

**Snohomish County  
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Appendix 2 – Total Maximum Daily Load (TMDL) Requirements of the Phase I Permit contains requirements pertinent to fecal coliform bacteria in North Creek, Swamp Creek, Little Bear Creek, Snohomish River Tributaries, and the Stillaguamish River basin and dissolved oxygen in the Stillaguamish River basin. Those requirements concern six categories of actions, as follows: Business Inspections, Public Education and Outreach, Operations & Maintenance, IDDE Field Screening, Targeted Source Identification and Elimination, and Surface Water Monitoring.<sup>1</sup> A summary of the County’s relevant 2021 activities for each of those six categories is provided below.

**I. Business Inspections**

In 2021, SWM updated the existing inventory for commercial animal handling and composting sites, with a final updated inventory of qualifying sites being determined once physical inspections are complete. All potential qualifying sites were mailed letters informing them of their requirements requiring implementation of pollution control BMPs, and that SWM would conduct compliance inspections in 2022 and 2023 at qualifying commercial animal handling and composting facilities. Throughout 2021, planning and coordination efforts with the Snohomish County Agricultural Board and Snohomish Conservation District (SCD) occurred, in order to prepare the businesses and partner agency for the upcoming inspections beginning in February 2022. SWM and SCD plan to perform joint inspection for sites located within the Pollution Identification and Correction (PIC) program area.

**II. Public Education and Outreach**

**A. Septic System Care Video, Social Media Posts and Workshops**

Engaging the public on septic system care in 2021 continued to occur via online platforms. These included SWM’s coordination of online workshops, collaborative production of an introductory video, and adaptation and posting of social media posts on septic care during the holidays.

**Introductory septic care video.**

In 2021, Snohomish County collaboratively produced a [Septic Care video](#) for County residents. The video is intended to be an encouraging and confidence-building introduction to residential septic care, and to link residents to additional local resources. It is linked on County webpages and shared with workshop registrants.



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<sup>1</sup> Not all categories apply to each TMDL area.

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**Social media posts encourage septic system care during the holidays.** Snohomish County adapted social media posts that were developed and shared out by Thurston County Public Health. The messaging focused on holiday septic system care – a time of more intensive septic system use when soils are commonly saturated. Snohomish County posted them on its Facebook and sites, and targeted unincorporated areas of the County.

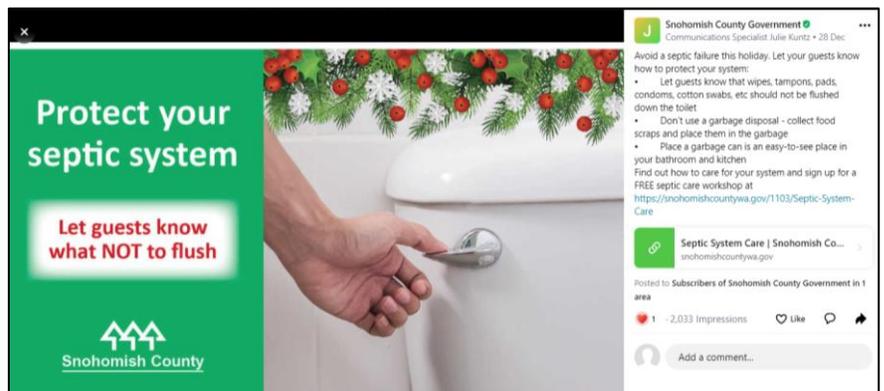
These reached residents and businesses in all basins of unincorporated areas of Snohomish County, including targeted TMDL basins shown in **bold** font: ***Little Bear Creek, North Creek, Snohomish Tributaries, Stillaguamish, Swamp Creek.***

**Message: Avoid overloading your system (laundry graphic)**  
Posted 12/23/2021.



Social Media	Impressions	Engagements	Comments	Shares	Clicks
Facebook	923	16	0	1	3
NextDoor	2598	5	0	NA	NA

**Message: Protect your septic system (toilet graphic)**  
Posted 12/28/2021.



Social Media	Impressions	Engagements	Comments	Shares	Clicks
Facebook	2077	78	2	4	43
NextDoor	2033	1	0	NA	NA

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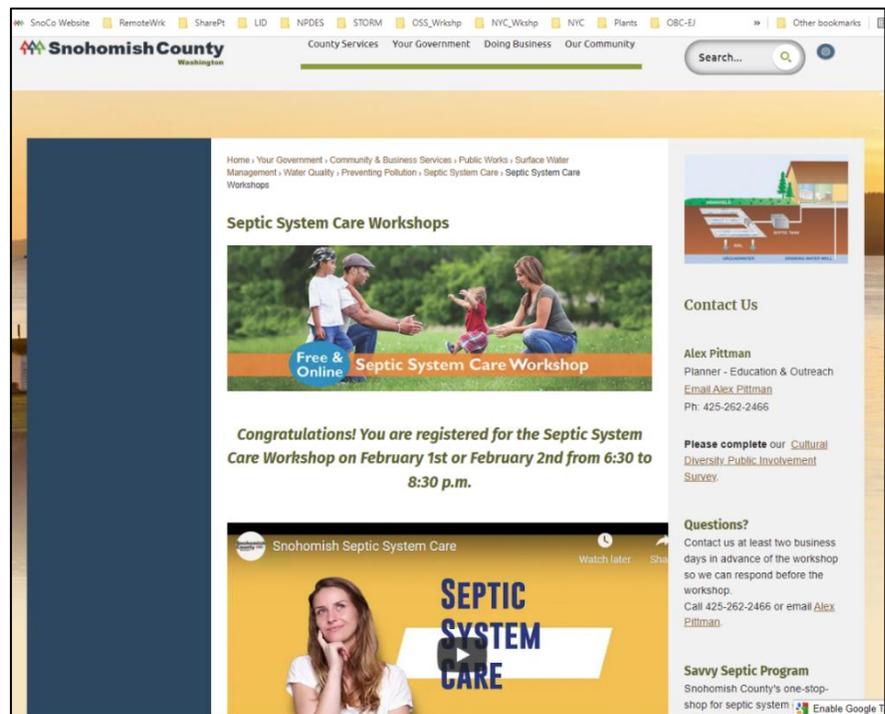
**Online workshops** are offered to residents with an onsite septic system (OSS) located in an unincorporated area of Snohomish County. Attendees are especially appreciative of the live (not pre-recorded) format in order to receive timely, interactive responses to their questions.

During 2021, four septic system care workshops were conducted via Zoom Webinar by SWM staff. These workshops are part of the County’s Septic System Care campaign and coordinated in partnership with the County’s NPDES Residential Education & Outreach, LakeWise and Savvy Septic programs. Two workshops were held in partnership with the Pollution, Identification and Control (PIC-3) grant managed by the Snohomish Conservation District. A goal for each of these partner programs is to provide public education and outreach activities to increase awareness of bacterial pollution problems and encourage behavior change. The septic care workshops educate homeowners about the environmental risks associated with septic systems and how to properly maintain them to avoid polluting nearby lakes, streams and marine waters. Septic owners discover, too, how to identify and get help when a system is not functioning properly.

The primary audience for these workshops is the owner of a residential onsite septic system (OSS) located within the unincorporated area of the County’s targeted TMDL basins. The secondary audience is an owner of a residential OSS located within any area of unincorporated County, whether a stream basin or lake watershed. For each workshop, a different geographic area is selected to receive a postcard invitation and typically includes a targeted TMDL basin. The geographic invitation area rotates throughout all unincorporated areas of the County – including the County’s targeted TMDL basins – such that within a 5-year period, each residential OSS owner is invited at least twice.

Registrants receive a link to the [Septic Care Workshop webpage](#) prior to the workshop. The webpage includes downloadable publications, an introductory video on septic care, and instructions on how residents can access their system’s as-built drawings and records.

During each workshop, attendees learn of services available to them through County programs (LakeWise, Streamside Landowner, Savvy Septic) and partner programs (Health District, PIC-3). Workshop content is presented by SeaGrant’s Teri King.



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**2021 Septic Care Workshop data:**

Date(s)	Attendance	Subbasins & Lakes (Targeted TMDL basins listed in <b>bold</b> font)
Feb. 9 & 11	150 people from 112 households	<i>Puget Sound drainages:</i> South Skagit Bay, Warm Beach, Port Susan  <i>WRIA 5 (inclusive of PIC-3 area):</i> <b>Stillaguamish watershed</b> , including lakes (Ketchum, Sunday, Martha North, Howard, Ki, Shoecraft, Goodwin, Cranberry, Loma, Armstrong, Bryant, Rowland)  <i>WRIA 7:</i> Little Pilchuck Creek, Upper and Middle Pilchuck River; Lake Crabapple
July 20 & 22	180 people from 121 households	<i>Puget Sound drainages:</i> Picnic Point/Meadowdale  <i>WRIA 7:</i> Lower Woods Creek; French Creek; Lakes (Roesiger, Cochran, Wagner, Gardener, Panther, Flowing, Storm, Chain, Meadow, Lost),  <i>WRIA 8:</i> <b>Swamp Creek</b> , North Creek, <b>Little Bear Creek</b> , Bear Creek; Lakes (Serene, Stickney, Martha, Ruggs, Echo),

**B. Scoop the Poop, pet waste campaign**

Scoop the Poop is the County’s campaign on proper management of pet waste. The 2021 campaign continues the partnership between the County (Scoop the Poop kit materials, veterinary clinic participation, and WSU contract), WSU Beach Watcher volunteers (Scoop the Poop kits assembly and clinic distribution), and participating veterinary clinics located within unincorporated areas of Snohomish County inclusive of targeted TMDL basins.

As the trusted resource for new puppy owners, veterinary clinics are ideally positioned to increase their clients’ awareness of the problem with improperly managed pet waste (bacterial pollution and related health risks to people and pets) and to encourage their proper disposal of pet waste.

Eight veterinary clinics continued their Scoop the Poop program participation in 2021. Participating clinics distribute the County’s Scoop the Poop kits to owners of new puppies, adopted dogs, and dogs that require testing for potential fecal coliform related illnesses. Kit materials are purchased by the County and customized to include a *The Poop Solution / Poop Problem* rack card listing the participating Clinic’s contact information, a roll of pet waste disposal bags, and a Scoop the Poop garbage can sticker.

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Over 1,400 kits were assembled by WSU Beach Watcher volunteers and distributed through participating clinics in 2021. Participating clinics are located within basins of unincorporated areas of Snohomish County, including targeted TMDL basins shown in **bold** font below, and serve clients beyond basin boundaries:

- ***Little Bear Creek***
- *North Creek*
- *Puget Sound drainages*
- *Snohomish Tributaries*
- ***Stillaguamish***
- ***Swamp Creek***

**C. Stillaguamish Pet Waste Awareness Campaign funded by Snohomish County**  
Sound Salmon Solutions (SSS), in partnership with Snohomish Conservation District staff, conducted an outreach campaign on pet waste called “Solution to the Poo-llution” in 2021, funded by a Snohomish County’s Discretionary Fund Rebate Program grant. The primary goal of this project was to raise public awareness on pet waste impacts and to reduce fecal coliform bacteria in the Stillaguamish River watershed through education and outreach, campaign signs, flags/marketing paint to visually represent all of the pet waste piles left on-site throughout the campaign. The campaign was conducted at 5 locations:

- Leque Island, managed by Washington State Department of Fish & Wildlife
- Twin Rivers Community Park, managed by Snohomish County Parks
- River Meadows Community Park, managed by Snohomish County Parks
- Kayak Point, managed by Snohomish County Parks
- Lake Goodwin, managed by Snohomish County Parks



Educational signs, shown above, were placed at the 5 sites during the outreach period of July to September 2021. SSS staff made 21 total site visits during the outreach period to the monitoring areas and recorded 118 pet waste piles left on-site. SSS staff spoke with 56 people in-person about the campaign at these sites during their outreach. Pet waste impacts to water quality information was also posted on SSS Facebook social media account and reached 1,623 people.

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**D. Beach Watchers Program**

Snohomish County WSU Beach Watchers (BW) receive 80 hours of university-caliber training from local experts on topics that include watersheds, water quality of marine and fresh water, stormwater issues and impacts, aquatic life, and so much more. As in 2021, the BW Training program was offered through a combination of online learning and outdoor field learning. An additional 9 BW trainees graduated to become BW volunteers in 2021.

BW volunteers continued to participate in the stewardship opportunity provided by Snohomish County by partnering with its Scoop the Poop pet waste campaign. These BW volunteers assemble the Scoop the Poop kits. WSU staff distributed these during the pandemic to participating veterinary clinics located within unincorporated County including targeted TMDL basins.

**E. Source Control Program**

The County also complies with its Special Condition S5.C.8 Source Control inspection program, which includes a strong education and outreach component, in the County's Appendix 2 TMDL areas, as applicable. Educational material and supplies are distributed during site inspections.

**III. Operations & Maintenance**

**Stillaguamish River/Swamp Creek/Little Bear**

Waste receptacles and/or signage specific to animal waste polluting waterways and signs with code citations directing the proper disposal of animal waste were maintained in parks located within the Stillaguamish River and Swamp Creek TMDL areas which have been identified as meeting the criterion of "substantial domestic animal (dog and horse) use with the potential for pollution of stormwater". There were no parks that met this criterion in Little Bear Creek basin.

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**IV. IDDE Field Screening**

**A. Overview**

SWM uses a variety of methods including dry weather outfall screening of circuits, business inspections, catch basin inspections, video inspections, and targeted source identification and elimination efforts to screen the MS4 for illicit connections and discharges, including sources of bacteria. Methodologies used are outlined in *Snohomish County's Dry Weather Outfall Screening Manual*, the *Illicit Connection and Illicit Discharge Field Screening and Source Tracing Guidance Manual*, and Snohomish County Drainage Manual Volumes IV and V. Targeted source identification and elimination project methodologies are described in *Microbial Water Quality Assessment for Fecal Coliform Bacteria – Contaminant Survey Protocols* (Britsch, et al., 2012, 2015, 2017).

Regardless of the method used, all IDDE efforts include looking for sources of bacteria. In short, during inspections, investigations or screening efforts, staff look for visual cues and odors that may indicate human and/or animal waste/wastewater is entering the MS4. Visual cues include staining, color, suds, and the presence of floatables (toilet paper). Analytical tests that measure the number of fecal coliform colonies and other parameters can be performed. When field staff observe potential sources of bacteria pollution, follow-up actions to identify and eliminate the source are undertaken.

**B. Stillaguamish River TMDL**

SWM continued screening efforts in the remaining subbasin.

This screening effort utilized outfall screening and the ditch inspection methodology as in many of the subbasins, there are County roads but very little to no stormwater infrastructure (pipes, catch basins, etc.).

**C. Snohomish River TMDL**

SWM screened for sources of bacteria pollution during field screening conducted under Special Condition S5.C.9 in 2022.

**D. North Creek TMDL**

SWM screened for sources of bacteria pollution during field screening conducted under Special Condition S5.C.9 in 2022.

**E. Swamp Creek TMDL**

SWM screened for sources of bacteria pollution during field screening conducted under Special Condition S5.C.9 in 2022.

**F. Little Bear Creek TMDL**

SWM screened for sources of bacteria pollution during field screening conducted under Special Condition S5.C.9 in 2022.

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**V. Targeted Source Identification and Elimination**

***Targeted Source Identification & Elimination:*** “Permittees shall implement the schedules and activities identified in S5.C.9 of the Phase I Permit or S5.C.5 of the Western Washington Phase II Permit, in response to any illicit discharges found. **Each annual report’s TMDL summary shall include qualitative and quantitative information about the source identification and elimination activities, including procedures followed and sampling results, implemented in the selected high priority area(s).**”

To achieve the primary objective of the Appendix 2 TMDL Targeted Source Identification & Elimination (TSIE) efforts, Snohomish County has monitored an outfall associated with a stormwater MS4 drainage circuit. Snohomish County generated a data set that consists of **1639** stormwater drainage circuits throughout unincorporated Snohomish County; each circuit includes a collection of interconnected MS4 stormwater conveyance assets (catch basins, pipe runs, etc.) associated with a unique stormwater drainage catchment area and having an outfall discharging to a receiving water. These stormwater drainage circuits, and each asset within the circuit has a unique identifying code.

The decision to use the stormwater circuit approach is based on findings in our data and document reviews that determined stormwater runoff, illicit discharges and illicit connections conveyed by a municipal MS4 can consistently contain high concentrations of fecal coliform bacteria; additionally, the use of an MS4 screening circuit for the TSIE site prioritization selection allows full and unrestricted access to the entire TSIE focus area allowing efficient IDDE follow up actions. Based in our literature review and a review of water quality data sources, Snohomish County has elected to prioritize a stormwater drainage circuit that discharges to the Marshland drainage subbasin between historic water quality monitoring sites **MLDN** and **MLUP**, these sites are identified in Water Quality Assessment of Tributaries to the “*Snohomish River and Nonpoint Source Pollution TMDL, September 1997*” and form the basis for the original TMDL listing for this subbasin.

Snohomish County has prioritized a TSIE screening circuit located on the southern uplands of the Marshland Drainage subbasin in the Waldenwood development constructed in approximately 2001. The land use served by this stormwater drainage circuit consists primarily of single-family residences and associated residential and arterial roadways. This stormwater drainage screening circuit has a Snohomish County asset identification number **00975** and is relatively large, consisting of 292 catch basins, 300 pipe segments with maximum pipe diameters of 36 inches.

**Priority Area Sample Location Details**

Storm event water quality samples were collected from a deep, Type II manhole structure (**asset ID 43518**) located upstream of the circuit outfall to the receiving water. This location was chosen to collect a representative stormwater sample and avoid receiving water combining with the stormwater sample at the outfall site. The sample location point is immediately downstream of a

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series of three water quality BMP stormwater retention ponds, drainage facility asset ID 0880. Figure 1 depicts an overview of the screening circuit selected.

Sample location details are as follows:

- Screening Circuit **Asset ID 0973**
- Outfall to Receiving Water **Asset ID 982**
- Sampling Location Point CB type II **Asset ID 43518**
- Sample Location: **Latitude 47.89928669, Longitude -122.1647645**
- Section 21 Township 28 Range 05

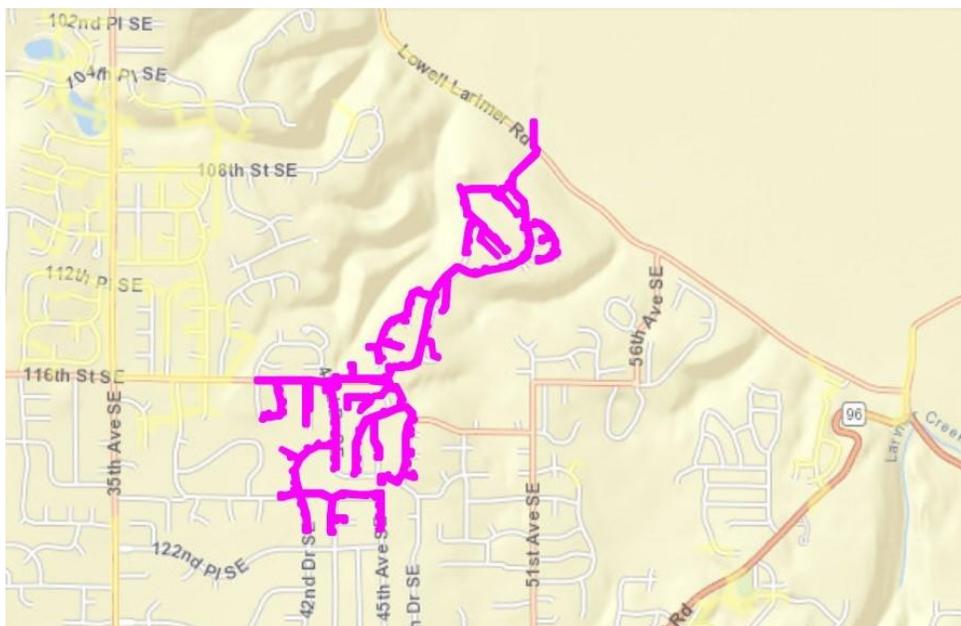


Figure 1. Screening Circuit Overview

### **Storm-Event Criteria and Frequency**

The NPDES Municipal Phase I Permit APPENDIX 2 – Total Maximum Daily Load (TMDL) Requirements for Targeted Source Identification (TSIE) do not specify criteria for storm event driven stormwater monitoring other than, “*stormwater quality sampling is defined as obtaining grab samples of stormwater discharging to or from the MS4 or receiving waters during a storm event*”

For the TSIE sampling effort, Snohomish County generally follows the 2019 NPDES Municipal Phase I Permit Special Condition S8.C – Stormwater Discharge Monitoring requirement which specifies the qualifying storm event criteria found in Appendix 9, Stormwater Discharge Monitoring Frequency, Qualifying Storm Event Criteria. For meteorologic information regarding precipitation,

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Snohomish County used the Washington State University, AgWeatherNet website, Snohomish Station.

### **Laboratory Analytical Parameter and Analysis Methods**

TSIE stormwater fecal coliform samples were analyzed by the Snohomish County contract analytical laboratory, AmTest. AmTest will supply sample containers and sample pick up services. Storm event water quality samples were collected directly into laboratory supplied sample containers from a deep, Type II manhole structure (asset ID 43518) using a telescoping pole with a sample bottle holder attachment.

For the Appendix 2 TMDL requirement, Snohomish County is only required to monitor for Fecal Coliform Bacteria during storm event grab samples, however, Escherichia coli bacteria, additional analytes and field indicator parameters were collected.

NPDES Permit Requirement, microbiological analysis methods:

- Escherichia coli; *SM 9222D 9222G*
- Fecal Coliform; *SM 9222D*

### **Procedures Followed**

Snohomish County generally adhered to the following list of procedure and guidance documents to complete this TSIE stormwater sampling requirement:

- Washington State Department of Ecology, *Collecting Grab Samples from Stormwater Discharges*, Publication # 18-10-023, July 2018. (**collecting grab samples from BMPs**)
- Washington State Department of Ecology, *Illicit Connection and Illicit Discharge Field Screening and Source Tracing Guidance Manual*, May 2020 revision (Herrera Environmental Consultants, Inc. et.al) **sampling at BMP and closed conveyance**.
- Washington State Department of Ecology, *Phase I Municipal Stormwater Permit, Appendix 9, August 1,2019 (qualifying storm event)*
- In-Situ Inc. *Aqua TROLL 500 Operators Manual*, Document # 0050702, July 9, 2021 (**field indicator measurements**)

### **Sampling Results**

Snohomish County TSIE sampling was conducted between approximately mid-September through mid-December spanning the end of the dry season and into the wet season. A total of six samples were collected during this time range yielding fecal coliform bacteria concentrations ranging from a high of 2900 CFU/100mL to a low of 45 CFU/100mL. Higher concentrations were detected in the early, dry weather samples, with samples trending down to lower concentrations in the wet weather samples (Table 1).

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The highest detection of fecal coliform bacteria corresponded with the highest measured precipitation during our sampling event date range and the lowest fecal coliform bacteria concentration corresponded with the lowest sampling event measured precipitation. This trend is counter to what literature suggests regarding wet weather stormwater sample results for fecal coliform bacteria.

Using the Snohomish County adopted IC/ID guidance manual suggested threshold value range for fecal coliform bacteria (500 to 1200 CFU/100ml), one of the sample results (2900 CFU/100mL) could trigger an illicit connection/illicit discharge source tracing effort. However, in context with the other sample results, this bacteria concentration is a data outlier. The geometric mean of all the sample concentrations is 313 CFU/100mL, below the IC/ID guidance manual suggested threshold value range for further investigation and indicator sampling. However, stormwater drainage conveyances immediately upstream of the stormwater detention ponds were assessed for field indicators consistent with an illicit connection/discharge, no indicators were encountered.

Table 1. Fecal Coliform Bacteria Stormwater Grab Sampling Results

<b>Date/Time Sampled</b>	<b>Parameter Name</b>	<b>Results</b>	<b>Units</b>	<b>Method</b>	<b>Precipitation 24-hrs. Prior (inches)</b>
9/20/2021 12:45	Fecal Coliform	850	CFU/100mL	SM9222 D	0.26
9/27/2021 12:10	Fecal Coliform	2900	CFU/100mL	SM9222 D	0.85
10/22/2021 12:20	Fecal Coliform	550	CFU/100mL	SM9222 D	0.31
11/5/2021 12:15	Fecal Coliform	97	CFU/100mL	SM9222 D	0.72
11/12/2021 12:50	Fecal Coliform	160	CFU/100mL	SM9222 D	0.54
12/13/2021 13:10	Fecal Coliform	45	CFU/100mL	SM9222 D	0.22

The fecal coliform bacteria sampling results suggest that:

1. The residential land use at the Waldenwood development is contributing a lower-than-expected amount of fecal coliform bacterial to the stormwater drainage circuit being investigated.
2. Higher concentrations of fecal coliform bacteria may be attributed to wildlife such as waterfowl that frequented the stormwater detention pond upstream of the sample collection point during the early portion of the sampling effort.
3. The stormwater detention pond as a stormwater BMP, upstream of the sampling point, is functioning as expected with respect to fecal coliform bacteria.

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4. Inconsistent and relatively low fecal coliform bacteria sample results do not seem to indicate a strong and consistent source of bacteria from an illicit connection.

## **VI. Surface Water Monitoring**

### **A. Overview**

Special Condition S7.A and Appendix 2 of the 2019 – 2024 Permit requires surface water monitoring for characterization and long-term trends evaluation of Fecal Coliform Bacteria (FCB) within designated Total Maximum Daily Load (TMDL) geographic coverage areas.

On Jan 23, 2019, Ecology adopted amendments to water quality standards for surface waters through Washington State Administrative Code 173-201A. This rulemaking updated fresh and marine water quality standards for the protection of water contact recreation in state waters. Changes include phasing out FCB in exchange for E.coli as the freshwater indicator beginning January 2021.

If changes to surface water monitoring locations or other updates were needed, permittees were required to submit a revised Quality Assurance Project Plan (QAPP) to Ecology for review and approval.

As a result of adopted amendments to water quality standards, the County revised its QAPP to include E.coli, address needs for monitoring location changes, while retaining FCB to achieve compliance with permit requirements. The Ecology approved 2021 – 2024 QAPP is available at [6604 \(snohomishcountywa.gov\)](https://www.snohomishcountywa.gov/6604).

At a minimum, the permit required the monitoring program to:

- Collect 12 samples taken in at least one location per TMDL basin per calendar year (Table 1).
- Submit available data to the Environmental Information Management (EIM) database by May 31 of each year.
- Provide data summaries and narrative evaluation of the data.

Available data are submitted to Ecology’s Environmental Information Management database by May 31 each year. Available data are found at [EIM Search Results](#). Data summaries and narrative evaluations of the data are required in each annual report.

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**Table 1: Snohomish County TMDL Monitoring Stations (2021)**

<b>WRIA</b>	<b>Subbasin</b>	<b>Sample Station</b>	<b>Location</b>	<b>Latitude</b>	<b>Longitude</b>
8	North Creek	NCMU	SILVER CREEK PRIOR TO CONFLUENCE WITH TAMBARK CREEK FROM UPSTREAM SIDE OF 196TH ST SE. 190FT SE OF INTERSECTION WITH BOTHELL EVERETT HWY	47.82049	122.20660
8	Swamp Creek	SCLD (replaced SCLU)	SWAMP CREEK FROM SOUTH SIDE OF BRIDGE 505 AT LOCKWOOD ROAD. 850FT SE OF THE INTERSECTION WITH CARTER ROAD	47.77730	122.25007
7	Allen Creek	ACLU	67TH AVE NE AND 100TH ST NE. PARK AT GRANGE AND WALK EAST APROXIMATELY 525FT TO CREEK. SAMPLE FROM UPSTREAM SIDE OF 67TH	48.08494	122.13735
5	Lower Stillaguamish	05TUNIDE (replaced) DOUG	GREENWOOD CREEK IMMEDIATELY DOWNSTREAM OF SOUNDVIEW DRIVE	48.16488	122.36781

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**B. Fecal Coliform Data Summary**

Although FCB and associated water quality standards were phased out December 31, 2020, the permit was issued prior to changes and continues to require characterization of FCB. Additionally, EPA approved the TMDLs based upon FCB impairments to surface waters. Lastly, station 05TUNIDE discharges directly to marine waters where FCB remains the indicator for protection of shellfish. For these reasons, we continue to summarize FCB data.

Although the County is not required by the permit to collect and summarize E.coli data, it was adopted as an indicator in 2019. As such, the County began collecting those data under the 2021-2024 QAPP at each station and summarize data for public benefit.

To characterize FCB and E.coli, the County determines whether a station exceeds its freshwater quality standard. To be compliant with expired FCB and current E.coli standards, a stations data must have met the geometric mean and 10 percent not to exceed criteria (Tables 2 and 3).

**Table 2: Washington State Freshwater Quality Standards for Fecal Coliform Bacteria  
(Amended Standards Expired Dec 31, 2020)**

TMDL Basin / Sample Station	Fecal Coliform Bacteria Standards		
	Colonies/100ml		
	Standard	Geometric Mean Not to Exceed	10 Percent Not to Exceed
<b>Stillaguamish River</b> 05TUNIDE – Greenwood Creek	Primary Contact	100	200
<b>Snohomish River Tribs</b> ACLU – Allen Creek @ 100th	Primary Contact	100	200
<b>North Creek /Swamp Creek/Little Bear Creek</b> NCMU – Silver Creek @ 196 <sup>th</sup> SCLD – Swamp Creek @ Lockwood Rd.	Primary Contact	100	200

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**Table 3: Washington State Freshwater Quality Standards for E.Coli  
(Adopted Jan 23, 2019)**

TMDL Basin / Sample Station	E.coli Bacteria Standards		
	Colonies/100ml		
	Standard	Geometric Mean Not to Exceed	10 Percent Not to Exceed
<b>Stillaguamish River</b> 05TUNIDE – Greenwood Creek	Primary Contact	100	320
<b>Snohomish River Tribs</b> ACLU – Allen Creek @ 100th	Primary Contact	100	320
<b>North Creek /Swamp Creek/Little Bear Creek</b> NCMU – Silver Creek @ 196 <sup>th</sup> SCLD – Swamp Creek @ Lockwood Rd.	Primary Contact	100	320

Over CY 2021 (January 1 – December 31), the County successfully collected 12 FCB and E.coli samples at each station. Verification of credibility resulted in accepting all samples for analysis.

Analysis of FCB and E.coli data are based upon a water year (October – September), which requires that data from fall and winter of 2020 be combined with data through September 2021. October – December 2021 data are held for analysis and reporting in CY 2022.

During the water year, not more than 10 percent of FCB or E.coli samples within a 90-day rolling averaging period (RAP) are allowed to exceed 200 or 320 colonies respectively. There were ten RAPs for FCB and eight for E.coli in WY 2020/2021. There were fewer RAPs for E.coli because monitoring for this parameter began in 2021. Table 4 shows the number of RAPs at each location where greater than 10 percent of samples exceeded either 200 or 320 colonies. All stations had greater than 10 percent of samples during RAPs that exceeded either the FCB or E.coli standards. Station SCLD (Swamp Creek at Lockwood Rd) exhibited the best conditions, where only one RAP had greater than 10 percent of samples exceeding the 200-colony standard.

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**Table 3: Number of rolling 90-day averaging periods where greater than 10 percent of samples exceeded 200 (FCB) or 320 (E.Coli) colonies. Maximum number = 10 for FCB and 8 for E.coli**

<b>Sampling Station</b>				
<b>Water Year 2020/2021</b>	<b>ACLU # RAPs with exceedence</b>	<b>05TUNIDE # RAPs with exceedence</b>	<b>NCMU # RAPs with exceedence</b>	<b>SCLD# RAPs with exceedence</b>
<b>FCB</b>	<b>8</b>	<b>5</b>	<b>7</b>	<b>1</b>
<b>E.coli</b>	<b>5</b>	<b>4</b>	<b>5</b>	<b>0</b>

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Within each RAP, the geometric mean of FCB or E.Coli may not exceed 100 colonies for each station. Table 5 contains the number of RAPs at each station where geometric means exceeded 100 colonies. The Swamp Creek station at Lockwood Rd was near to being compliant with the geometric mean component of the standard, while all other stations had multiple exceedences.

Geometric means must not exceed 100 colonies and be based upon a minimum of 3 samples over 3 consecutive months. The highest geometric means (over 1,000 colonies) were found during summer months at Greenwood Creek (05TUNIDE). The County has been working diligently to

<b>Sampling Station</b>				
<b>Water Year</b>	<b>ACLU # RAPs with exceedence</b>	<b>05TUNIDE# RAPs with exceedence</b>	<b>NCMU # RAPs with exceedence</b>	<b>SCLD # RAPs with exceedence</b>
<b>2020/2021</b>				
<b>FCB</b>	5	3	7	1
<b>E.Coli</b>	3	5	3	0

identify and eliminate sources of bacterial pollution from Greenwood Creek.

**Table 4: Number of Rolling 90-day averaging periods where geometric means exceeded 100 colonies. Maximum number = 10 for FCB and 8 for E.Coli**

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**C. Trends Evaluation**

There is not enough data at any station to conduct credible trends analysis. Using ACLU, which has the highest number of valid samples (78), Ecology's sample size calculator indicates that 286 samples would need to be collected to detect a 50 percent change in FCB with 90 percent confidence. All sites would need a similar number of samples to conduct credible trends analysis. Conducting trends analysis on fewer samples could mislead Ecology, the public, and decision makers.

**D. Fecal Coliform Bacteria Narrative Evaluation**

Over the 2020-2021 water year, no sample location met both parts of the FCB or E.coli standard. Given high FCB and E.coli concentrations at Greenwood Creek (05TUNIDE), the County has been working with partners to identify and eliminate sources of bacterial contamination. Actions have included drainage system screening, collection of time series datasets and dye testing of septic systems to isolate potential sources. While no definitive source has been identified, efforts suggest diffuse non-point sources of septage from functional septic system drainfields being conveyed by groundwater to the County drainage system and Greenwood Creek.

**E. Dissolved Oxygen Data Summary and Narrative Evaluation for the Stillaguamish River TMDL Coverage Area**

To characterize dissolved oxygen results the County determines whether a location fails Washington State Water Quality Standards. In accordance with standards, Greenwood Creek (05TUNIDE) dissolved oxygen is not allowed to fall below a one-day value of 8.0 mg/l at an average frequency greater than once in ten years.

During 2021, the County collected one dissolved oxygen measurement per month at Greenwood Creek (05TUNIDE). Over that period, no dissolved oxygen measurement fell below 8.0 mg/l. Dissolved oxygen values ranged from a minimum of 8.97 to mg/l a maximum of 12.21 mg/l. These results suggest dissolved oxygen conditions at this station are supportive of salmonid spawning, rearing and migration.