality standards for Massachusetts, New Hampshire, or Vermont. Hohreiter and Rigg derived acute and chronic aquatic life formaldehyde criteria of 4.58 mg/L and 1.61 mg/L, respectively, in Draft AQUAGP 2020 Fact Sheet Page 26 of 50 accordance with EPA's Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses. These criteria were developed based on data for at least one species in eight different taxonomic families, including 12 species of fish. These criteria are appropriate for the purpose of establishing effluent limitations for formaldehyde during formalin use at CAAP facilities.

The acute and chronic formaldehyde criteria described above were converted to acute and chronic formalin criteria (37% formaldehyde) by multiplying by 2.7; resulting in 12.36 mg/L formalin (acute) and 4.34 mg/L formalin (chronic).
Applying these formalin criteria at 7Q10 flow conditions (IWC=0.98) will result in Maximum Daily concentration limit for formalin to be 12.1 mg/l. The monthly average concentration limit for formalin should be 4.28 mg/l. Formalin also reduces dissolved oxygen, at a ratio of 1 mg/l DO per 5 mg/l Formalin, and extra care should be taken to remain in compliance with the VWQS Dissolved Oxygen criteria and the BOD limitation on days with formalin use.

The permit should contain a requirement to describe how formalin will be used, reporting the treatment concentrations, duration of treatments, dates, masses and calculated effluent concentration of formalin for each treatment. Additionally, a minimum of two samples should be collected and analyzed during treatments each month formalin is used.

If the formalin limits described are problematic for the facility to meet, chemical effluent detention ponds should be considered. Holding the formalin effluent waste for 36 hours before discharging to surface waters will allow for formalin concentrations to be reduced significantly.

E. Total Residual Chlorine (TRC)

The use of any chlorine containing product should be limited such that the effluent concentration is equal to or less than the VWQS for chlorine. A daily maximum value of 0.019 mg/l and a monthly average value of 0.011 mg/l should be included in the permit. Sampling should occur a minimum of twice per month during months when chlorine containing products are used. The permit should contain a requirement to report the dates, masses and calculated effluent concentration of TRC for each chlorine containing treatment. A sufficiently sensitive test method should be used to perform the analysis.

F. Chloramine-T

Chloramine-T contains chlorine and is subject to the limitation for TRC described above. The permit should contain a requirement to report the dates, masses and calculated effluent concentration of TRC for each chlorine containing treatment. A sufficiently sensitive test method should be used to perform the analysis.

G. Chloride

Chloride can be toxic to aquatic biota and numeric water quality criteria exist. Monitoring data indicates that the receiving water in the Trib. 10 to Halnon Brook has a maximum observed chloride concentration of 41.9 mg/l. This is less than 20% of the chronic water quality standard of 230 mg/l.

Hatchery staff indicate that chloride is used infrequently at the facility. There isn't adequate data to properly characterize the frequency or mass of chloride used to determine reasonable potential more formally. Due to the nature of the facility, it is considered unlikely that chloride will be used in a manner detrimental to aquatic biota. The permit should contain a requirement to report the dates, masses and calculated effluent concentration of chloride for each chloride treatment.

Other fishery drugs

There is insufficient information about the need for, use of or toxicity of other chemicals used to control and prevent fish disease and pathogens at this facility. However, a variety of products have been approved by the Food and Drug Administration for use in treating and controlling pathogens and disease and are generally considered safe when used as directed. The use of any necessary chemical should reported to DEC and be in accordance with the manufacturer's directions, in accordance with an Investigative New Animal Drug (INAD) authorization and/or under the direction of a veterinarian if necessary. A non-exhaustive list of these chemicals

includes:– Sulfadimethoxine + Ormetoprim (Romet-30®) ,Florfenicol (AQUAFLOR®) , Oxytetracycline Dihydrate (Terramycin®200), and Oxytetracycline Hydrochloride (Pennox 343). The permit should contain a requirement to report the name of the drugs(s), dates, masses and calculated effluent concentration for each drug treatment.

VII. Summary of Reasonable Potential Determinations

A. Recommended In-Stream Biological and Water Quality Monitoring

In-stream biological and water quality monitoring should continue to be conducted. A sampling plan will be developed and submitted to DEC for approval. Once the sampling plan is approved, a QAPP will be submitted to DEC for approval. The data collected under the updated QAPP will be used to evaluate the effectiveness of the adaptive management strategy being developed by VHB for reducing total phosphorus concentrations discharged from the Salisbury FCS.

- Macroinvertebrate monitoring in 2024 and 2026 at Halnon Trib 10 at RM 0.1 and Halnon RM 2.5 following a DEC approved QAPP. VHB will submit a sampling plan and update their current QAPP with suggested revisions by VTDEC.
- In-stream sampling for TP and DP should coincide with effluent monitoring. A minimum of monthly sampling at Halnon Trib 10 RM 0.1, 0.2, and 0.5 should occur between November 1 and May 31; twice a month sampling should occur between June 1 and October 31.

B. Recommended Effluent Monitoring

The most recent permit for the hatchery discharge expired on March 31, 2012, however the facility has continued operation with a Title 3 Section 814 administrative continuation since that date. In addition to the monitoring required in that expired permit, the following monitoring is suggested for inclusion in the renewed permit to provide additional data to support future Reasonable Potential Determinations:

- To provide additional data for future assessments of WET reasonable potential, it is recommended that four 1-species (*Ceriodaphnia dubia)* 48 hour acute/ 7-day chronic tests be included in the draft permit, two during the summer (August/October 2022 and 2024) and two during the winter (January/February 2023 and 2025). It is also suggested that concurrent sampling for TAN and the priority metals be conducted with each of these tests.
- The draft permit shall include a requirement for sampling for priority metals scans three times. These scans should be conducted concurrently with any WET testing.
- To gather data on the amount of Total Nitrogen (TN) in this discharge and its potential impact on the receiving water, monthly "monitor only" requirements for Total Nitrogen (TN), Nitrate/Nitrite (Nox), and Total Kjeldahl Nitrogen (TKN) are suggested for inclusion in this permit. The monitoring frequency has been chosen based on the high IWC.
- To provide additional data for future assessments of TAN reasonable potential, it is recommended that monthly monitoring with a monitor only condition be included in the next permit. This analysis should be conducted concurrently with any WET testing included in the permit.
- This facility is subject to the 2016 Lake Champlain Phosphorus TMDL. That document maintains the facility's Annual Waste Load Allocation of 0.181 mt/year or 399 lbs/year of TP.
- The existing TP monthly average concentration limit of 0.1 mg/L should be reduced to 0.05 mg/L.
- Monthly sampling for TP in effluent should occur between November 1 and May 31. Sampling for TP between June 1 and October 31 should be conducted twice a month.
- Practices identified by VHB in their adaptive management strategy should be undertaken by the permittee and reported to DEC.

- Additional information is required for future determinations of reasonable potential for chemicals used to treat and control pathogens and disease. Any chemical used to do so should be in compliance with FDA and manufacturer's directions and/or requirements. The permit should contain a requirement to report the name of the drugs(s), dates, masses, and calculated effluent concentration for each drug treatment.
- Formalin sampling should occur twice a month each month Formalin is used. The Maximum Day concentration limit for formalin should be 12.1 mg/l. The monthly average concentration limit for formalin should be 4.28 mg/l. Quantities, dates, and calculated effluent concentrations should be recorded each time formalin is used.
- The Salisbury FCS shall report the quantities, dates and calculated effluent concentrations for any other chemicals used to control and prevent fish disease and pathogens at this facility.
- The use of any chlorine containing products should be limited to a daily maximum effluent concentration of 19 ug/l and a monthly average effluent concentration of 11 ug/l. Sampling should occur twice a month.

C. Conclusion

After review of all available information, it has been determined that there is a reasonable potential for the Salisbury FCS to cause or contribute to a water quality violation. The Salisbury FCS discharge with an average effluent TP concentration of 70 µg/L is the source of elevated phosphorus in Halnon Trib. 10. This discharge overwhelms Trib 10, creating an effluent dominated stream, comprised of 95.7% effluent at LMM flow and 98.7% effluent at 7Q10 flow.

Halnon Trib. 10 does not have the capacity to assimilate the current Salisbury FCS discharge without exceeding VWQS, the current mass loading TP limit is equivalent to an effluent concentration of 100 µg/L. Recommend lowering this TP limit by 40 percent to mitigate the significant nutrient enrichment and resulting water quality violations.