

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 DRAFT PERMIT
Revised JULY 2021

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE TO WATERS OF THE STATE

PERMIT NO: 3-0365
PIN: RU96-0141
NPDES NO: VT0100552

NAME AND ADDRESS OF APPLICANT:

Wallingford Fire District #1
PO Box 87
Wallingford, VT 05773

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

Wallingford Fire District #1 Wastewater Treatment Facility
84 Creek Road
Wallingford, VT 05773

FACILITY COORDINATES: Lat: 43.48219 Long: -72.97653

FACILITY CLASSIFICATION: Grade II Domestic Non-Major

RECEIVING WATER: Otter Creek

CLASSIFICATION: All uses Class B(2) 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.

I. Proposed Action, Type of Facility, and Discharge Location

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 March 30, 2011. The facility's previous permit was issued on May 12, 2006 with an effective date of October 1, 2006. 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 treatment of municipal wastewater and is classified as a Grade II Domestic 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. Description of Discharge

The WWTF is engaged in the treatment of municipal wastewater which includes residential and commercial wastewaters. There are no pretreaters permitted under the NPDES program that discharge to the collection system. The WWTF is an extended aeration activated sludge treatment facility with one oxidation ditch, two clarifiers, and a chlorine contact chamber. The design flow of the WWTF is 0.12 million gallons per day (MGD) and the design Biochemical Oxygen Demand (BOD₅) loading is 153 lbs./day. The average flow from the facility over the last 5 years is approximately 0.044 MGD.

The WWTF maintains a constant discharge to Otter Creek.

III. Limitations and Conditions

The draft permit contains limitations for effluent flow, Biochemical Oxygen Demand (BOD₅), Total Suspended Solids (TSS), Total Phosphorus (TP), Total Residual Chlorine, Settleable Solids, *Escherichia coli*, and pH. It also contains monitoring requirements for Total Nitrogen (TN), Total Kjeldahl Nitrogen (TKN), Nitrate/Nitrite (NO_x), and Total Ammonia Nitrogen (TAN). The effluent limitations of the draft permit and the monitoring requirements may be found on the following pages of the draft permit:

Effluent Limitations:	Pages 2-3 of 27
Monitoring Requirements:	Pages 2-5 of 27

IV. Statutory and Regulatory Authority

A. Clean Water Act and NPDES Background

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 BOD₅, 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. The applicable water quality standards for this permit are the 2017 Vermont Water Quality Standards (Environmental Protection Rule, Chapter 29a).

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 in-stream 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).

1. Reasonable Potential Determination

In determining whether this permit has the reasonable potential to cause or contribute to an impairment, Vermont 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, 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.

V. Description of Receiving Water

The receiving water for this discharge is Otter Creek, a designated Cold-Water Fish Habitat. At the point of discharge, the river has a contributing drainage area of 105 square miles. The summer 7Q10 flow of the river is estimated to be 12.9 cubic feet per second (CFS), and the summer Low Median Monthly flow is estimated to be 40.4 CFS. The instream waste concentration at the summer 7Q10 flow is 0.014 (1.4%) and the instream waste concentration at the summer Low Median Monthly flow is 0.005 (0.5%).

In addition, Otter Creek 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 VIII.C. of this Fact Sheet.

VI. 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.

10 V.S.A. § 1252 describes the process by which the Secretary may establish a WMZ as part of the issuance of a discharge permit. 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 draft permit retains the existing waste management zone (WMZ) that extends downstream from the outfall for approximately one mile in Otter Creek.

Mixing Zone. 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.

VII. Facility History and Background

The Wallingford Fire District #1 owns and operates the Wallingford wastewater treatment facility. The facility was originally constructed in 1972. In 1992 a second clarifier was added to the facility. The existing facility is an extended aeration activated sludge treatment facility with one oxidation ditch and two clarifiers used in series. Chlorine is added to the wastewater prior to the second clarifier for additional contact time. Dechlorination is provided in the chlorine contact chamber. There are two aerated sludge holding tanks and sand drying beds for drying the sludge located at the facility.

An influent pump station with dual alternating pumps is located prior to the headworks. The collection system contains two pump stations (Main and South Main) with two alternating pumps. There are four single barrel gravity sewer line stream crossings in the collection system.

VIII. Permit Basis and Explanation of Effluent Limitation Derivation

A. Flow – The draft permit maintains the annual average flow limitation of 0.12 MGD. This facility maintains a constant discharge. Continuous flow monitoring is required.

B. Conventional Pollutants

1. Biochemical Oxygen Demand (BOD₅) – The effluent limitations for BOD₅ remain unchanged from the current permit. The monthly average (30 mg/L) and weekly average (45 mg/L) reflect the minimum level of effluent quality specified for secondary treatment in 40 C.F.R. Part 133.102. In addition, the draft permit contains a 50 mg/L, maximum day, BOD₅ limitation. This is applied to all such discharges pursuant to 13.4 c. of the Vermont Water Pollution Control Permit Regulations. The Secretary implements the limit to supplement the federal technology-based limitations to prevent a gross one-day permit effluent violation to be offset by multiple weekly and monthly sampling events which would enable a discharger to comply with the weekly average and monthly average permit limitations. Mass limits (22.5 lbs/day, monthly average and 30 lbs/day, weekly average) are calculated using the concentration limits outlined above. The BOD₅ monthly monitoring requirement is unchanged from the current permit.

The monthly “monitor only” monitoring requirement for influent BOD₅ is unchanged from the current permit.

2. Total Suspended Solids (TSS) – The effluent limitations for TSS remain unchanged from the current permit. The monthly average (30 mg/L) and weekly average (45 mg/L) reflect the minimum level of effluent quality specified for secondary treatment in 40 C.F.R. Part 133.102. In addition, the draft permit contains a 50 mg/L, maximum day, TSS limitation. This is applied to all such discharges pursuant to 13.4 c. of the Vermont Water Pollution Control Permit Regulations. The Secretary implements the limit to supplement the federal technology-based limitations to prevent a gross one-day permit effluent violation to be offset by multiple weekly and monthly average permit limitations. Mass limits (22.5 lbs/day, monthly average and 30 lbs/day, weekly average) are calculated using the concentration limits outlined above and the

permitted flow. The TSS monthly monitoring requirement is unchanged from the current permit.

The monthly “monitor only” monitoring requirement for influent TSS is unchanged from the current permit.

3. ***Escherichia coli*** – The *E. coli* limitation is 77 cfu/100ml, instantaneous maximum, based upon the limitation in the current permit and the anti-backsliding provisions of Section 402(o) of the CWA. As in the current permit, monitoring is required once monthly.
4. **pH** – The pH limitation remains at 6.5 - 8.5 Standard Units as specified in Section 29A-303(6) in the Vermont Water Quality Standards. Monitoring remains at daily.

C. Non-Conventional and Toxics

1. Total Phosphorus (TP)

Background:

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 will be issued by the Secretary 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 of 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 x 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 1,827 pounds of TP per year. This annual mass limitation was based on an allocation of 0.829 metric tons established in the 2002 Lake Champlain Phosphorus TMDL.

This proposed draft permit contains a phosphorous mass effluent limit of 1,827 total pounds, annual limitation. The mass annual effluent limitation is based on the LC TMDLs. The LC TMDL allocated 0.829 metric tons per year or 1,827 pounds per year to the Pittsford WWTF.

$$(0.829 \text{ mt/yr}) (2204.62\text{lbs/mt}) = 1,827 \text{ lbs/yr}$$

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.G.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.” However, discharges of less than 200,000 gallons per day are not subject to this requirement. The WLA in the TMDL was based on a TP effluent concentration of 5.0 mg/L (at a design flow of 0.120 MGD), carried forward from the 2002 Lake Champlain TMDL.

Monthly sampling for total phosphorus is required.

Condition I.G.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 Secretary is using the WLA from the LC TMDL (https://ofmpub.epa.gov/waters10/attains_impaired_waters.show_tmdl_document?p_tmdl_doc_blobs_id=79000) as the water quality-based effluent limitation (WQBEL) for phosphorus for this permit. Because this is the first permit issued to this facility under the new LC TMDL and the TMDL is less than five years old, an analysis of the assumptions underlying the TMDL is not required. In re Montpelier WWTF Discharge Permit, 2009 WL 4396740, 6, 9-10 (Vt. Env'tl. Ct. June 30, 2009) (stating that it “probably would have been meaningless to engage in further analysis” of the 2002 Lake Champlain TMDL a mere year and a half after its adoption, while also holding that when issuing a permit more than five years after the adoption of a TMDL, ANR must assess whether the past assumptions upon which the WLA was based upon “continue to have a basis of reliability”). Notwithstanding the fact that an analysis is not required, the Agency provides the following.

Using the WLA from the LC TMDL as the phosphorus WQBEL in the permit is appropriate because the State is making significant progress toward meeting the assumptions upon which the WLA is based. For 2016, EPA gave Vermont an “excellent” report card for meeting milestones by December 30, 2016. By 2017, the State had completed a majority of the milestones in the LC TMDL Accountability Framework (pages 54-59 of the LC TMDL) due by December 30, 2017 and was actively working to complete those that were outstanding, as outlined in the 2018 Vermont Lake Champlain Phosphorus Total Maximum Daily Loads Accountability Framework Report (Submitted by the State to EPA on March 7, 2018; available at: <https://dec.vermont.gov/sites/dec/files/wsm/erp/docs/2018VermontLakeChamplainPhosphorusTMDLAccountabilityFrameworkReport.pdf>)

With the issuance of the “Developed Lands General Permit” (Stormwater General Permit 3-9050) in late 2020, Vermont has successfully completed all Phase 1 Accountability Framework

milestones, as acknowledged in the EPA September 3, 2020 Lake Champlain TMDL Implementation Final Report Card for Phase 1 Milestones (Available at: <https://www.epa.gov/sites/production/files/2020-09/documents/lake-champlain-report-card-ltr-09-3-20.pdf>).

With the State having completed all Phase 1 Accountability Framework milestones, and with EPA's affirmative reports thus far, there is no reason to believe that the assumptions upon which the WLA was developed – including that discharges in other sectors will be reduced in the future – are no longer valid. Therefore, it is appropriate to establish the phosphorus WQBEL for this facility based upon its WLA in the LC TMDL.

Phosphorus Elimination and Reduction Plan:

To ensure the facility is operating as efficiently as possible for purposes of phosphorus removal, Condition I.G.3. of the permit requires that within 120 days of the permit effective date, the Permittee shall develop or update (as appropriate), and submit to the Secretary, a Phosphorus Optimization Plan (POP) to increase the WWTF's phosphorus removal efficiency by implementing optimization techniques that achieve phosphorus reductions using primarily existing facilities and equipment. The techniques to be evaluated may include operational process changes to enhance biological and/or chemical phosphorous removal, incorporation of anaerobic/anoxic zones, septage receiving policies and procedures, and side-stream management.

The facility shall have 12 months from the permit effective date to optimize removal of total phosphorus. If, after the 12-month optimization period, the WWTF's actual TP loads reach or exceed 80% of the LC TMDL WLA for the WWTF, based on the WWTF's 12-month running annual load calculated using the Phosphorus Load Calculation (Condition I.G.2.d. of the permit) the Permittee shall, within 90 days of reaching or exceeding 80% of the LC TMDL WLA for the WWTF, develop and submit to the Secretary a projection based on the WWTF's current operations and expected future loadings of whether it will exceed its WLA during the permit term.

If the facility is not projected to exceed its WLA within the permit term, the WWTF shall reassess when it is projected to reach its WLA prior to permit renewal and submit that information with its next permit application. If the facility is projected to exceed its WLA during the permit term, the Permittee shall submit a Phosphorus Elimination/Reduction Plan (PERP) within 6 months to the Secretary to ensure the WWTF continues to comply with its WLA. The PERP shall be treated as an application to amend the permit, and therefore, shall be subject to all public notice, hearing, and comment provisions, in place at the time the plan is submitted, that are applicable to permit amendments. The WWTF shall revise the PERP, if required by the Secretary.

2. Total Nitrogen (TN)

A quarterly “monitor only” requirement for TN has been included in this permit. TN is a calculated 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 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).

Facilities with design flow greater than 1 MGD will complete monthly monitoring unless more frequent sampling is already required by the permit. Facilities with design flows less than 1 MGD will complete quarterly unless more frequent sampling is already required by the permit.

For more information, see:

<https://www.epa.gov/sites/production/files/documents/nandpfactsheet.pdf>

3. **Total Kjeldahl Nitrogen (TKN)** – TKN is the sum of nitrogen in the forms of ammonia (unionized (NH₃) and ionized (NH₄⁺)), soluble organic nitrogen, and particulate organic nitrogen. A quarterly “monitor only” requirement has been included in the draft permit.
4. **Nitrate/Nitrite (NO_x)** – Nitrite and nitrate are oxygenated forms of nitrogen. A quarterly “monitor only” requirement has been included in the draft permit.
5. **Total Ammonia Nitrogen (TAN)** – To gather data on the amount of Total Ammonia-N (TAN) in this discharge and its potential impact on the receiving water, a new quarterly “monitor only” requirement for TAN has been included in the draft permit.
6. **Settleable Solids** – The limitation of 1.0 mL/L instantaneous maximum and daily monitoring remain unchanged from the current permit. This numeric limit was established in support of the narrative standard in Section 29A-303(2) of the Vermont Water Quality Standards.
7. **Total Residual Chlorine** – The current permit contains effluent limitations of 1.0 mg/L, weekly average and 2.0 mg/L, instantaneous maximum. Upon review, it was determined that the effluent limitations were not protective of the Vermont Water Quality Standards. Effluent

limitations of 0.5 mg/L, monthly average and 1.2 mg/L, daily maximum have been included in the draft permit.

8. **Toxicity Testing** – 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 the schedule outlined in Condition I.I. of the draft permit. If the results of these tests indicate a reasonable potential to cause an instream toxic impact, the Secretary may require additional WET testing, establish a WET limit, or require a Toxicity Reduction Evaluation.
9. **Annual Constituent Monitoring** - For all facilities with a design flow of greater than 0.1 MGD, 40 CFR § 122.21(j) requires the submittal of effluent monitoring data for those parameters identified in Condition I.C. of the draft permit. Samples must be collected once annually such that by the end of the term of the permit, all quarters have been sampled at least once, and the results will be submitted by December 31 of each year. For subsequent sampling, the “Guidance for Annual Constituent Monitoring” document should be referred to determine the season in which samples should be taken each year.

D. Special Conditions

1. **Laboratory 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 be submitted to the Secretary by December 31, annually, beginning in **2021**.
2. **Operation Management and Emergency Response Plan (OMERP)** – The Permittee submitted the Operation, Management, and Emergency Response Plan for the treatment facility, sewage collection system, sewage pumping stations, and sewer line stream crossings on March 31, 2008. As required by the revisions to 10 V.S.A. Section 1278, promulgated in the 2006 legislative session, the Permittee shall prepare and submit a revised OMERP to the Secretary for review and approval. The Permittee shall implement the OMERP for the treatment facility, sewage collection system, sewage pumping stations, and sewer stream line crossings as approved by the Secretary.
3. **Engineering Evaluation** – An engineering evaluation condition is included in this permit. This condition requires the Permittee to conduct an in-depth inspection and report of the treatment facility to identify and repair equipment, processes, and other possible deficiencies which may adversely affect effluent quality or proper operation. This type of evaluation is required once every 20 years and per DEC records an engineering evaluation for the collection system was submitted on November 1, 1992 and an engineering evaluation for the WWTF was submitted on June 24, 1993.
4. **Emergency Power Failure Plan** – The current Emergency Power Failure Plan for the facility was submitted on December 8, 2006. To ensure the facility can continue operations during the event of a power failure, Permittees are required to have Emergency Power Failure Plans on

file. Within **90** days of the effective date of the permit, the Permittee must ensure this plan is up to date by submitting to the Secretary updated documentation addressing how the discharge will be handled in the event of an electric power outage.

- 5. Electronic Reporting** - The EPA recently promulgated a final rule to modernize the Clean Water Act reporting for municipalities, industries, and other facilities by converting to an electronic data reporting system. The final rule 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 non-majors, individually permitted or covered by a general permit, must do so electronically after December 2016. The Secretary has created an electronic reporting system for DMRs and has recently trained facilities in its use. As of December 2020, these NPDES facilities will also be expected to submit additional information electronically as specified in Appendix A in 40 C.F.R. part 127.
- 6. Noncompliance Notification** - As required by the passage of 10 V.S.A. § 1295, promulgated in the 2016 legislative session, Condition II.D.3. 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.
- 7. Reopener** - This draft permit includes a reopener whereby the Secretary reserves the right to reopen and amend the permit to implement an integrated plan to address multiple Clean Water Act obligations.

E. Reasonable Potential Analysis

The Secretary has conducted a reasonable potential analysis, which is attached to this Fact Sheet as Attachment A. Based on this analysis, the Secretary has determined that there is a reasonable potential for the discharge to cause or contribute to a water quality violation for Total Residual Chlorine (TRC). As such, the development of water quality based effluent limitations (WQBELs) for TRC has been included in the draft permit.

IX. Procedures for Formulation of Final Decision

The public comment period for receiving comments on this draft permit was originally scheduled from May 24, 2021 to June 24, 2021. A request to extend the public comment period was received on June 18, 2021. **The Secretary has agreed to extend the public comment period, which has been revised to May 24, 2021 to July 21, 2021** during which time interested persons may submit their written views on the draft permit. All written comments received by 4:30 PM on July 21, 2021 will be retained by the Secretary and considered in the formulation of the final determination to issue, deny or modify the draft permit.

A public meeting request was received on July 21, 2021. The Secretary will hold a public meeting on September 2, 2021 and the comment period will be extended to **September 10, 2021**. All written comments received by 4:30 PM on September 10, 2021, will be retained by the Secretary and considered in the formulation of the final determination to issue, deny or modify the draft permit.

Written comments should be sent to:

Agency of Natural Resources
Department of Environmental Conservation
Watershed Management Division
One National Life Drive, Davis Building, 3rd Floor
Montpelier, VT 05620-3522

Comments may be submitted by e-mail to ANR.WSMDWastewaterComments@vermont.gov

For additional information, contact Amy Polaczyk at 802-490-6185.

Any interested person or groups of persons may request or petition for a public meeting with respect to this draft permit. Any such request or petition for a public meeting shall be filed within the public comment period described above and shall indicate the interest of the party filing such request and the reasons why a meeting is warranted.

The Agency will hold a meeting if there is significant public interest in holding such a meeting. Any public meeting brought in response to such a request or petition will be held in the geographical area of the proposed discharge or other appropriate area, at the discretion of the Agency and may, as appropriate, consider related groups of draft permits. Any person may submit oral or written statements and data concerning the draft permit at the public meeting. The Agency may establish reasonable limits on the time allowed for oral statements and may require the submission of statements in writing. All statements, comments, and data presented at the public meeting will be retained by the Agency and considered in the formulation of the final determination to issue, deny, or modify the draft permit.

The complete application, draft permit, and other information are on file and may be inspected by appointment on the 3rd floor of the Davis Building at One National Life Drive, Montpelier, Vermont. Copies may be obtained by calling 802-828-1115 from 7:45 AM to 4:30 PM Monday through Friday and will be made at a cost based upon the current Secretary of State Official Fee Schedule for Copying Public Records. The draft permit and fact sheet may also be viewed on the Watershed Management Division's website at:

<https://anrweb.vt.gov/DEC/IWIS/ReportViewer2.aspx?Report=WWPublicNotices&ViewParms=False>

ATTACHMENT A.
REASONABLE POTENTIAL DETERMINATION

**Vermont Agency of Natural Resources
Department of Environmental Conservation
Watershed Management Division
1 National Life Drive, Davis 3
802-828-1535**

MEMORANDUM



Prepared by: John Merrifield, Wastewater Program (WWP)

Cc: Pete LaFlamme, Director, WSMD
Rick Levey, Monitoring and Assessment Program (MAP)
Amy Polaczyk, Manager, WWP
Bethany Sargent, Manager, MAP

Date: **April 29, 2021**

Subject: Reasonable Potential Determination for the Wallingford FD 1 Wastewater Treatment Facility

I. Facility Information:

Wallingford FD 1 Wastewater Treatment Facility (WWTF)
Wallingford, VT
Permit No. 3-0365
NPDES No. VT0100552
Facility Location: 43.48219, -72.9765 (NAD 83)
Approximate Outfall Location: 43.4826, -72.9767 (NAD 83)

II. Hydrology:

Receiving water: Otter Creek
Facility Design Flow: 0.120 MGD = 0.186 CFS
Estimated 7Q10¹ = 12.9 CFS
Estimated LMM² = 40.4 CFS
Instream Waste Concentration at 7Q10 Flow (IWC-7Q10) = 0.014 (>1%)
Instream Waste Concentration at Low Median Monthly Flow (IWC-LMM) = 0.005 (<1%)

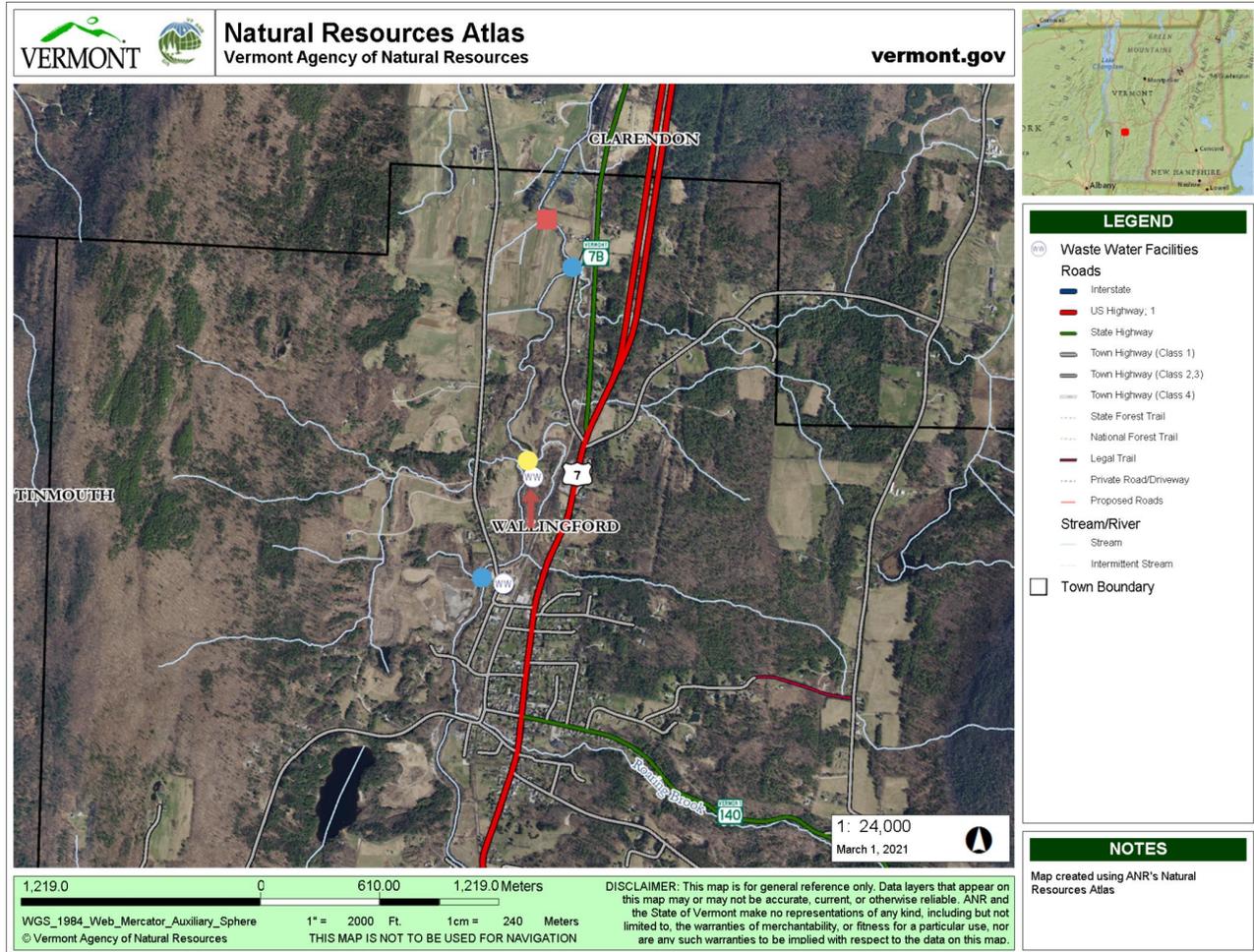
The Town of Wallingford owns and operates the Wallingford FD 1 Wastewater Treatment Facility (WWTF) which is an activated sludge extended aeration oxidation ditch with chlorine disinfection..

¹ Using daily mean streamflows, 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 streamflows, the median monthly flow of the receiving water for that month having the lowest median monthly flow.

The Otter Creek downstream of the Wallingford FD 1 WWTF discharge is a Class B (2) water and is designated as Cold Water Fish Habitat. At the point of discharge, the river has a contributing drainage area of 105 square miles. The existing permitted waste management zone (WMZ) begins at the outfall of the WWTF and extends downstream 1.0 mile (Figure 1) pursuant to 10 V.S.A., Section 1252.

Figure 1. Otter Creek near the Wallingford FD 1 WWTF. Facility location represented by white dot containing “WW “ and red arrow, the outfall location is indicated by a yellow dot, upstream monitoring location at RM 85.0 and downstream monitoring location at RM 84.2 are shown by blue dots and the end of the 1.0 mile long WMZ is shown by the red square. Figure produced with the Vermont Integrated Watershed Assessment System on the VT Agency of Natural Resources Atlas (<https://anrweb.vt.gov/DEC/IWIS/>).



This memo is organized into the following sections:

- Summary of Effluent Data for the Wallingford FD 1 WWTF
- Summary of Instream Ambient Chemistry Data for the Otter Creek
- Biological Assessments upstream and downstream of the Wallingford FD 1 WWTF
- Assessment of Reasonable Potential of the Wallingford FD 1 WWTF discharge to exceed Vermont Water Quality Standards (VWQSs)

III. Effluent Data for the Wallingford FD 1 WWTF

Table 1a. Effluent Data for the Wallingford FD 1 WWTF from 2/29/2016 to 10/31/2020.

Parameter Name	Limit	Units	Min	Average	Max	Count
BOD, 5-DAY (20 DEG. C) - Weekly Average	45	mg/l	2	7.5	36	58
BOD, 5-DAY (20 DEG. C) - Daily Maximum	50	mg/l	2	7.5	36	58
BOD, 5-DAY (20 DEG. C) - Monthly Average	30	mg/l	2	7.3	36	58
BOD, 5-DAY (20 DEG. C) - Monthly Average	22.5	lbs/day	0.19	2.7	24.3	58
BOD, 5-DAY (20 DEG. C) - Weekly Average	30	lbs/day	0.19	2.8	24.3	58
BOD, 5-DAY (20 DEG. C) - Influent Monthly Average	MO	mg/l	99	207.9	410	58
BOD, 5-DAY Percent Removal Monthly Minimum	85	%	72	96.3	99	58
SOLIDS, SUSPENDED Percent Removal Monthly Minimum	85	%	76	97.8	99.9	58
TOTAL SUSPENDED SOLIDS (TSS) - Weekly Average	45	mg/l	2	3.3	24	58
TOTAL SUSPENDED SOLIDS (TSS) - Daily Maximum	50	mg/l	2	3.3	24	58
TOTAL SUSPENDED SOLIDS (TSS) - Monthly Average	30	mg/l	2	3.3	24	58
TOTAL SUSPENDED SOLIDS (TSS) - Monthly Average	22.5	lbs/day	0.3	1.3	10.1	58
TOTAL SUSPENDED SOLIDS (TSS) - Weekly Average	30	lbs/day	0.3	1.3	10.1	58
TOTAL SUSPENDED SOLIDS (TSS) - Influent Monthly Average	MO	mg/l	45	184.3	400	58

Table 1b. Effluent Data for the Wallingford FD 1 WWTF from 2/29/2016 to 10/31/2020.

Parameter Name	Limit	Units	Min	Average	Max	Count
pH - Maximum	8.5	SU	7.28	7.6	7.99	58
pH - Minimum	6.5	SU	6.61	7.0	7.32	58
SETTLEABLE SOLIDS - Instant Maximum	1	mg/l	0	0.0	0.1	58
PHOSPHORUS, TOTAL (AS P) - Monthly Average	MO	mg/l	0.1	1.7	8.2	58
PHOSPHORUS, TOTAL (AS P) - See Comments (annual total, prev #) Annual Average	1827	lbs/year	150.99	209.7	277.85	4
E. COLI, THERMOTOL, MF, M-TEC - Monthly Maximum	77	cfu/100ml	0	5.2	130	58
FLOW, IN CONDUIT OR THRU TREATMENT PLANT - Annual Average	0.12	MGD	0.0209	0.0	0.0848	58
CHLORINE, TOTAL RESIDUAL - Weekly Average	1	mg/l	0.01	0.1	0.8	53
CHLORINE, TOTAL RESIDUAL - Instant Maximum	2	mg/l	0.05	0.5	1.95	53

Whole Effluent Toxicity Data Summary:**A. Whole Effluent Toxicity (WET) Data Summary:**

This facility does not perform Whole Effluent Toxicity (WET) testing and therefore no WET data was analyzed. This facility has a 7Q10 IWC of 0.014 (>1%). This value exceeds the IWC described in the RPD Decision Trees for facilities to have potential RP for Total Ammonia Nitrogen (TAN) toxicity but not for Priority Pollutant Metals toxicity.

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 WET reasonable potential, it is recommended that two 2-species (*Ceriodaphnia dubia* and *Pimephales promelas*) 48 hour acute/ 96 hour chronic tests be included in the draft permit, one during the summer (August/October 2022) and one during the winter (January/February 2024). It is also suggested that concurrent sampling for TAN be conducted with each of these tests.

B. Biological Assessments and Ambient Chemistry Data for the Otter Creek upstream and downstream of the Wallingford FD 1 WWTF

The VTDEC assessment database is an EPA-required database which describes the conditions of Vermont's surface waters with respect to their attainment of VWQS.

The assessment database indicates that the segment of the Otter Creek to which this facility discharges meets all designated uses. However, approximately 2 river miles downstream from the Wallingford WWTF discharge, the Otter Creek is on the 2016 Stressed Waters List. The pollutants sediment, organic enrichment, toxics, and metals prohibit the Otter Creek from the Furnace Brook confluence upstream to the Mill River confluence from attaining a higher water quality.

Biological Assessments:

Biological assessments were not conducted downstream of this facility. No biological assessment is possible for macroinvertebrates because this section is non-wadeable. This lack of data will also preclude a determination of whether the receiving water is impaired for Total Phosphorus.

C. Ambient Chemistry Data:

The most recent ambient chemistry data available from VTDEC sampling is from 7/8/20, when surface waters were sampled upstream of the outfall at River Mile (RM) 85.0 and downstream of the outfall at RM 84.2. The upstream sampling location is 0.5 miles upstream and the downstream sampling location is 0.8 miles downstream from the Wallingford FD 1 WWTF outfall (Figure 1).

Data representativeness are assessed by evaluating the observed flow conditions from field sheets, whether measured or qualitatively described, at which 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 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.

Water chemistry measures of relevant parameters for this assessment are summarized in Tables 2a and 2b.

Data used to evaluate in-stream chemistry is collected under low flow conditions (typically August or September) when turbidity is low and no precipitation has been observed for 3 days.

Table 2a. Surface-water quality upstream and downstream of the Wallingford FD 1 Wastewater Treatment Facility collected by VTDEC.

Visit Date	Location ID	RM	Location Name	Flow Level	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)	Temperature (deg C)	Total Ammonia Nitrogen (mg/l)	Total Chloride (mg/l)	Total Color measured using the visual method (PCU)	Total Hardness (mg/l)	Total Nitrate/Nitrite Nitrogen (mg/l)	Total Nitrogen (mg/l)	Total Phosphorus (ug/l)	Total Sulfate (mg/l)	Turbidity (NTU)
9/26/2016	502231	85.0	Otter Creek	Low	121	146.2					8.12	13.2	<0.05	10		126.691	0.11	0.31	11.1	6.14	1.14
7/8/2020	502231	85.0	Otter Creek	Low	126	278.5	28.5	4	8.74	105.7	7.99	22.2	0.057	10	15	128	0.125	0.32	14.2	4.09	
9/26/2016	515418	84.2	Otter Creek	Low	125	218					8.3	14.8	<0.05	11.4		134.605	0.14	0.27	20.2	6.44	1.03
7/8/2020	515418	84.2	Otter Creek	Low	125	281.5	29.5	4	9.08	110.9	8.14	22.7	<0.05	10.9	15	127	0.107	0.27	14.1	4.13	

Table 2b. Surface-water metals quality upstream and downstream of the Wallingford FD 1 Wastewater Treatment Facility collected by VTDEC.

Visit Date	Location ID	RM	Location Name	Flow Level	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 Thallium (ug/l)	Total Uranium (ug/L)	Total Vanadium (ug/l)	Total Zinc (ug/l)
9/26/2016	502231	85.0	Otter Creek	Low	25.69		<1			<1	30.98	<5		<10	259.8	<1	11.98	39.92		<5	0.948	<5		6.537					<50
7/8/2020	502231	85.0	Otter Creek	Low	28	<5	<1	15	<1	<1	32.1	<1	<1	<5	148	<1	11.7	52.7	<5	<1	0.9	<1	<1	6.63	60.9	<1	<1	<1	<10
9/26/2016	515418	84.2	Otter Creek	Low	<20		<1			<1	33.16	<5		<10	281.2	<1	12.58	38.27		<5	1.105	<5		7.661					<50
7/8/2020	515418	84.2	Otter Creek	Low	28	<5	<1	14.7	<1	<1	31.6	<1	<1	<5	132	<1	11.7	40.7	<5	<1	0.94	<1	<1	7.05	60.3	<1	<1	<1	<10

IV. Assessment of Reasonable Potential of the Wallingford FD 1 WWTF discharge to exceed Vermont Water Quality Standards

A. Methodology:

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 3, and 4 present this analysis for the Wallingford FD 1.

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

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.

C_s = critical background in-stream 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} .

$$\text{Equation 2. } C_{etsd} = \text{TSD}_{\text{factor}} \times C_e$$

Where:

C_{etsd} = Effluent concentration adjusted to 95th percentile value (mg/L or ug/L)

$\text{TSD}_{\text{factor}}$ = 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:

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

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

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

- Average values of observed upstream and downstream chemical data were used for most calculations; exceptions are described below.
- Upstream 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_e) 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 three during summer. Summer defaults of 20 °C for coldwater fish habitat streams and 25 °C for warmwater fish habitat streams were used in summer months while winter water temperature was assumed to be 5 °C. The highest observed downstream values were used for both winter and summer pH.
- Hardness 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.

D. Metals

This facility does not have any effluent data for the priority pollutant metals. The 7Q10 IWC of 0.014 (>1%) is below the IWC described in the RPD Decision Trees for facilities to have potential RP for Priority Pollutant Metals toxicity. No Priority Pollutant Metals testing is required as a regular monitoring activity. However, in the event that process upsets or WET testing indicates toxicity suggest that metal toxicity is a problem, testing for the Priority Pollutant Metals should be included in the follow up actions.

F. Nutrients

The results of mass balance calculations for Total Nitrogen and Total Phosphorus were calculated using Equation 1 are presented in Table 3.

Table 3. Mass Balance of Nutrients of Concern around the Wallingford FD 1 WWTF.

	Total Phosphorus (ug/l)	Total Nitrogen (mg/l)	Notes
Qs (cfs)	40.38		<i>Estimated LMM flow</i>
Qe (cfs)	0.186		<i>permitted effluent discharge</i>
Qr = Qs + Qe (cfs)	40.57		<i>Qs+Qe</i>
IWC	0.0046		<i>Qe/(Qs+Qe)</i>
Cs	12.65	0.32	<i>upstream pollutant concentration (average)</i>
Ce	8200	19.2	<i>maximum effluent pollutant concentration observed</i>
Cetsd	13120	38.4	<i>effluent pollutant concentration adjusted by TSD method.</i>
Cr = (CsQs+CeQe)/Qr	50.1	0.40	<i>calculated resultant downstream pollutant concentration without TSD factor of safety</i>
Cr = (CsQs+CetsdQe)/Qr	72.6	0.49	<i>calculated resultant downstream pollutant concentration</i>
Stream Type	B2 Medium, High-Gradient		
Calculated Instream Contribution from Effluent without TSD method	37	0.1	<i>difference between observed upstream concentration and calculated resultant downstream concentration. Without TSD method</i>
Calculated Instream Contribution from Effluent with TSD method	60	0.2	<i>difference between observed upstream concentration and calculated resultant downstream concentration. With TSD Method</i>
VWQS Criteria (2017)		None for Streams	
Threshold Criteria	15		
Threshold Exceeded with TSD method?	Yes		
Threshold Exceeded with TSD method?	Yes		

G. Total Nitrogen:

TN is the sum of nitrate, nitrite, ammonia, soluble organic nitrogen, and particulate organic nitrogen. To gather data on the amount of Total Nitrogen (TN) in this discharge and its potential impact on the receiving water, quarterly “monitor only” requirements for Nitrate/Nitrite (NO_x), Total Nitrogen (TN) and Total Kjeldahl Nitrogen (TKN) are suggested for inclusion in this permit.

TN is a calculated value based on the sum of NO_x 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) + 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 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).

The range and average concentrations of Total Nitrogen in the Wallingford FD 1 WWTF discharge from 2/29/2016 to 10/31/2020 are presented in Table 1 and the mass balance of Total Nitrogen around the facility is presented in Table 3 above. The calculated change in the in-stream Total Nitrogen concentration attributable to the Wallingford FD 1 WWTF effluent is 0.17 mg/L.

Total Ammonia Nitrogen (TAN):

This facility collects Total Ammonia Nitrogen (TAN) data during Annual Constituent Monitoring. As seen in Table 4 below this facility does not have sufficient TAN data available to determine RP. However, it does have a 7Q10 IWC of 0.014 (>1%). This value exceeds the IWC described in the RPD Decision Trees for facilities to have potential RP for TAN toxicity.

The results of mass balance calculations for Total Residual Chlorine (TRC) and TAN were calculated using Equation 1 are presented in Table 4.

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 quarterly 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.

Table 4. Mass Balance for TRC and TAN around the Wallingford FD 1 WWTF

	TRC (mg/L)	TAN - Summer (mg/L)	TAN - Winter (mg/L)	Notes
Qs (cfs)		12.91		<i>Estimated 7Q10 flow</i>
Qe (cfs)		0.186		<i>permitted effluent discharge</i>
Qr = Qs + Qe (cfs)		13.09		<i>Qs+Qe</i>
7Q10 IWC		0.014		<i>Qe/(Qs+Qe)</i>
Cs	0	0	0	<i>upstream pollutant concentration</i>
Max Ce	1.950	2.200	4.340	<i>Maximum Observed Concentration</i>
Cetsd	3.32	6.60	9.98	<i>effluent pollutant concentration adjusted by TSD factor</i>
Number of Observations	60.00	3.00	5.00	
No. of Observations needed to determine RP	10.00	10.00	10.00	
Cr = (CsQs+CeQe)/Qr	0.03	0.03	0.06	<i>resultant pollutant concentration in receiving water</i>
Cr = (CsQs+CetsdQe)/Qr	0.05	0.09	0.14	<i>resultant pollutant concentration in receiving water using TSD multiplier</i>
VWQS Criteria (2017)				
Protection of Aquatic Biota - Acute	0.019	1.45	3.15	
Protection of Aquatic Biota - Chronic	0.011	0.88	2.81	
Exceedance Calculated?				
Protection of Aquatic Biota - Acute	YES	NO	NO	Are exceedances calculated using the maximum observed concentration?
Protection of Aquatic Biota - Chronic	YES	NO	NO	
Protection of Aquatic Biota - Acute	YES	NO	NO	Are exceedances calculated using the TSD multiplier?
Protection of Aquatic Biota - Acute	YES	NO	NO	
Sufficient Data to Determine RP?	YES	NO	NO	

H. 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 life use, all display compliance with their respective criteria in the Water Quality Standards. To assist in determining whether this facility's TP discharge is in compliance with VWQS the analysis is broken into an analysis of the TP numeric standard and an analysis of the Nutrient Response Conditions needed to determine compliance with the narrative standard.

Total Phosphorus Numeric Analysis:

The TP concentrations in the Otter Creek are greater than the 2017 nutrient criteria threshold of 15ug/L Total Phosphorus in a Class B Medium, High-Gradient stream. The calculated change in the in-stream TP concentration attributable to the Wallingford FD 1 WWTF is 60 ug/L using the TSD method adjusted effluent data and is 37.5 ug/L without the adjustment. Both of the calculated resultant concentrations exceeded the numeric threshold criteria. This calculation is presented above in Table 3.

Total Phosphorus Nutrient Response Conditions Analysis:

The Combined Nutrient Response Conditions for Aquatic Biota and Wildlife in Rivers and Streams at RM 84.2 on 9/26/2016 meets VWQS for pH, meets VWQS for Turbidity, does not meet VWQS for Dissolved Oxygen and does not meet VWQS for Aquatic Biota as shown below in Table 5.

Table 5. Assessment of Phosphorus Response Variables around the Wallingford FD 1 WWTF

Response variable (VWQS reference)	Target Value for Cold Water Fish Habitat	River-mile: 85.0 (Upstream) 9/26/2016	River-mile: 84.2 (Downstream) 9/26/2016
pH (§3-01.B.9)	6.5-8.5 s.u.	8.1	8.3
Turbidity (§3-04.B.1)	< 10 NTU at low mean annual flow	1.14	1.03
Dissolved Oxygen (min) (§3-04.B.2)	>6 mg/L and 70% saturation	N/A	N/A
Aquatic biota, based on macroinvertebrates.	Attaining an assessment of good, or better.	Meets VWQS	N/A

Total Phosphorus Reasonable Potential Determination:

The numeric criteria for TP are exceeded by when calculated at this facility's full design flow and with the receiving water at LMM conditions. The narrative criteria for TP are not satisfied, however this is due to a lack of monitoring data for dissolved oxygen and aquatic biota. Therefore, insufficient data is available to determine whether the receiving water is in compliance with VWQS.

This facility is subject to the 2016 Lake Champlain Phosphorus TMDL. That document maintains the facility's Annual Waste Load Allocation to 0.829 mt/year or 1827 lbs/year.

Due to the permitted flow being less than 200,000 gallons per day this facility is not subject to VSA 1266a limiting the discharge of TP to a monthly average of 0.8 mg/L. However, in order to assess compliance with the Annual Waste Load Allocation monthly sampling with a Monitor Only condition should continue to be included in the permit.

I. Total Residual Chlorine (TRC):

The results of mass balance calculations for TRC and TAN were calculated using Equation 1 are presented in Table 4.

This facility has a reasonable potential to violate VWQS for TRC. The existing limits have been checked and need to be updated to be protective of VWQS. Daily sampling should continue.

V. Summary of Reasonable Potential Determinations

This facility has a reasonable potential to violate VWQS for TRC. The existing limits have been checked and need to be updated to be protective of VWQS. Daily sampling should continue.

A. Recommended Biological and Water Quality Monitoring:

Although biological monitoring results are not available, and the stream does not comply with VWQS for all identified response variables, and the narrative standard presented in §29A-302(2)(A) of the VWQS is not supported (as shown in *Table 5*), no localized impairments were identified and therefore it is not necessary to include biomonitoring in the draft permit.

B. Recommended Effluent Monitoring:

In addition to the monitoring required in the current 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 two 2-species (*Ceriodaphnia dubia* and *Pimephales promelas*) 48 hour acute/ 96 hour chronic tests be included in the draft permit, one during the summer (August/October 2022) and one during the winter (January/February 2024). It is also suggested that concurrent sampling for TAN be conducted with each of these tests.
- To gather data on the amount of Total Nitrogen (TN) in this discharge and its potential impact on the receiving water, quarterly "monitor only" requirements for Nitrate/Nitrite (NO_x), Total Nitrogen (TN) and Total Kjeldahl Nitrogen (TKN) are suggested for inclusion in this permit.

- To provide additional data for future assessments of TAN reasonable potential, it is recommended that quarterly 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.
- No Priority Pollutant Metals testing is required as a regular monitoring activity. However, in the event that process upsets or WET testing results that indicates toxicity suggest that metal toxicity is a problem, testing for the Priority Pollutant Metals should be included in the follow up actions.
- The limits for Total Residual Chlorine should be updated to be protective of the VWQS. A memo with new permit limits is attached. Daily monitoring should continue.

C. Conclusion:

After review of available information, it has been determined that there is a reasonable potential for the discharge to cause or contribute to a water quality violation for TRC, and as such, the development of WQBELs for TRC will be necessary. Additional information is required to assess TAN at the next permit renewal. Total Phosphorus also has reasonable potential to exceed the critical thresholds in the VWQS. The nutrient response narrative requirements for Total Phosphorus are not met, and the Lake Champlain Phosphorus TMDL already impose WQBELs for this permit which must be implemented prior to further analysis of the TMDL. This discharge does not appear to cause, have a reasonable potential to cause, or contribute to an instream toxic impact or instream excursion above the water quality criteria with the exception of TRC for which new WQBELs are necessary.

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MEMORANDUM



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Date: April 29, 2021

Subject: WQBEL Permit Limit Review and Calculations for the Wallingford FD 1 WWTF Facility (3-0365)

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

Effluent Characteristics (Constituents)	WQBEL Discharge Limitations									
	Annual Average	Annual Limit	Monthly Average	Weekly Average	Maximum Day	Monthly Average	Weekly Average	Maximum Day	Instantaneous Maximum	Sampling Frequency
		lbs/year	Mass (lbs/day)			Concentration (mg/L)			(per month)	
Total Phosphorus		1827				MO				Monthly (1)
Total Residual Chlorine						0.46		1.2		Daily (30)
Total Nitrogen			MO			MO				Quarterly
Total Kjeldahl Nitrogen			MO			MO				Quarterly
Nitrate/Nitrite Nitrogen			MO			MO				Quarterly
Total Ammonia Nitrogen			MO			MO				Quarterly

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, Ultimate Oxygen Demand, BOD, TSS, Settleable Solids, TKN, TN, E. coli and pH. These constituents are either subject to TBELs or the data and analytical capacity to model as WQBELs is unavailable.

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 Residual Chlorine

A new Maximum Day value of 1.20 mg/l has been added to the permit. A new Monthly Average value of 0.46 mg/l has also been added to the permit. Sampling is required daily. The previous permit limits were not protective of VWQS.

2. Total Phosphorus

This facility has been assigned an Annual Limit of 1827 lbs of Total Phosphorus in the 2016 Lake Champlain Phosphorus TMDL. This facility is not subject to VSA 1266a and therefore no concentration limit is necessary. Sampling should remain at monthly. These limits are unchanged and should be retained.

3. Total Ammonia Nitrogen

This facility has an IWC great enough to have potential Total Ammonia Nitrogen toxic effects in the receiving water. In order to collect data to calculate the reasonable potential for this facility to violate VWQS for Total Ammonia Nitrogen a quarterly monitor only requirement has been added to the permit.

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

Monthly Total Nitrogen monitoring should be conducted in support of the 2016 Lake Champlain Total Phosphorus TMDL. Total Nitrogen (TN), Total Kjeldahl Nitrogen (TKN) and Nitrate/Nitrite Nitrogen (NO_x) should each be reported using an appropriate combination of CWA approved methods and arithmetic. $TN = TKN + NO_x$