APPENDIX F IMPAIRED WATERS - Statewide Bacteria TMDL

The following includes selected sections from the *New Hampshire Statewide TMDL for Bacteria Impaired Waters (September 2010)* as published by the New Hampshire Department of Environmental Services (NHDES) with additional commentary related specifically to the Town of Pelham, as applicable. Certain sections have been condensed/abridged while other text is taken directly from the original document. Unless noted otherwise, all text is referenced to this specific document.

F1.0 What is a TMDL

A *Total Maximum Daily Load (TMDL)* is an approved US Environmental Protection Agency (EPA) report that provides a framework to address surface water pollution in rivers and streams, impoundments, lakes, and ponds that have been identified by the NHDES as having a significant impairment. Contamination of surface waters results from a variety of natural and man-made sources and can degrade aquatic ecosystems, negatively affect public health, and may ultimately result in closures of beaches and drinking water supplies.

The purpose of a TMDL is to calculate the amount of a pollutant that receiving waters can assimilate without exceeding water quality standards. The pollutant load is then allocated to specific known sources. The TMDL report sets the goal of meeting water quality criteria from all sources in order to meet water quality standards throughout the affected waterbodies.

In Pelham, impaired waters have been identified by NHDES in one TMDL report: the *New Hampshire Statewide TMDL for Bacteria Impaired Waters (September 2010)*. This bacteria TMDL establishes the allowable bacterial loadings for Pelham's listed impaired waters, provides documentation of impairment, and outlines the reductions needed to meet water quality standards. The statewide report contains the computed concentration based TMDLs for 379 bacteria impaired segments in New Hampshire. Within each watershed, measured bacteria concentrations in each of the impaired segments are used to estimate a percent reduction needed to reach the goal of the TMDL to attain water quality standards.

F1.1 Bacteria as an Impairment

Bacteria TMDLs are aimed to reduce waterborne disease-causing organisms, known as pathogens, that are public health risk. Pathogens can be carried to the impaired waterbody by stormwater runoff as well as other discharges into surface waters. Once in a stream, lake, or pond, they can infect humans through consumption of contaminated fish and shellfish, skin contact, or ingestion of the water.

Under Section 303(d) of the Clean Water Act (303d, CWA), protection from pathogen contamination is most important for waters designated for recreation (beaches); public water supplies; aquifer protection; and protection and propagation of fish, shellfish, and wildlife. Infections from pathogens in recreational waters can include gastrointestinal, respiratory, eye, ear, nose, throat, and skin diseases.

Wastes from warm-blooded animals are a source for many types of bacteria found in water. Each gram of human feces contains approximately 12 billion bacteria. In addition, feces may contain pathogenic viruses, protozoa, and parasites.

F2.0 Bacteria Pollution Sources

Sources of bacteria and associated pathogens can come from either point source pollution or non-point source pollution. Municipal stormwater discharges located within EPA-designated urbanized areas (the MS4 area) are considered point sources under the CWA. Municipal stormwater discharges located outside the MS4 area are considered non-point source discharges. For this reason, stormwater is listed as a source of bacteria in both point and nonpoint sources of pollution.

As defined by the NHDES, "'Point source' means a discernible, confined, and discrete conveyance from which pollutants are or might be discharged, excluding return flows from irrigated agriculture or agricultural stormwater runoff. The term includes, but is not limited to, a pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft."

A non-point source (NPS) is defined as "*any source other than a point source*", and is generally more difficult to trace, identify, and control.

Examples of sources that can contribute bacteria to surface waters in stormwater runoff, groundwater, and/or by direct deposition include:

- wastewater treatment plants (none in Pelham);
- combined and sanitary sewer overflows (none in Pelham);
- industrial discharges (MSGP);
- construction activities (CGP);
- urban stormwater discharges (MS4);
- illicit discharges;
- human waste, failing septic systems;
- pet waste;
- wildlife waste;
- congregations of birds and small mammals;
- excrement from farm animals;
- agricultural applications of manure; and
- contact recreation (swimming or wading).

Below provides detail related to each possible source of bacteria-contaminated stormwater as applicable to Pelham.

Illicit Discharges

Illicit discharges include any discharges to stormwater systems that are not entirely composed of stormwater. These include intentional or unknown illegal connections from commercial or residential buildings or dumping of non-stormwater constituents. Examples of illicit discharges commonly seen in urban communities in New Hampshire include sanitary wastewater piping that is directly connected from a home to a storm drainage pipe or improper disposal of sewage from campers and boats. As a result of these illicit connections, contaminated wastewater enters storm drains and is then discharged to surface waters.

NPS Discharges of Untreated Wastewater (i.e., Failing Septic Systems)

Untreated discharges of sewage (i.e., wastewater) to stormwater systems or to surface waters are prohibited. When properly installed, operated, and maintained, septic systems effectively reduce bacteria concentrations in sewage. However, age, overloading, or poor maintenance of septic systems often lead to system failure and the release of bacteria into surface waters. Bacteria from failed septic systems enter surface waters via both groundwater and stormwater runoff.

Pet Waste

Pet waste can be a substantial contributor of bacteria to surface waters when not properly managed. These wastes are picked up in stormwater runoff flowing into surface waters. Pet waste can also enter surface waters directly from pets standing or swimming in the surface water.

Wildlife Waste

Fecal matter from wildlife is a significant source of bacteria in some watersheds. This is particularly true when human activities, including the feeding of wildlife and habitat modification, result in the increased congregation of wildlife such as ducks and geese at a waterfront area. They often deposit their waste immediately adjacent and directly into surface waters.

Agriculture

Activities and facilities associated with agricultural land use can be sources of bacteria impairment to surface waters through direct deposition of fecal matter from farm animals standing or swimming in surface waters, and wash-off of farm animal waste in stormwater runoff. Agricultural activities and facilities with the potential to contribute to bacteria impairment include manure storage and application, livestock grazing, animal feeding operations and barnyards, and paddock and exercise areas for horses and other animals.

Contact Recreation (swimming or wading)

Bacteria from people swimming or wading in surface waters can contribute to bacteria loads by direct deposition. When people enter the water, residual fecal matter may be washed from the body and contaminate the water with pathogens. In addition, small children in diapers can contribute to bacterial contamination of surface waters.

F3.0 TMDL Allocations

The calculated NH bacteria TMDLs are expressed as both daily loads and as concentrations. Daily load TMDLs are expressed in terms of billions of organisms per day. The concentration based TMDLs are set equal to NH water quality criteria for bacteria, in terms of count/100mL.

Although, concentration-based TMDLs implies a goal of meeting bacteria standards at the point of discharge for all sources, and end of pipe bacteria measurements can identify where to prioritize investigations and BMP implementation, ultimately, compliance with this TMDL is to be based on ambient water quality and not water quality at the point of discharge (i.e., end of pipe).

From the calculated TMDLs, estimated percent reductions are calculated based on the difference between previously measured bacteria data and water quality criteria for bacteria. These reductions needed to achieve the TMDLs are based on estimates of current loadings. Future development activities or land use changes have the potential to increase levels of bacteria and will need to continue to meet the TMDLs through watershed management plans and by local requirements. Table F.1 shows the TMDLs and percent reductions for Pelham’s TMDL waterbodies.

TABLE F.1 Ambient Bacteria Criteria for Pelham TMDL (*Escherichia coli)*

Waterbody	Beach	Single Sample Maximum Criteria		Geometric Mean Criteria*	
		cts/100 mL	% Reduction to meet TMDL	cts/100 mL	% Reduction to meet TMDL
Beaver Brook (1203-22)	No	406	63%	126	21%
Tony’s Brook (1205-01)	No	406	50%	126	66%
Long Pond – Town Beach	Yes	88	78%	47	26%

* Geometric mean criteria are based on at least 3 samples obtained over a 60-day period

F4.0 Types of BMPs to Reduce Loads to Impaired Waters
A compliment of Best Management Practices (BMPs) that consists of both structural and non-structural measures produces an effective program.

Structural BMPs include physical constructed devices and/or systems designed to achieve water quality benefits. Structural BMPs can be used for both existing watershed impairments as well as the impacts from new development or redevelopment. Examples of structural BMPs to reduce bacteria loading include:

- infiltration systems;
- detention/retention systems;
- constructed wetland systems; and
- filtration systems.

Non-structural BMPs are practices that prevent pollution through maintenance and management and can be effective at controlling pollution at the source. These measures can be related to:

- improving operational techniques;
- regular inspection and maintenance;
- public education and participation programs;
- good housekeeping practices (SWPPPs); and
- municipal Standard Operating Procedures (SOPs).

Effective BMP implementation should focus not only on reducing existing pollutant loads, but on preventing new pollution, as well. Once pollutants are present in a waterbody, or after it reaches a receiving waterbody, it is much more difficult and expensive to restore to an unimpaired condition. Therefore, non-structural systems that rely first on preventing degradation of receiving waters are always recommended.

The following includes examples of various mitigation measures as they relate to each pollutant source as listed above in Section F2.0.

F4.1 Stormwater
In developed areas, such as small MS4 areas, large areas of natural landscape cover have been replaced with impervious surfaces that increase the quantity of stormwater runoff over land. This faster moving water picks up added surface pollutants and can cause soil erosion in areas without healthy vegetation. Structural BMPs are generally designed to reduce and disconnect these impervious surfaces to minimize these adverse impacts to receiving waters. Structural stormwater BMPs are also used to collect and treat stormwater runoff before it is discharged.

Best Management Practices– Stormwater

Although structural BMPs are generally more costly than non-structural BMPs, an effective maintenance program will extend the life of stormwater controls and BMPs. Examples of structural stormwater BMPs that can be used to treat potential bacteria contaminated stormwater include:

- storm-drain stenciling;
- buffers;
- constructed wetlands;
- sand filters;
- infiltration trenches;
- porous pavements;
- rain gardens;
- bioretention systems; and
- and other proprietary devices and systems.

F4.2 Septic Systems

A septic system is a two-part treatment and disposal system designed to condition untreated liquid waste (sewage) so that it can be readily dispersed and percolated into the subsoil. Percolation through the soil accomplishes much of the final purification of the effluent, including the destruction of disease-producing bacteria. When properly installed, operated, and maintained, septic systems effectively reduce pathogen concentrations in sewage and replenish local groundwater. To reduce the release of pathogens, measures should be taken to maximize the life of existing systems, identify failed systems, and replace or remove failed systems.

The NHDES Subsurface Systems Bureau is the office responsible for reviewing applications for septic system designs, performing on-site inspections of septic systems, administering the program for licensing both designers and installers of septic systems, investigating written complaints, and coordinating other necessary permits. Municipalities also have the right to regulate septic systems as they affect local health issues (especially groundwater contamination).

Best Management Practices– Septic Systems

Replacing Failed Septic Systems

New Hampshire RSA 485-A:2 defines septic system failure as "*the condition produced when a subsurface sewage or waste disposal system does not properly contain or treat sewage or causes the discharge of sewage on the ground surface or directly into surface waters, or the effluent disposal area is located in the seasonal high groundwater table*."

According to NHDES, to ensure prompt and effective replacement of a failed subsurface system, the following steps must be taken (refer to NHDES for specific rules and requirements):

1. The town health officer or local health code department, or a permitted designer must prepare a written statement verifying that the existing system is in failure. This statement must be submitted to NHDES with the application to replace the existing system.

2. Before construction approval is granted, test pits and percolation tests must be completed. Septic system leach fields must be designed and constructed in locations with suitable soils.
3. If construction approval is granted, the construction must be completed within 90 days. Failure to complete construction and obtain operational approval of the system within the 90-day period will result in invalidation of NHDES approval.
4. In the event that a construction approval becomes invalid as a result of exceeding the 90-day construction period, a request for extension must be submitted to the NHDES, Subsurface Systems Bureau who may grant one 90-day extension.
5. NHDES is required to inspect all newly constructed subsurface disposal systems to verify that the proper materials have been used in the construction of the system and to ensure that the design intent has been met. Once the inspector determines that the system meets all the requirements, a written "Approval for Operation" will be completed.

Maintenance Practices for Private Septic Systems
Proper septic system maintenance is the best way to reduce the occurrence of failed septic systems. At a minimum, owners of septic systems should be encouraged to do the following:

- know the location of the septic tank and leach field;
- inspect the septic tank yearly;
- have the septic tank pumped as needed and at least once every three years;
- do not flush bulky items such as disposable diapers or sanitary pads into the system;
- do not flush toxic materials such as paint thinner, pesticides, or chlorine into the system as they may kill the bacteria in the tank which are essential to proper operation of the septic system;
- repair leaking fixtures promptly;
- be conservative with your water use and use water-reducing fixtures wherever possible;
- be conservative with your paper use;
- keep deep-rooted trees and shrubs from growing on your leaching area; and
- keep heavy vehicles from driving or parking on your leaching area.

F4.3 Pet Waste

Pet waste left anywhere may be a source of bacteria and nutrients in surface waters, and a potential public health risk. Pet waste on playing fields, sidewalks, or parks can be unhealthy and messy. Even at home, responsible pet owners should throw pet waste in the trash or flush it down the toilet to prevent water pollution associated with bacteria laden waste. Encouraging pet owners to properly collect and dispose of pet waste is the primary means for reducing the impact of pet waste. To this end, pet waste outreach campaigns can be an effective BMP for reducing this type of water pollution, including, providing materials to pet owners when they register their dogs annually.

Best Management Practices– Pet Waste

Pet Waste Outreach Campaigns
A successful outreach campaign will work with local partners to motivate dog owners/walkers to pick up after their dogs and dispose of the waste in an environmentally sound and safe way. The following 'rules' may be encouraged as part of an outreach campaign.

Examples of Pet Waste BMPs for Communities:

- conduct public awareness campaigns that can include public service announcements, signs in areas frequented by pet owners, and mailings.
- Install "pet waste stations" that include waste receptacles, collection bags, scoops, and shovels.
- ensure areas, such as public beaches, are either off-limits to pets or subject to certain ordinances to control fecal contamination of swimming areas.
- develop and enforce local "pooper scooper" ordinances or bylaws requiring pet owners to correctly dispose of pet waste.
- maintain areas with long grass. Dogs prefer defecating in long grass.

Examples of Pet Waste BMPs for Pet Owners:

- always carry a plastic bag with you when you walk your dog.
- flush unbagged pet waste down the toilet.
- NEVER place the bagged or unbagged pet waste in a storm drain or hose the pet waste towards storm drains or surface waters.
- if you have a large yard, you may bury unbagged pet waste in the yard at least five inches in the ground and away from gardens and waterways.

F4.4 Wildlife Waste
Fecal matter from wildlife can be major sources of pathogens, particularly in lakes and ponds where large resident populations have become established near beaches. As a result, many pollution mitigation measures are focused on waterfowl.

Best Management Practices - Wildlife
Reducing the impact of wildlife on pathogen concentrations in water bodies generally requires either reducing the concentration of wildlife in an area or reducing their proximity to the water body. The primary means for doing this is to eliminate human inducements for congregation. In some instances, population control measures may be appropriate. The following methods to reduce fecal contamination from wildlife were excerpted from "*Mitigation Measures to Address Pathogen Pollution in Surface Waters: A TMDL Implementation Guidance Manual for Massachusetts*" (MADEP, 2005).

- *Reducing Animal Feeding* **-** Educating the public about the potential impacts to water quality from feeding wildlife can reduce wildlife congregation. In addition to education, regulations and signage may be enacted to prohibit the feeding of wildlife.

- *Behavioral Modification* **-** Methods can be used to change the behavior of wildlife to minimize congregation of wildlife in areas where they contribute to water quality problems. These methods include techniques for scaring wildlife out of an area, the introduction of physical barriers, or the modification of the environment to reduce its attractiveness to certain wildlife (Underhill 1999). Scaring wildlife using trained dogs or loud noises has been effective in some instances. Physical barriers may include fencing to either exclude wildlife from areas near water bodies or from areas containing food sources. Finally, changing landscaping may reduce the congregation of wildlife in areas near water.

- *Population Control* **-** If other measures fail to effectively control the impact of wildlife, population control measures may be appropriate. These include the introduction or expansion of a hunting season, culling, relocation, or the prevention of egg hatching (Underhill 1999). Wildlife agencies should be contacted and consulted to determine legal measures of population control.

F4.5 Agriculture

Pollutants in animal waste and manure can enter surface waters through a number of pathways, including surface runoff and erosion, direct discharges to surface water, spills and other dry-weather discharges, and leaching into soil and ground water. These discharges of manure pollutants can originate from animal confinement areas, manure handling and containment systems, manure stockpiles, and cropland where manure is spread.

In New Hampshire, agricultural operations must conform to BMPs determined by the New Hampshire Department of Agriculture Markets & Food in consultation with the USDA Natural Resources Conservation Service and the UNH Cooperative Extension and the New Hampshire Department of Agriculture Markets & Food (NHDAMF, 2008).

<u>Best Management Practices - Agriculture</u>

Below are recommended mitigation measures designed to reduce the contribution of pathogens from agriculture in the state.

Comprehensive Nutrient Management Plans (CNMPs)

A Comprehensive Nutrient Management Plan (CNMP) is a conservation system for agricultural operations that is designed to address, at a minimum, the soil erosion and water quality concerns of agricultural operations. The CNMP should include the storage and handling of the manure as well as the utilization and application of the manure nutrients on the land. Manure and nutrient management involve managing the source, rate, form, timing, and placement of nutrients. The practice of nutrient management serves four major functions:

1. Supplies essential nutrients to soils for plant utilization to produce adequate food, forage, and fiber;
2. Provides for efficient and effective use of scarce nutrient resources so they are not wasted;
3. Helps maintain or improve the physical, chemical, and biological condition of the soil; and
4. Minimizes environmental degradation caused by excess nutrients in the environment.

Agricultural operators can obtain assistance in developing CNMPs from the US Natural Resource Conservation Service (NRCS), which can be accessed through the local county conservation district.

Manure Management BMPs

The BMPs presented below were excerpted from the *"Manual of Best Management Practices (BMPs) for Agriculture in New Hampshire"* (NHDAMF, 2008) and are intended to reduce pathogen pollution from manure spreading areas, pastures, and barnyards.

Barnyards and Pastures:

- control access of livestock to water bodies;
- control runoff from barnyards and feedlots;
- divert roof runoff away from barnyards and feedlots;
- manage barnyards and feedlots to minimize concentrations of manure; and
- manage pastures to reduce concentrations of manure.

Manure Spreading Areas:

- store manure in properly constructed facilities or field stack during periods when land application is not suitable;
- utilize soil tests to determine background levels of nutrients and soil pH;
- calibrate manure application equipment properly to guard against over fertilization and to achieve maximum benefit from the manure over the greatest amount of farmland;
- incorporate manure applications where and when appropriate, as soon as possible after application;
- avoid the application of manure on frozen ground or snow-covered fields;
- avoid applying manure directly on exposed bedrock and reduce application rates on shallow soils;
- plant cover crops on fields after harvesting annual crops, when possible; and
- maintain filter strips next to surface waters receiving runoff from crop fields where manure is applied.

F4.6 Beaches and Boats

Recreational water uses can contribute to pathogens loads. Bathing beaches, marinas, and areas frequented by boats may be impacted by pathogen sources specific to these areas, including swimmers at beaches, and sewage and graywater from boats. Municipal officials, boards of health, departments of public works, and citizens are largely responsible for managing these pathogen sources. A description of each of these types of sources is provided below

Best Management Practices – Beaches and Boats

Bathing Beaches

The NHDES Designated Public Beach Inspection Program monitors and samples Designated Public Beaches throughout the state from mid-June through Labor Day. About 170 public bathing beaches on lakes, rivers, and impoundments are inspected on a monthly basis during the swim season. NHDES has adopted criteria recommended by the EPA for bacteria in surface waters. The state instantaneous, and geometric mean standards for freshwater beaches are 88 and 47 counts/100 mL respectively for *E. coli*. Statistically, as the level of indicator bacteria increase, the potential for the public to contract a water-borne disease increase. Designated Public Beaches that exceed the state standards for bacteria levels are notified within 24 hours and advisories are issued to the public. The beaches are immediately re-sampled until bacteria levels fall below the standards. Once standards are met, the advisories are removed.

Recommended BMPs for beaches include:

- shower facilities should be made available, and bathers should be encouraged to shower prior to swimming;
- parents, guardians, and childcare providers should be encouraged to check and change children's diapers when they are dirty; and
- local health agencies may provide visitor education programs and present information on sanitary practices.

Boats

Boats have the potential to discharge pathogens in sewage from installed toilets and graywater (includes drainage from sinks, showers, and laundry). Sewage and graywater discharged from boats can contain pathogens (including bacteria, viruses, and protozoans), nutrients, and chemical products. These constituents can directly harm aquatic life or degrade water quality. NH law prohibits any sewage discharge from boats and has established "No Discharge Areas" (NDAs) where the discharge of all boat sewage, whether treated or untreated, is prohibited. This waste must be contained in a holding tank to be later removed at a pump-out or dump station.

Boat sewage discharges are highly concentrated with bacteria and nutrients that can contribute to unhealthy water and unsafe conditions for swimming and other recreation activities. Even properly operating vessels are most likely to contribute significantly to pathogen impairment in situations where large numbers congregate in enclosed environments with low flushing rates. Many marinas and popular anchorages are located in such environments (MADEP, 2005).

Graywater from boats includes wastewater from sinks, showers, and laundry. Graywater can contain low levels of pathogens, detergents, soap, and food wastes. These components can contribute to reduced oxygen levels in small bays and coves by enriching algae growth and bacterial breakdown of wastes. Graywater discharge is prohibited in all inland NH waterbodies.

NHDES conducts boat inspections for freshwater vessels with onboard wastewater containment facilities. Random inspections of occupied boats are conducted at marinas or at private docks, at the convenience of the owner or boat operator. If found in compliance with state law, the boat is identified with a DES decal. If the boat is not in compliance, the corrective measures are outlined, and a schedule is agreed upon for re-inspection. The law currently provides for an administrative fine up to $2,000 for each offense and loss of boat registration if a problem is not remedied within 48 hours of citation.

Recommended BMPs for boating includes:

Boats:

- distribute information on the proper operation and maintenance of watercrafts;
- target outreach to watercraft owners, marinas, and boat dealers regarding the State and EPA requirements for the No Discharge Area; and
- encourage marina owners to provide clean and safe onshore restrooms and pump-out facilities.

Boat Washing:

- outdoor wash facilities should be located on a permeable surface such as grass or gravel;
- outdoor wash facilities can be located on pavement if a trench is in place to filter out sediments and other harmful constituents from wash water or a water bar is installed to prevent discharge to surface water. Marinas must obtain a groundwater discharge registration for this option; and
- boat washing huts must have a roof and an impermeable floor sloped to a central floor drain at public launch locations. The drain can discharge to a NHDES registered holding tank.

Sewage and Grey Water

- do not allow waste to drain into receiving waters;
- charge an appropriate fee for boat pump-out services;
- educate boat owners about the no discharge policy in New Hampshire's inland waters;
- include a section in boater contracts that explains that grey water discharge is illegal and punishable by federal law;
- request watercrafts disable grey water systems to prevent illegal discharges, boat companies or marinas provide this service on fresh waters;
- provide educated staff to assist in boat pump-outs;
- question boat owners about their existing grey water systems;
- properly maintain the pump-out station systems for optimal performance; and

- marinas should provide an appropriate pump out station that is accessible to staff and customers.

Boat Launches and Parking

- pave only areas that are necessary;
- consider alternatives to asphalt for parking lots and vessel storage areas such as dirt, gravel, or permeable pavement;
- install infiltration trenches at the leading edge of a boat ramp to catch pollutants in an oil absorbent barrier or crushed stone before discharge;
- install water bars to divert water away from ramp areas and redirect to an infiltration area;
- install vegetative buffers between surface waters and upland areas;
- grassy or constructed wetlands allow pollutants to first be filtered out of water before discharging to the water body;
- protect storm drains with filters or oil-grit separators; and
- stencil words (such as "Drains to Lake") on storm drains to alert customers and visitors that storm drains lead directly to water bodies without treatment.

F5.0 Estimated Load Reduction Calculation Methodology

TMDL reductions necessary to meet water quality standards were calculated for a rough estimation of pollution abatement action needed. The estimate of percent (%) reduction needed is calculated based on the difference between measured ambient bacteria data and the water quality criteria for bacteria. For segments impaired by *E. coli* the necessary % reduction was calculated based on both single sample and geometric mean water quality standards;

The following process was used to estimate the % reduction necessary to achieve the water quality standard in each impaired segment:

For E. coli impaired segments: Select highest concentration level of single sample among all current samples (both dry and wet conditions). For the highest concentration of bacteria, calculate the % reduction in bacteria levels needed to meet the appropriate single sample water quality criteria.

For all impaired segments: Select highest geometric mean value, calculated from all current samples (both dry and wet conditions) within an impaired segment. For the highest geometric mean value, calculate the % reduction in bacteria levels needed to meet the appropriate geometric mean water quality criteria.

For example, if the highest single sample value is 1,000 counts /100mL, and the water quality standard is 104 counts /100mL, then the % reduction needed to meet the single sample criterion is [(1000 – 104)/1000] x 100 = 89.6% reduction.

While both single sample and geometric mean percent reductions are presented, it is recommended that the reductions needed to attain the geometric mean be used (when available) for implementation planning purposes in most cases. Bacteria sampling results can be highly variable, and the geometric mean helps to reduce undue influence of any one data point.

F6.0 Screening and Sampling Plan for Pelham Waters with a TMDL

As an MS4 municipality with impaired waters having a TMDL, outfalls with direct discharge to the impaired water (within 100-feet), must be screened and sampled on a regular basis with the results tracked and reported in the Annual Report.

Eleven (11) MS4 outfalls as mapped directly discharge to bacteria impaired waters in Pelham as shown in Table F.2. Of the eleven outfalls listed, five discharge to Tony's Brook, six to Beaver Brook (NHDES segment 1203-22), and none at Long Pond-Town Beach.

Annual screening of these outfalls shall include the collection of grab samples and analysis for the pollutant of concern, bacteria (E. coli, indicator). Bacteria analysis shall be conducted using the analytical methods. If the results of the sampling exceed the water quality benchmarks as defined in SOP-ID-3: *Water Quality Screening in the Field*, an illicit discharge investigation is to be conducted and sampling frequency should be increased. If an illicit discharge is identified, action must be taken immediately, and the ID removed with 60-days of its discovery.

All screening and sampling shall be in accordance with Pelham's IDDEP SOPs:

Appendix DD
SOP ID-1: *Dry Weather Outfall Inspection*
SOP ID-2: *Wet Weather Outfall Inspection*

Appendix DE
SOP-ID-3: *Water Quality Screening in the Field*
SOP-ID-3 *Attachment 1, Stormwater Sampling Quality Assurance Project Plan*

Appendix DF
SOP-ID-4: *Locating Illicit Discharges*
SOP-ID-5: *Catchment Investigations*

TABLE F.2 MS4 OUTFALLS DISCHARGING DIRECTLY TO IMPAIRED WATER LISTED IN NHDES BACTERIA TMDL (w/i 100-feet)						
LOCATION	**ID_NO**	**HEADWALL**	**OUTFALL PIPE**	**PIPE DIA (in)**	**IDDEP RANK**	**WATERSHED**
Clark Circle	OLBB-29-08	Concrete	Concrete	24	HIGH	Tonys Brook
7 Clark circle	OLBB-29-09	Concrete	Concrete	15	HIGH	Tonys Brook
Next to Walgreens on Bridge	OLBB-29-13	None	Concrete	40	HIGH	Tonys Brook
Behind Walgreens Parking Lot	OLBB-29-16	Stone	Concrete	12	HIGH	Tonys Brook
Corner of Walgreens and Old Bridge Street on side bridge	OLBB-29-06	None	Concrete	12	HIGH	Tonys Brook
32 Priscilla Way	OUBB-14-04	None	Concrete	12	HIGH	Beaver Brook
50 Monument Hill Rd	OUBB-06-04	None	Concrete	15	HIGH	Beaver Brook
38 Mount Vernon Dr	OUBB-07-02	Concrete	Other	12	HIGH	Beaver Brook
28 Mount Vernon Dr	OUBB-07-01	None	Other	12	HIGH	Beaver Brook
42 Monticello Dr	OUBB-07-04	Concrete	Concrete	24	HIGH	Beaver Brook
3 Edwards Dr	OUBB-03-02	None	Concrete	12	HIGH	Beaver Brook

F7.0 Sources and References

1. *New Hampshire Statewide TMDL for Bacteria Impaired Waters,* NHDES, September 2010.

2. *EPA New England Bacterial Source Tracking Protocol, Draft – January 2012.*

3. New Hampshire Department on Environmental Services, Watershed Management Bureau website: publications, technical guidance.
https://www.des.nh.gov/organization/divisions/water/wmb/tmdl/index.htm

4. New Hampshire Department on Environmental Services, Surface Water Quality Assessment Program website: publications, technical guidance.
https://www.des.nh.gov/organization/divisions/water/wmb/swqa/index.htm

5. *Draft Pathogen TMDL for the Merrimack River Watershed*, Massachusetts DEP, USEPA New England Region 1, (no date).