SANITARY SURVEY REPORT FOR THE BELLAMY RIVER, NEW HAMPSHIRE

December 2018

New Hampshire Department of Environmental Services
Water Division
Watershed Management Bureau

R-WD-19-14

SANITARY SURVEY REPORT FOR THE BELLAMY RIVER, NEW HAMPSHIRE

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December 2018

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Acknowledgements

The New Hampshire Department of Environmental Services (NHDES) Shellfish Program wishes to thank the following people for their assistance with the field work and laboratory analyses used to prepare this report:

Carina Pearson, Angela Piemonte, Brooke Dejadon, Stefanie Giallongo, Brian Hauschild and Mary Lenehan of the NH Department of Environmental Services

Michael Eastman of the New Hampshire Fish and Game Department

Mona Freese, Rachel Rainey, Denise Ambelas, Phillip Schuld, Oliver Beaumont and Jayne Finnigan of the New Hampshire Department of Health and Human Services

Amy Fitzpatrick, Valerie Potopsingh, David Lamoreaux, Greg Goblick, Kevin Calci and Yaping Ao of the US Food and Drug Administration

Tim Bridges of the US Environmental Protection Agency

Max Driscoll, Dave Lovely and Dan Peterson of the Town of Durham wastewater treatment facility

Paula Anania, Tim Babkirk and Terry Desmarais of the City of Portsmouth Department of Public Works

Sam Heffron of the Town of Newmarket wastewater treatment facility

Steve Dalton of the Town of Exeter wastewater treatment facility

Citizen volunteers Cody Cartnick and Eric Schroeder.

Dave Shay, Stephen Jones, Kari Hartman and Meghan Hartwick of the UNH Jackson Estuarine Laboratory.

The work of the NHDES Shellfish Program is funded by state general funds and by a grant from the U.S. Environmental Protection Agency.

I. Executive Summary

This report describes the results of a sanitary survey for the Bellamy River, New Hampshire, conducted in accordance with National Shellfish Sanitation Program (NSSP) guidelines. In October 2005, NHDES published a sanitary survey of the area. Since that time, annual and triennial updates have been conducted on the growing area, resulting in periodic modifications to the growing area classification. NSSP guidelines state that a new sanitary survey should be conducted on a shellfish growing area every 12 years. This report summarizes data collected through the end of 2017.

Work for the sanitary survey began with a review and modification of the existing shellfish management area boundary. Updated digital tax maps were obtained where available, and property records for those lots within the revised management area were updated in the NHDES Environmental Monitoring Database (EMD). The entire shoreline of the Bellamy River growing area was inspected by Shellfish Program staff in 2016 and 2017. Descriptions of each property and any new or existing pollution sources were updated in the EMD. Plans to evaluate, inspect and/or sample all pollution sources were developed and implemented to allow for evaluation of sanitary conditions. Ambient monitoring of sites under a systematic random sampling program, as well as additional water sampling under various environmental conditions, was conducted.

The results of the present sanitary survey indicate that the lower section of the Bellamy River, from Clements Point to the river mouth, can be classified as Conditionally Approved for shellfish harvest. Closure of the Conditionally Approved area is necessary following rainfall events of over one inch per 24 hours, and following significant discharges of raw or partially treated sewage from the Durham, Dover, or Portsmouth wastewater treatment facilities. Seasonal closure of the Conditionally Approved area for the months of June, July and August is also warranted because of high bacteria levels observed during dry and wet weather conditions. Until the Portsmouth wastewater treatment facility is upgraded, recreational harvest in the Bellamy River should be restricted to Saturday only, 9am-sunset, and all harvesting (commercial and recreational) should be prohibited for the period of October through March. The waters of the Bellamy River north of Clements Point shall be classified as Prohibited, due to intermittently poor water quality from a number of pollution sources, and due to the potential for rapid contamination from accidental releases of sewage from nearby sewage collection infrastructure.

II. Introduction

The New Hampshire Department of Environmental Services (NHDES), under the authority granted by RSA 143:21, RSA 143:21-a and RSA 487:34, is responsible for classifying shellfish growing waters in the State of New Hampshire. The purpose of conducting shellfish water classifications is to determine if growing waters meet standards for human consumption of molluscan shellfish. The primary concern with the safety of shellfish growing waters is contamination from human sewage, which can contain a variety of disease-causing microorganisms. Shellfish pump large quantities of water through their bodies during normal feeding and respiration processes. During this time, shellfish also concentrate microorganisms that may include pathogens and a positive relationship between sewage pollution of shellfish growing areas and disease has been demonstrated many times (ISSC, 2017).

Though testing shellfish growing waters and/or shellfish meats for the pathogenic microorganisms themselves would seem to be the most direct method of determining whether or not growing waters meet consumption standards, several factors preclude this approach. Perhaps the most important is that the number of pathogens that may be in sewage is large, and laboratory methods that are practical, reliable, and cost effective are not available for all of the pathogens that may be present. Therefore, shellfish water classifications are based on evidence of human sewage contamination, which may include direct evidence (identification of actual pollution sources) or indirect evidence (elevated or highly variable indicator bacteria levels in the growing waters). If such evidence is found, then pathogens may be present, and the area is closed to harvesting. Areas may also be closed if contamination from animal waste or poisonous/toxic substances is found.

Under the authority granted by RSA 143:21, RSA 143:21-a and RSA 487:34, NHDES uses a set of guidelines and standards known as the National Shellfish Sanitation Program (NSSP) for classifying shellfish growing waters. These guidelines were collaboratively developed by state agencies, the commercial shellfish industry, and the federal government in order to provide uniform regulatory standards for the commercial shellfish industry. The NSSP is used by NHDES to classify all growing waters, whether used for commercial or recreational harvesting, because these standards provide a reliable methodology to protect public health. Furthermore, RSA 485-A:8 (V) states that “Those tidal waters used for growing or taking of shellfish for human consumption shall, in addition to the foregoing requirements, be in accordance with the criteria recommended under the National Shellfish Program Manual of Operation, United States Food and Drug Administration.”

The key to the accurate classification of shellfish growing areas is the sanitary survey. The principal components of a sanitary survey include: (1) an evaluation of pollution sources that may affect the areas, (2) an evaluation of the meteorological and hydrographic factors that may affect distribution of pollutants throughout the area, and (3) an assessment of water quality. The development of each of these components was originally presented in the first sanitary survey for Little Bay, published October 2005 (Nash and Wood, 2005). The NSSP requires a new sanitary survey every 12 years. This report presents findings for a new sanitary survey for the Bellamy River.

III. Description of Growing Area

The Bellamy River is part of the Great Bay Estuary, the largest estuary in New Hampshire. The tidal portion of the river begins just downstream of the Sawyer Mills dam complex near Route 108, and extends approximately four miles to the tidal river mouth at the Route 4/Scammel Bridge, where the river empties into Lower Little Bay (Figure 1). The upper section of the river is relatively narrow (100-300 feet wide), with low tide water depths averaging two feet or less. Farther downstream, the river widens to 400-900 feet in width, with low tide channel depths in the range of seven to ten feet. The lower section of the river, south of Clements Point exhibits extensive intertidal mudflats. The tidal portion of the Bellamy River includes approximately 437 acres of tidal waters, with 12 miles of tidal shoreline.

Land cover around the Bellamy River is lightly developed or undeveloped, especially on the western shoreline. Developed areas along the eastern shoreline are primarily single family residential buildings, many of which are conversions from seasonal cottages. Just over half of the residences are served by municipal sewer (some collection infrastructure is privately owned), while septic systems/leach fields service the remaining structures. There are no direct municipal wastewater treatment facility discharges in the Bellamy River; however, the Durham and the Dover municipal WWTFs discharge to tidal tributaries of the Great Bay system, and dye studies of these facilities demonstrate that they have the potential to affect water quality in the Bellamy River (Nash and Bridges, 2003; Nash, Carr, and Bridges, 2005). Furthermore, City of Dover sanitary sewer pump station and line crossings are in and near the river at numerous locations, some of which have a history of bypassing sanitary waste and stormwater during heavy rainfall events. Pump stations near Varney Brook and Sawyer Mills are among those that have bypassed in heavy rain in the past, although such incidents have been less frequent in recent years. A 2012 hydrographic dye study of the Portsmouth municipal WWTF on Peirce Island (Ao et al., 2017) showed that a low tide disinfection failure at this primary treatment facility could result in insufficiently diluted effluent reaching the Bellamy River growing area during the first flood tide. In 2015 some classification changes were implemented, including the expansion of the Prohibited/Safety zone in Lower Little Bay, and new conditions for recreational harvesting in the Conditional Area Management Plan. Specifically, the Management Plan now includes a restriction of recreational harvesting to Saturdays only, 9am to sunset, during the harvesting season. This restriction gives NHDES time to react to a Friday-overnight disinfection failure and implement a temporary harvest closure when needed. No adjustments to commercial harvesting were needed because commercial harvesters must gain NHDES permission for each harvesting event. When the Portsmouth WWTF is upgraded to secondary treatment over the next several years, its influence on Little Bay will be re-examined.

Agricultural uses on the western shore include two hayfields on conservation lands that are leased to a private farmer, and a small horse paddock (two animals) on the eastern shore of the river. There are 402 acres of conservation land within the management area, much of which is adjacent to the river (Figure 1)

At the end of 2017 there were no commercial oyster farms in the Bellamy River (Figure 1), although one application is pending with NHF&G and a license may be issued for calendar year 2018. All aquaculturists are required to contact the Shellfish Program prior to harvest to verify the open/closed status of the growing waters.

Land use for the 152 properties within the Bellamy Management Area is summarized in Table 1.

Table 1: Land Use for Properties in the Little Bay Management Area

	Agricultural	Commercial Industrial	Mooring Field	Other	Residential	Vacant
Dover	3	3	2	3	100	26
Durham	1	0	0	0	4	2
Madbury	0	0	0	1	4	3
TOTAL	4	3	2	4	108	31

Perhaps the most significant pollution sources with the potential to affect the management area are the nearby municipal wastewater treatment facilities. The Durham WWTF discharges to the Oyster River, which empties into Little Bay, and Little Bay is hydrologically connected to the Bellamy River. The Dover WWTF discharges to the Upper Piscataqua River, which in turn flows into Little Bay at Dover Point. The Portsmouth WWTF is located much farther from the growing area than the Durham and Dover facilities; however, a 2012 hydrographic study of its outfall and effluent illustrate that this large, primary treatment facility can affect Bellamy River water quality following a significant lapse in disinfection (Ao et. al, 2017). Subsequent studies documenting indicator virus concentrations in Portsmouth WWTF effluent have shown this facility has a chronic impact on virus levels in Little Bay that warrant a seasonal (cold weather) shellfish harvest closure. Ongoing studies of Bellamy River seawater and shellfish are showing similar results. Although these influences are expected to lessen once the facility is upgraded to secondary treatment, they must be discussed in the present report for Little Bay. Each of these facilities is described in greater detail in Section IV., C of this report.

The Bellamy River provides recreational oyster (American oyster, *Crassostrea virginica)* and softshell clam (*Mya arenaria)* harvesting opportunities in New Hampshire, although the oyster resource is substantially less than it once was. The number of adult oysters in the entire estuary decreased from over 25 million in 1993 to 1.2 million in 2000. Since 2012, the population has averaged 2.1 million oysters, which is 28% of the Piscataqua Region Estuaries Partnership (PREP) goal for oyster recovery by 2020. This shows a decline from the previous reporting period (2009-2011), which averaged just over 2.8 million oysters (Piscataqua Region Estuaries Partnership, 2018). Other shellfish species such as blue mussels (*Mytilus edulis)* are also present in scattered locations, but few comprehensive datasets are available.

A sanitary survey for the Bellamy River, developed in accordance with National Shellfish Sanitation Program guidelines, was initially published in October 2005 (Nash and Wood 2005). Figure 2 illustrates the most recent classifications of the area, taken from the 2016 Bellamy River Management Area Annual Report (Nash, 2017).

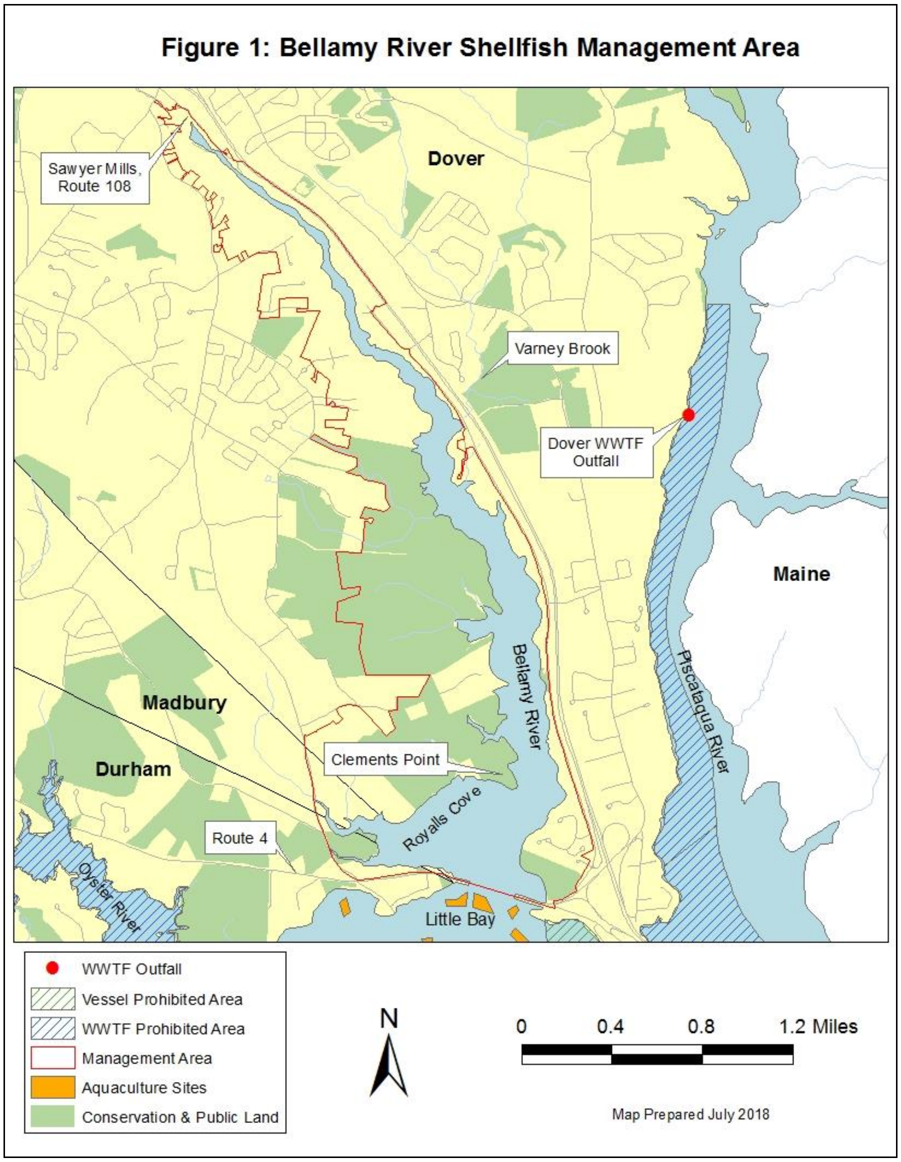


Figure 1: Bellamy River Shellfish Management Area
Sawyer Mills, Route 108
Dover
Varney Brook
Dover WWTF Outfall
Maine
Bellamy River
Piscataqua River
Madbury
Durham
Clements Point
Royalls Cove
Route 4
Oyster River
Little Bay
WWTF Outfall
Vessel Prohibited Area
WWTF Prohibited Area
Management Area
Aquaculture Sites
Conservation & Public Land
N
0
0.4
0.8
1.2 Miles
Map Prepared July 2018

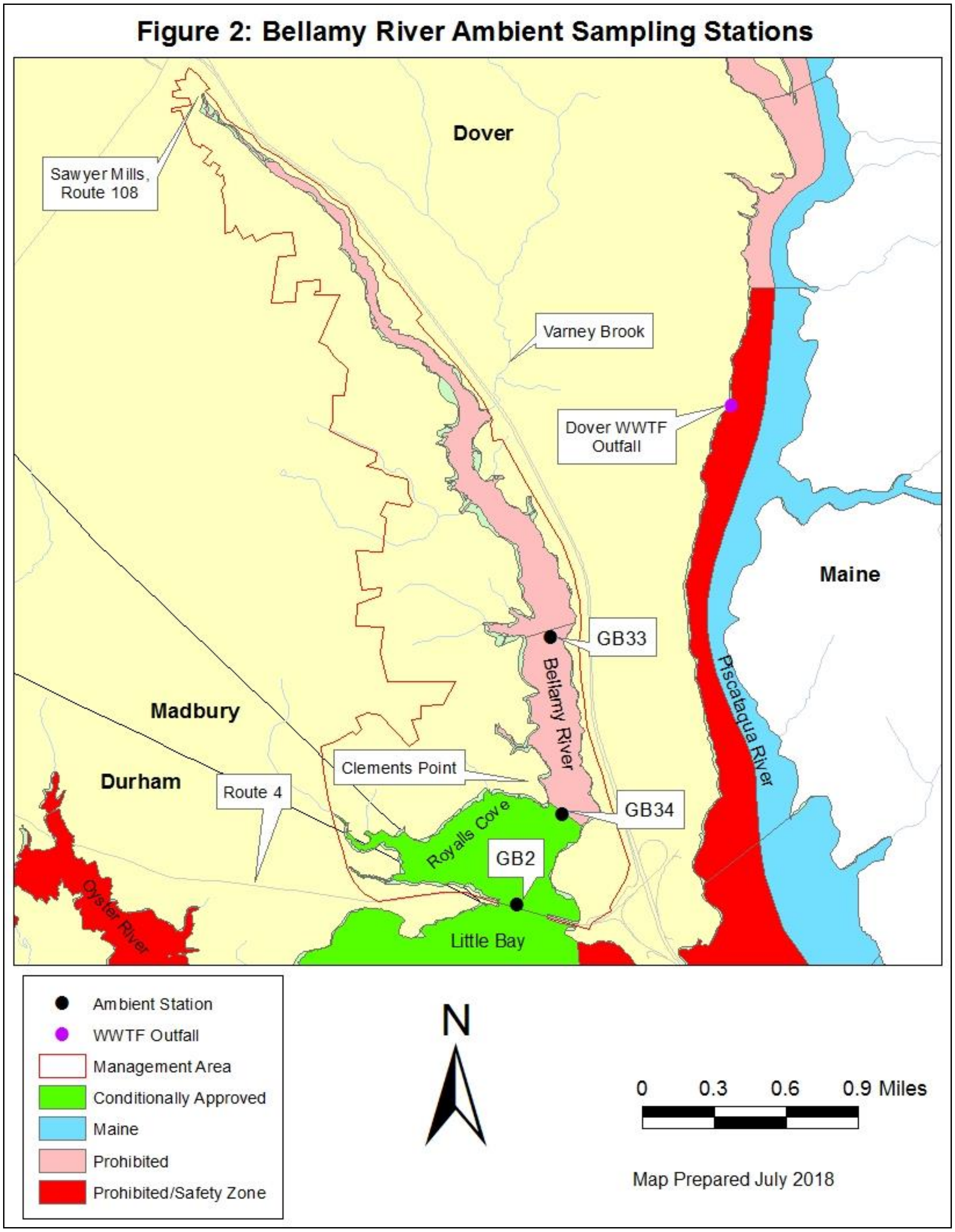


Figure 2: Bellamy River Ambient Sampling Stations
Dover
Sawyer Mills, Route 108
Varney Brook
Dover WWTF Outfall
Maine
GB33
Bellamy River
Piscataqua River
Madbury
Durham
Clements Point
Route 4
GB34
Royalls Cove
GB2
Oyster River
Little Bay
Ambient Station
WWTF Outfall
Management Area
Conditionally Approved
Maine
Prohibited
Prohibited/Safety Zone
N
0 0.3 0.6 0.9 Miles
Map Prepared July 2018

IV. Pollution Source Survey

A. Survey Area and Methodology

The original shoreline survey for the Bellamy River was conducted by the NHDES Shellfish Program in the fall of 2001 and the summer of 2002. The information collected during the shoreline survey was reevaluated and updated in the fall of 2004. The present survey was completed during the 2017 and 2018 field seasons. The survey focused on tidal shoreline properties. After review of the management area boundary, minor adjustments were made to the boundary to place emphasis on properties directly adjacent to the growing. The survey area for the lot-by-lot inspection of shoreline properties along the Bellamy River is depicted as the management area in Figure 2. Parcel-based tax maps were acquired from the Towns of Durham, Madbury and Dover, and GIS software was used to compile a list of the properties inside the revised management area boundary. The properties and pollution sources that were no longer inside the management area and deemed to pose no risk to the growing waters were archived in the NHDES Environmental Monitoring Database (EMD) and were not inspected as part of the 2017 survey. Records for all properties within the revised management area boundary were reviewed and organized to prepare for a shoreline survey. Properties that had been subdivided since the last survey according to tax map records were flagged to be deactivated in the EMD and replaced with the list of new properties. The records of the deactivated properties were not deleted, but rather their waterbody designation was changed to “Archive” in order to exclude these properties from future Bellamy River queries while preserving the historical property and pollution source information in the database. A potential impact to the growing area (direct or indirect) was assigned to each source based on its location relative to the growing waters. For the purposes of this survey, the growing waters include all tidally influenced portions of the Bellamy River, and portions of its numerous tributaries.

Lot-by-lot walkthrough inspections of all properties within the management area boundary were completed by NHDES Shellfish Program Staff. Each property’s land use was checked against existing records and each known pollution source was re-inspected and/or sampled. Every property inspection also included a search for new sources not previously documented. Seventy-five pollution sources were previously identified in this management area in the original 2005 sanitary survey. Since that time, nine additional sources have been identified and evaluated.

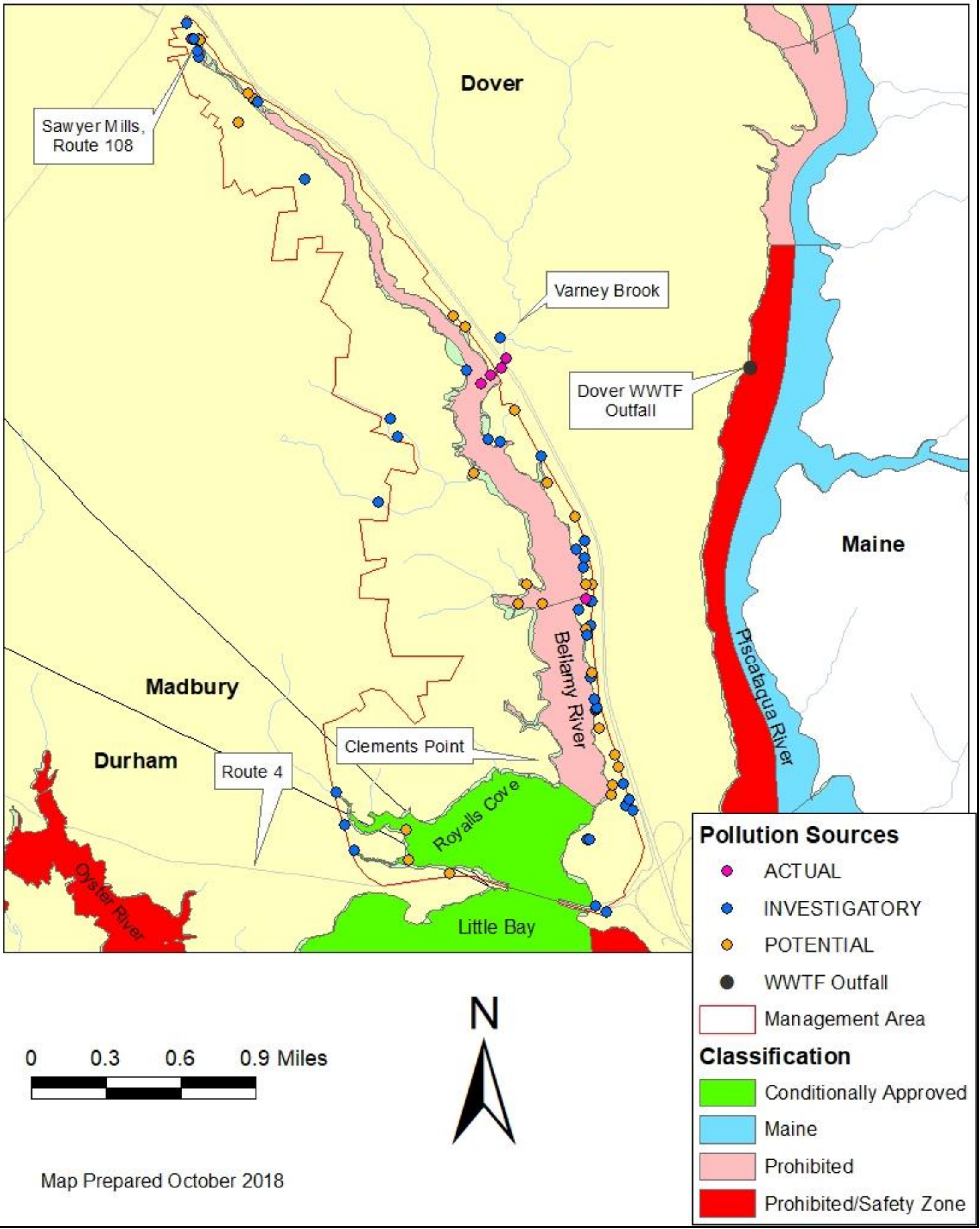
All identified pipes, tidal creeks, streams with flowing water, and other potential bacterial pollution sources located along the shoreline were documented and sampled under dry and wet weather conditions during the shoreline surveys. Homes bordering the growing area were visually evaluated for malfunctioning septic systems, discharging pipes, outhouses and other potential pollution sources. Water samples were collected in sterilized Nalgene bottles, labeled, and kept on ice packs in coolers until delivery to the DHHS Water Analysis Laboratory in Concord. Once all of the data had been collected and evaluated each source was categorized as actual, potential, or investigatory. Sources (Figure 5) were categorized based on the following criteria:

- Actual Pollution Source is a known source of pollution and is, or is capable of, causing a violation of NSSP bacteriological standards for approved shellfish growing waters. A source can only be described as 'Actual' if (1) It has been found to have consistently high bacteria levels and (2) It is determined, beyond a reasonable doubt, that the source is polluting, or capable of polluting, the surrounding area, e.g. a WWFT outfall or failing septic system. Actual pollution sources must be re-sampled and re-evaluated a minimum of every three years.

- Potential Pollution Source is a source that has the potential to infrequently and/or unpredictably release contaminants to the surrounding shellfish growing waters at levels that are in violation of NSSP bacteriological standards. Examples would include sources such as pipes, streams, road swales, etc. During an initial shoreline survey, all sources found will be classified as potential until further bacterial investigations can be conducted. Potential pollution sources must be re-evaluated, through sampling or other means, at least every three years.
- Investigatory Pollution Source is a source that meets the definition of "Potential" but has no likely means of impacting shellfish growing waters. Investigatory sources will not be followed up on in as much detail or in as timely a manner as "Potential" sources. Investigatory sources will be used to track down unexplained elevated bacterial values at ambient sampling stations. Examples would include sources like old broken pipes, salt marsh pannes, indirect sources far up in the watershed, sources within a prohibited area (WWTF safety zone), and sources that cannot be sampled (pipe with no outlet, or fuel dock).
- Investigated/Clean Source is a source that was initially identified in the field survey as a possible pollution source, but sampling data and /or other relevant information has shown that it does not have the capability of generating pollution sufficient to cause an exceedance of NSSP standards in nearby growing waters.

Updated sampling of identified pollution sources were carried out mainly during the 2017 field season, with additional sampling during the 2018 field season.

Figure 3: Pollution Sources In/Near Management Area



B. Summary of Sources and Locations

The property survey involved the on-site inspection of 152 shoreline properties, as well as a few non-shoreline properties; 108 of the properties are residential, three are commercial/industrial facilities, four are agricultural lands, two are mooring fields, 31 are vacant lots, and the remaining four are other land uses. Approximately half of all the residential properties and commercial/ industrial facilities are connected to the municipal sewer system, while the rest utilize on-site septic systems. Much of the developed eastern shore of the Bellamy, particularly along Spur Road, are on or soon will be on municipal sewer, as the City of Dover is encouraging connections in conjunction with a major road reconstruction. The shoreline investigations revealed 84 potential pollution sources, predominantly tidal creeks, road culverts, streams and drainage pipes.

Although not directly within the growing area, the Durham and Dover wastewater treatment facilities (WWTFs) were identified as sources of potential pollution that could affect the growing waters. Dye studies were conducted on the WWTFs to delineate prohibited areas around the outfalls. Although the prohibited areas do not extend into the Bellamy River, the studies indicate that insufficiently diluted effluent might be able to reach the Bellamy River after the first full ebbing tide. In 2017, a second dye study was conducted on the Durham WWTF in order to update the knowledge of this facility's impact on adjacent waters, and this 2017 study specifically included the Bellamy River as part of the area under study. Previous dye study work on the Portsmouth WWTF (Ao et. al, 2017) demonstrated that this facility, although well outside of the Bellamy River growing area, has the potential to adversely affect the Bellamy River.

A sampling plan was developed for each of the 84 pollution sources to evaluate bacterial loading under dry and/or wet weather conditions (Appendix 1). Dry weather samples were collected only after a period of at least three consecutive days with less than 0.25 inches of rainfall. Wet weather samples were collected following rainfall events of 0.25 inches or more, although in practice higher rain amounts were targeted. Sampling results for all of the potential sources of pollution are summarized in Appendix II. Most of the potential sources of pollution were found to be of little significance in terms of bacterial contamination of shellfish waters. Many showed no flow, even after repeated site visits after significant rainfalls. Some sources, however, may represent significant public health threats to the growing waters. A summary of sampling results for pollution sources is presented in Table 2. Location of these pollution sources is illustrated in Figure 3.

Table 2: Fecal Coliform (/100ml) Sampling Data for Pollution Sources

Station ID	Source Description	Range of Dry Weather FC/100mL	Range of Wet Weather FC/100mL
BLMPS001	Stormwater Outfall	< 10 (1 sample)	< 10-460
BLMPS002	Stormwater Outfall	no flow	no flow
BLMPS003	Freshwater River	33-825	46-1100
BLMPS003A	Perennial Stream	4.5-1100	23-5300
BLMPS004	Stormwater Outfall	no flow	no flow
BLMPS005	Stormwater Outfall	0-100	60-1400
BLMPS006	Pipe	no flow	no flow
BLMPS007	Pipe	no flow	no flow
BLMPS008	Pipe	no flow	no flow
BLMPS009	Pipe	no flow	no flow
BLMPS010	Pipe	5-800	30-1600
BLMPS011	Pipe	3-2150	90-6500
BLMPS012	Pipe	no flow	9-60 (2 samples)
BLMPS013	Stormwater Outfall	no flow	60- >20,000 (2 samples)
BLMPS014	Stormwater Outfall	23-545 (2 samples)	100-4500 (2 samples)
BLMPS015	Stormwater Outfall	< 10 (1 sample)	< 10-7200
BLMPS016	Stormwater Outfall	< 10 (1 sample)	< 10-10,000
BLMPS017	Intermittent Stream	6-1708	39-4400
BLMPS018	Pipe	no flow	no flow
BLMPS019	Sewer Line	0-50	10-40
BLMPS020	Intermittent Stream	10-900	60-1900
BLMPS021	Road Culvert	0-190	50-650
BLMPS022	Foundation Drain	no flow	no flow
BLMPS023	Foundation Drain	no flow	no flow
BLMPS024	Intermittent Stream	100 (1 sample)	10-290
BLMPS025	Road Culvert	no flow	20-400 (2 samples)
BLMPS026	Foundation Drain	no flow	< 10 (1 sample)
BLMPS027	Foundation Drain	no flow	< 100 (1 sample)
BLMPS028	Pipe	< 10-23	< 10-1220
BLMPS029	Foundation Drain	no flow	no flow
BLMPS030	Foundation Drain	no flow	< 10- < 50 (2 samples)
BLMPS031	Road Culvert	60 (1 sample)	< 10-1200
BLMPS032	Intermittent Stream	< 10-70	5->20,000
BLMPS033	Pipe	no flow	no flow
BLMPS034	Pipe	>8000 (1 sample)	80- >8000 (2 samples)
BLMPS035	Stormwater Culvert	no flow	no flow
BLMPS036	Stormwater Culvert	no flow	< 10-960
BLMPS037	Stormwater Culvert	0-320	< 10-3400

Station ID	Source Description	Range of Dry Weather FC/100mL	Range of Wet Weather FC/100mL
BLMPS038	Road Culvert	no flow	12.5 (1 sample)
BLMPS039	Road Culvert	< 10- >=100	< 10-3800
BLMPS040	Intermittent Stream	9-2500	200-2100
BLMPS041	Intermittent Stream	< 5-140	10-2600
BLMPS042	Intermittent Stream	< 10-280	30-4500
BLMPS043	Intermittent Stream	3-500	< 5-2300
BLMPS044	Foundation Drain	no flow	< 10-390 (2 samples)
BLMPS045	Intermittent Stream	3-120	10- >2000
BLMPS046	Intermittent Stream	20 (1 sample)	80-110 (2 samples)
BLMPS047	Intermittent Stream	no flow	< 10-4800 (2 samples)
BLMPS048	Foundation Drain	no flow	no flow
BLMPS049	Foundation Drain	no flow	no flow
BLMPS050	Foundation Drain	no flow	no flow
BLMPS051	Intermittent Stream	no flow	20-7900 (2 samples)
BLMPS052	Intermittent Stream	< 10-300 (2 samples)	< 10-260
BLMPS053	Intermittent Stream	< 10-10 (2 samples)	10-405 (2 samples)
BLMPS054	Intermittent Stream	0-860 (2 samples)	7.5-210 (2 samples)
BLMPS055	Tidal Creek	< 10-60	< 5-380
BLMPS056	Intermittent Stream	3 (1 sample)	208- >1000 (2 samples)
BLMPS057	Intermittent Stream	5-20	< 10-440
BLMPS058	Intermittent Stream	60 (1 sample)	< 10-67.5
BLMPS059	Intermittent Stream	10-138	< 10- >2000
BLMPS060	Road Culvert	3- < 10	< 10- 40
BLMPS061	Perennial Stream	2- >1600	4.5-16,000
BLMPS061A	Perennial Stream	7.8-310	70-2300
BLMPS061B	Perennial Stream	7-70	70-230
BLMPS061C	Perennial Stream	4.5- >1600	4.5-1600
BLMPS062	Road Culvert	no flow	5-7100
BLMPS063	Road Culvert	< 10	10-460
BLMPS064	Tidal Creek	0-150	< 10-600
BLMPS065	Road Culvert	< 10 (1 sample)	120-1575 (2 samples)
BLMPS066	Tidal Creek	5-38	< 10-140
BLMPS067	Perennial Stream	< 10-380	< 10-3000
BLMPS068	Intermittent Stream	no flow or unable to access	5-660
BLMPS069	Stormwater Outfall	130 (1 sample)	< 10-300
BLMPS070	Road Culvert	no flow	220-540 (2 samples)
BLMPS071	Pump Station	no samples	no samples
BLMPS074	Pump Station	no samples	no samples
BLMPS075	Pump Station	no samples	no samples

Station ID	Source Description	Range of Dry Weather FC/100mL	Range of Wet Weather FC/100mL
BLMPS076	Intermittent Stream	< 10-200	30-150
BLMPS077	Intermittent Stream	< 10-40	< 10-50
BLMPS078	Intermittent Stream	< 10-50	9-70
BLMPS079	Intermittent Stream	< 5-40	20-50
BLMPS080	Stormwater Outfall	50-2200	10- >20,000
BLMPS081	Pipe	no flow	no flow
BLMPS082	Road Culvert	no flow (1 entry)	no data

C. Identification of Pollution Sources

The following summarizes information on the potential pollution sources listed in Appendix I and Appendix II. These are categorized as Permitted NPDES Wastewater Discharges, Wastewater Treatment Infrastructure, Other Domestic Waste Discharges, Stormwater Outfalls, Road Culverts, Tidal Creeks, Tidal Rivers, Intermittent Streams, Marinas and Mooring Fields, Agricultural Sources, Wildlife Areas, Industrial Wastes, and Dredging.

Sampling data are presented in Appendix II.

Permitted NPDES Wastewater Discharges

Perhaps the most significant pollution sources with the potential to affect the growing area are the nearby municipal wastewater treatment facilities. No WWTFs discharge directly to the Bellamy River. The Durham WWTF discharges to the Oyster River, which, like the Bellamy River, empties into Little Bay. The Dover WWTF discharges to the Piscataqua River. The Portsmouth WWTF discharges to the Piscataqua River and is located farther from the growing area than the Durham and Dover outfalls, but a 2012 hydrographic study of its outfall and effluent (Ao et al., 2017) illustrated that this large, primary treatment facility can affect Bellamy River water quality following a significant lapse in disinfection. Although this influence is expected to lessen once the facility is upgraded to secondary treatment, it must be included in the present report for the Bellamy River.

Durham Wastewater Treatment Facility

The Durham Municipal Wastewater Treatment Facility (NPDES No. NH0100455) provides secondary treatment to wastewater from residents and businesses in the Town of Durham, as well as wastewater from the University of New Hampshire. The treatment plant is designed for a flow of 2.5 million gallons per day (mgd) and utilizes an activated sludge process, including secondary clarifiers, chlorine disinfection, scum collection, and sludge disposal. The outfall is an open pipe (no diffuser) in the Oyster River and is located below the low tide line. In anticipation of limits on nitrogen in the next NPDES permit, the facility has been retrofitted in the aeration tanks with systems to remove nitrogen.

The most recent NPDES permit for Durham became effective on January 29, 2000, and expired on January 29, 2005. An application for permit renewal was received by EPA on June 11, 2004, and is still under review. The most recent compliance inspection report by the NHDES Wastewater Engineering Bureau (April 2017 shows no significant deficiencies in regards to effluent bacteria concentrations, plant flow levels, or operation of the disinfection system. Review of the facility's MORs shows the facility routinely meets its bacteria permit limits. Plant flows show seasonal characteristics, with highest values in the spring.

The permit sets limits on a number of parameters, including BOD, TSS, pH, fecal coliform, total residual chlorine, and others. Whole Effluent Toxicity Testing is required four times per year, and the permit requires the facility to immediately notify NHDES/Watershed Management Bureau/Shellfish Program in the event of a lapse in treatment at the WWTF or from the sewage collection system.

As raw sewage enters the plant, it flows into a grit removal chamber, and then moves through the following treatment steps:

Primary settling: four tanks (63,334 gallons each)
Aeration: four tanks (192,500 gallons each; typically 2-3 tanks online)
Clarification: two tanks (248,700 gallons each; only one used in low flow conditions)
Disinfection: two chlorine contact tanks (38,400 gallons each)

The plant has little capacity to hold/store treated sewage. The plant operator indicates that under the best circumstances (low flow, one aeration and one clarifier tank offline and therefore available for use as storage vessels) the plant might be able to hold a half day of treated effluent. Sludge is dewatered on site and transported for composting in Holderness, NH. Industrial users include the University of New Hampshire (although no industrial discharges, only sewage, are permitted to the system) and a minor discharge from Heidleberg-Harris Printing (approximately 13 gallons of pre-treated process water per day).

Disinfection is achieved with sodium hypochlorite and sodium bisulfite for dechlorination. Contact time is typically 1.5 hours when both tanks are online. A maximum of 3,000 gallons of sodium hypochlorite is stored on site, which typically provides for 2.5 months of disinfection. Chlorine injection pumps are backed up, and both primary and backup pumps are operational even in the event of a loss of power at the facility. The chlorine contact tanks are cleaned every 1-2 weeks.

The plant is staffed Monday-Friday, 8 hours per day, and checked every morning on the weekends and holidays (3 hours). Staff is on-call 24 hrs/day and typically responds in less than one hour of notification in the event of a problem at the plant. Loss of power, abnormally high flows, etc. trigger alarms that are tied to the police station, which in turn results in staff notification. Chlorination pump failures/abnormal chlorine residuals are also alarmed.

Table 3: Durham WWTF Flow and Bacterial Monitoring Data (from Monthly Operations Reports)

Month	2015 Flow (MGD)		2015 Fecal Coliform (per 100mL)		2016 Flow (MGD)		2016 Fecal Coliform (per 100mL)		2017 Flow (MGD)		2017 Fecal Coliform (per 100mL)	
	Mon. Avg. (low)	Mon. Avg. (high)	Mon. Avg.	Num. of Samples >43 per 100mL	Mon. Avg. (low)	Mon. Avg. (high)	Mon. Avg.	Num. of Samples >43 per 100mL	Mon. Avg. (low)	Mon. Avg. (high)	Mon. Avg.	Num. of Samples >43 per 100mL
Jan	0.55	1.07	1.1	0	0.58	1.48	1.2	0	0.67	1.42	1	0
Feb	0.74	1.08	1.2	0	0.85	1.99	0	0	0.85	2.18	1.1	0
Mar	0.67	1.93	1.0	0	0.68	1.60	1.0	0	0.63	1.79	1.1	0
Apr	1.11	2.43	1.1	0	0.90	1.58	1.0	0	0.93	2.63	1.1	0
May	0.41	1.10	1.1	0	0.43	1.09	1.0	0	0.77	1.76	1.4	0
Jun	0.41	0.98	1.2	0	0.38	0.66	0	0	0.59	1.04	1.1	0
Jul	0.48	0.89	1.5	1 (491)	0.38	0.73	1.1	0	0.46	0.71	1.1	0
Aug	0.42	0.84	1.0	0	0.39	0.87	1.2	0	0.43	1.01	1.1	0
Sep	0.75	1.36	0	0	0.64	1.07	1.4	0	0.83	1.18	1.1	0
Oct	0.70	1.40	1	0	0.62	1.60	3.2	4 (51,125, 74,46)	0.79	1.71	1.0	0
Nov	0.43	1.19	1.1	0	0.55	1.45	1	0	0.49	1.19	1.1	0
Dec	0.59	1.02	0	0	0.45	1.75	1	0	0.45	1.01	1.0	0

A hydrographic dye study was initially conducted on the Durham WWTF in 2002 (Nash and Bridges, 2003). That study involved a relatively short (3-hour) injection time of dye into the effluent stream, and surface tracking of dye on the ebbing tide using fluorometers towed behind boats. That study established that insufficiently diluted effluent from the WWTF arrived at Bunker Creek after three hours and at the mouth of the Oyster River after four hours. Impacts to the Bellamy River were not seen, although this could be due to the short injection period and a lack of tracking in the Bellamy itself. As a conservative measure, subsequent Conditional Area Management Plans incorporated the possibility that a lapse in disinfection at the Durham WWTF might affect the Bellamy River. A new hydrographic dye study of the Durham WWTF was conducted in May 2017. This study was designed to incorporate different injection and data analysis protocols more recently adopted in the NSSP, namely, a 12.4-hour injection of dye, in-situ measurements of dye concentration at fixed stations to allow for estimation of steady-state dilution, mobile fluorometer tracking, and vertical profiling of dye concentration at selected locations. The data from the 2017 study is currently under review and will be formulated into a report to help better understand the possible effects of the WWTF on the nearby growing waters. However, a preliminary review of the surface tracking data indicates a faster transport of insufficiently diluted dye than what was observed in the 2002 study. An in-situ fluorometer, moored in Royalls Cove, will illustrate when dye was present in the Bellamy River on the day of the injection. Dye presence likely would have occurred after the time of low tide in the early afternoon of 5/3/17. Surface tracking of dye shows no dye concentration during the morning ebbing tide, but dye was present in in the afternoon during the subsequent flood tide. Dilution in the conditionally approved area of the lower Bellamy River was 6,240:1 to over 226.284:1. The significance of these values, and their implications for classification, are discussed in Section IV., D of this report.

Dover Wastewater Treatment Facility

The Dover Municipal Wastewater Treatment Facility (NPDES No. NH0101311) is a secondary wastewater treatment facility located on the Upper Piscataqua River approximately 2.8 miles north (upstream) of Dover Point, Dover, New Hampshire. This facility has a design flow of 4.7 mgd, employs an activated sludge treatment process, and uses ultraviolet light for disinfection, with a backup chlorination disinfection system available. The outfall was originally a multiport diffuser, 260 feet long with 53 three-inch ports and a dilution factor of 78:1 under low tide conditions. Sedimentation and plugged/buried ports were corrected in a winter/spring 2004 outfall rehabilitation project which involved sediment dredging around the outfall, and construction on the outfall to include the installation of 26 duckbill pinch valves, along with the concurrent elimination/plugging of 27 ports. Dilution from the rehabilitated outfall is estimated to be greater than 100:1. Water depth at the outfall is in the range of 10-15 feet at low tide.

The most recent NPDES permit for Dover became effective on October 1, 2006, and expired on September 30, 2011. An application for permit renewal is under review. The most recent compliance inspection report by the NHDES Wastewater Engineering Bureau (December 2016) shows no significant deficiencies in regards to effluent bacteria concentrations, plant flow levels, or operation of the disinfection system. Review of the facility's Monthly Operations Reports shows the facility routinely meets its bacteria permit limits. Review of the facility's Monthly Operations Reports shows the facility routinely achieves suitable disinfection (Table 4).

The permit sets limits on a number of parameters, including BOD, TSS, fecal coliform, and several metals. In addition, Whole Effluent Toxicity (WET) testing is done annually using Mysid Shrimp and Inland Silversides. All tests are performed by an in-house, NELAC-certified laboratory. The plant is required to immediately notify NHDES/Watershed Management Bureau/Shellfish Program in the event of a discharge of raw or improperly treated sewage, as well as incidents of improperly disinfected effluent or invalid effluent test results. The plant is staffed by eight employees for nine hours per day during the week, and one to three hours on each weekend day. Four staff are on-call with an automated dialer/pager system.

Following initial grit removal at the River Street pump station, raw effluent flows into the treatment plant and through the following treatment steps:

> Primary clarification: two tanks (315,000 gallons each; typically only one in use)
> Aeration: four tanks (252,000 gallons each)
> Secondary clarification: two tanks (713,000 gallons each; usually only one in use)
> Disinfection: Disinfection is achieved with a Trojan 3000 Plus, which is comprised of two channels (each sized to handle a flow of eight mgd). Each channel has two banks of UV lights.

Under typical operating conditions, effective disinfection is achieved with one channel operating, using one bank of lights operating at 60-100% of full UV intensity. The clarity of effluent entering the disinfection system is continuously monitored. If light transmission drops below 65%, the automated system will adjust by increasing the intensity of light banks already on and/or turning on the other light bank in the active channel. If flows approach 8 mgd, the system will activate the second channel. The facility is designed to handle a peak flow of approximately 16 mgd. Depending on flow conditions, the plant operator estimates that the facility has the capacity to store 1,500,000 gallons of flow if needed. The facility receives approximately 165,000 gallons of industrial effluent, for which pretreatment is required.

The plant is staffed Monday-Friday, 7am-3:30pm. One staff member is typically at the plant on both weekend days, usually in the morning for approximately four hours, and the plant is checked every morning on the weekends. Staff is on-call 24 hrs/day. Issues at the WWTF (high flow, loss of power, etc.) are detected by the SCADA systems, which notifies the on-call staff.

Table 4: Dover WWTF Bacterial Monitoring Data (from Monthly Operations Reports)

Month	2015 Flow (MGD)		2015 Fecal Coliform (per 100mL)		2016 Flow (MGD)		2016 Fecal Coliform (per 100mL)		2017 Flow (MGD)		2017 Fecal Coliform (per 100mL)	
	Mon. Avg. (low)	Mon. Avg. (high)	Mon. Geo-mean	Num. of Samples >43 per 100mL	Mon. Avg. (low)	Mon. Avg. (high)	Mon. Geo-mean	Num. of Samples >43 per 100mL	Mon. Avg. (low)	Mon. Avg. (high)	Mon. Geo-mean	Num. of Samples >43 per 100mL
Jan	2.11	2.94	11.61	1 (220)	2.41	6.83	3.89	0	2.22	7.73	6.77	2 (50, 70)
Feb	1.84	2.30	5.33	0	2.37	4.75	3.86	1 (50)	2.00	5.53	3.52	0
Mar	1.93	5.47	6.03	1 (50)	2.77	4.55	3.61	0	2.15	4.72	5.3	2 (50,110)
Apr	2.67	7.17	4.00	0	2.40	4.69	2.94	0	2.97	7.84	13.7	5 (50,80, 300,59, 280)
May	1.71	2.77	6.89	1 (80)	2.04	3.01	3.93	1 (50)	2.97	5.62	9.38	5 (300, 1600,59, 130,50)
Jun	1.81	3.75	6.06	2 (50, 50)	1.97	3.03	3.00	0	2.27	4.14	4.95	1 (170)
Jul	1.76	2.86	2.97	0	1.82	3.05	3.96	0	2.05	2.80	3.04	0
Aug	1.82	2.72	6.41	2 (110, 130)	1.22	2.14	5.01	1 (50)	2.01	3.69	3.29	0
Sep	1.46	4.09	4.15	0	1.48	2.30	5.78	1 (80)	1.83	3.02	10.09	3 (220, 500, 70)
Oct	1.83	3.22	4.93	1 (50)	1.65	3.81	5.66	0	1.64	4.46	4.88	1 (500)
Nov	1.95	3.08	5.46	2 (50, 90)	1.71	3.25	4.7	1 (50)	1.92	2.63	2.00	0
Dec	2.12	3.59	8.52	3 (50,86, 500)	1.87	4.00	4.3	1 (50)	1.89	2.36	3.4	0

There was an increased incidence of high fecal coliform in finished effluent in 2017. Facility staff attribute this to a combination of rainfall-related high flow events and processes related to operating a new nitrogen removal system, which requires more solids on hand. The higher solids levels can interfere with the effectiveness of UV disinfection.

An ebbing tide dye/dilution study of the Dover wastewater treatment facility effluent's impact on the Lower Piscataqua River and Little Bay was conducted in September 2004 (Nash, Carr, and Bridges, 2005). The dye study determined that the Prohibited area should encompass an area in the Piscataqua River from the unnamed cove approximately 1,800 feet south of the powerline crossing to the red navigational buoy near Seal Rock. The study did not specifically examine effects of a Dover disinfection failure on the Bellamy River. The study did suggest that improperly disinfected effluent released during an ebbing tide would enter Little Bay on the next flood tide. That flooding tide could conceiveably carry insufficiently diluted effluent to the Bellamy River. As time and resources allow, the dye study on the Dover facility should be revisited, using updated procedures and protocols to identify the steady state 1,000:1 dilution area. Examination of the effects of the Dover facility on the Bellamy River should be included in such a future study.

Although the Dover WWTF outfall/effluent may have a limited effect on the Bellamy River, nearby sewage infrastructure can dramatically affect the Bellamy River. This is particularly true of the Varney Brook pump station, which transmits a significant amount of the total sewage load from the city to the WWTF. In April 2015, up to 360,000 gallons of sewage discharged from a broken force main that this station, causing a harvest closure that lasted three weeks.

Portsmouth Wastewater Treatment Facility

The Portsmouth Municipal Wastewater Treatment Facility is a 4.8 mgd primary treatment facility that discharges to the Lower Piscataqua River. Although the outfall is located several miles away from Great Bay, a 2012 hydrographic study (Ao et. al, 2017) illustrated that a disinfection failure occurring at low tide could result in insufficiently diluted effluent reaching the entrance to Little Bay in approximately 4.5 hours, and the Bellamy River shortly thereafter.

The most recent NPDES permit (NH0100234) for the Portsmouth WWTF became effective on August 1, 2007, and expired on July 31, 2012. A new permit has not yet been issued. The most recent compliance inspection report by the NHDES Wastewater Engineering Bureau (August 2017) shows no significant deficiencies in regards to effluent bacteria concentrations or operation of the disinfection system. Review of the facility's Monthly Operations Reports shows the facility routinely meets its bacteria permit limit (Table 6), but frequently exceeds its design flow. The City of Portmsouth is currently operating under a consent decree to upgrade the existing primary treatment facility to secondary treatement. Construction is slated to begin in 2017. Because the process of upgrading the Portsmouth WWTF to secondary treatment will involve a substantial amount of time and money, the City has been given interim permit limits by the EPA. The new permit will not become active until the construction of a new secondary treatment plant is completed. Although the WWTF routinely exceeds its design flow of 4.8 mgd, their interim permit limits only require that they report effluent flow volumes. Therefore, as long as they report flow levels, they are in full compliance with their permit (S. Larson, NHDES Wastewater Engineering Bureau, personal communication).

In December 2012, the U.S. Food and Drug Administration and NHDES conducted a hydrographic dye study of the Portsmouth municipal WWTF on Peirce Island (Ao et.al, 2017). The 2012 study includes a simulation of a hypothetical disinfection failure at the WWTF, using an effluent fecal coliform concentration assumption of 1,000,000 FC/100ml. This rather high assumption is based on repeated sampling of pre-disinfection effluent at the facility, and is much higher than an assumption that would be appropriate for a secondary treatment facility. The 2012 study indicates that for a disinfection failure occurring at slack low tide, insufficiently diluted effluent would reach Little Bay during the first flooding tide, in approximately 4.5 hours, and would travel throughout Little Bay during that first flood tide. Mobile dye tracking confirmed the presence of dye in the Bellamy River during the first flooding tide. Dye was detected in the Bellamy River on the mobile fluorometers approximately 7-8 hours after lack low tide at the Portsmouth outfall. It likely first arrived in the Bellamy River before that 7-8 hour time frame, but no stationary fluorometers were deployed at that location. Dye concentrations in the Bellamy River were similar to those in Lower Little Bay, with more consisentently high and stable dye signals in the Bellamy and Lower Little Bay, with more "patchy and diluted" signals in Upper Little Bay. Observed dilution was not enough to dilute effluent with 1,000,000 FC/100ml (a very high assumed fecal coliform concentration, deemed reasonable because Portsmouth is not currently a secondary treatment facility) down to 14 FC/100ml. For this reason, recreational harvest in Little Bay and in the Bellamy River is now only allowed on Saturdays, 9:00am-sunset. This management strategy affords the City of Portsmouth and NHDES sufficient time to detect WWTF operational problems that might occur on Friday evening/early Saturday morning. If such problems result in the discharge of high bacteria effluent, NHDES can implement and communicate a harvest closure to recreational harvesters in a timely manner.

When the new secondary facility is operational, the classification of this area can be revisited because the assumed FC concentration of effluent under a disinfection failure scenario will probably be much lower than 1,000,000 FC/100ml.

Table 5: Portsmouth WWTF Flow and Bacterial Monitoring Data (from Monthly Operations Reports)

Month	2015 Flow (MGD)		2015 Fecal Coliform (per 100mL)		2016 Flow (MGD)		2016 Fecal Coliform (per 100mL)		2017 Flow (MGD)		2017 Fecal Coliform (per 100mL)	
	Mon. Avg. (low)	Mon. Avg. (high)	Mon. Avg.	Num. of Samples >43 per 100mL	Mon. Avg. (low)	Mon. Avg. (high)	Mon. Avg.	Num. of Samples >43 per 100mL	Mon. Avg. (low)	Mon. Avg. (high)	Mon. Avg.	Num. of Samples >43 per 100mL
Jan	3.028	7.107	1.1	0	3.60	12.17	1.1	0	3.772	7.908	1.1	0
Feb	2.82	5.194	1.1	0	3.318	9.265	1.1	0	3.143	10.990	1.1	0
Mar	2.722	9.83	1.0	0	4.275	9.022	1.4	0	3.468	8.127	1.0	0
Apr	4.355	14.74	1.3	1 (43)	3.172	6.367	1.1	0	4.297	14.487	1.2	1 (60)
May	2.715	4.221	1.1	0	2.632	4.298	1.1	0	4.069	11.187	1.3	1 (115)
Jun	2.596	9.323	1.3	0	2.421	5.398	1.3	0	3.086	5.807	1.0	0
Jul	2.635	5.234	1.2	0	2.387	4.427	2	2 (194, 249)	2.465	4.104	1.1	0
Aug	2.535	4.353	1.4	0	2.308	3.767	1.3	1 (59)	2.331	5.305	1.2	1 (44)
Sep	2.319	9.032	1.2	0	2.113	4.223	1.5	2 (86, 78)	2.268	5.216	1.2	0
Oct	2.466	6.309	1.2	0	2.213	8.122	1.3	1 (135)	2.190	7.534	2.0	1 (75)
Nov	2.524	6.277	1.1	0	2.634	5.588	1.0	0	2.562	3.992	1.1	0
Dec	2.787	7.248	1.0	0	2.819	8.861	1.3	1 (80)	2.580	3.959	1.1	0

Another issue with respect to Portsmouth's influence on Little Bay and Bellamy River water quality is the chronic loading of viruses to the estuary. The December 2012 dye study of the Portsmouth WWTF included multiple measurements of male-specific coliphage in the effluent. Male-specific coliphage (MSC) is a viral indicator, used as a means to assess the possible presence of viral pathogens in municipal wastewater streams. The December 2012 study found very high levels of MSC in Portsmouth effluent. This prompted a more robust, multi-year characterization of MSC concentration and variability in Portmouth effluent to examine MSC levels under various operational conditions. The multi-year study also included periodic measurements of MSC levels in Little Bay seawater and shellfish tissue, in order to gauge possible public health risks to consuming shellfish that may be affected by Portsmouth effluent. In 2017 and 2018, the seawater and shellfish tissue sampling was expanded to include a station in the Bellamy River.

The multi-year study showed that Portsmouth effluent typically has MSC concentrations well over 10,000 plaque-forming units per 100ml, and sometimes approached 1,000,000 pfu/100ml (Figure 4). This is a very high value compared to MSC levels in other coastal WWTFs, all of which employ more advanced treatment technologies. MSC values at these secondary treatment facilities typically range from <10 – 250 pfu/100ml, and rarely exceed a value of 1,000 pfu/100ml. Current NSSP guidance for well-run secondary treatment facilities calls for a Prohibited zone around the outfall large enough to provide a minimum of 1,000:1 dilution. Applying that dilution value to typical secondary treatment effluent MSC concentrations, the NSSP guidance would call for MSC concentration in the seawater at the Prohibited area boundary to be in the range of 250/1000 = 0.25 MSC/100ml. In the case of Portsmouth, the December 2012 dye study established a steady-state dilution value of approximately 4,600:1 at entrance to Little Bay at Dover Point. Achieving a 0.25 MSC/100ml in Dover Point seawater would mean Portsmouth effluent should not exceed 1,150 MSC/100ml. The multi-year study documented that Portsmouth effluent routinely exceeds this amount, often by a factor of 100. Indeed, seawater MSC concentrations in Little Bay and in the Bellamy River, particularly in the cold weather months when MSC persists in the environment, are typically in the range of 10-40 pfu/100ml (Table 6). This is particularly concerning because the persistence of MSC in the seawater first occurs in the fall, when cooling water temperatures prompt more vigorous feeding activity in shellfish, leading to a more pronounced bio-accumulation of virus particles in their gut. This tissue accumulation was consistently documented in Little Bay shellfish during the fall/winters of 2013-2017, and has been confirmed in Bellamy River samples collected in 2017 and 2018.

The combination of high MSC concentration in Portsmouth effluent, insufficient dilution at Dover Point, and unacceptably high MSC concentration in seawater entering Little Bay and the Bellamy River during the fall and winter months, prompted NHDES to implement a seasonal closure of Lower Little Bay and the Bellamy River in October 2018. The seasonal closure will be lifted on April 1, 2019. A similar closure will be implemented October 2019-March 2020. The Portsmouth WWTF upgrade to secondary treatment, which is expected to dramatically reduce effluent MSC levels, is scheduled for completion in April 2020. The continuation of seasonal cold-weather closures in Lower Little Bay and the Bellamy River will be revisited once MSC levels in effluent from the upgraded facility are confirmed.

Figure 4: Comparison of MSC Wastewater Concentration in the Portsmouth and Durham Wastewater Treatment Facilities

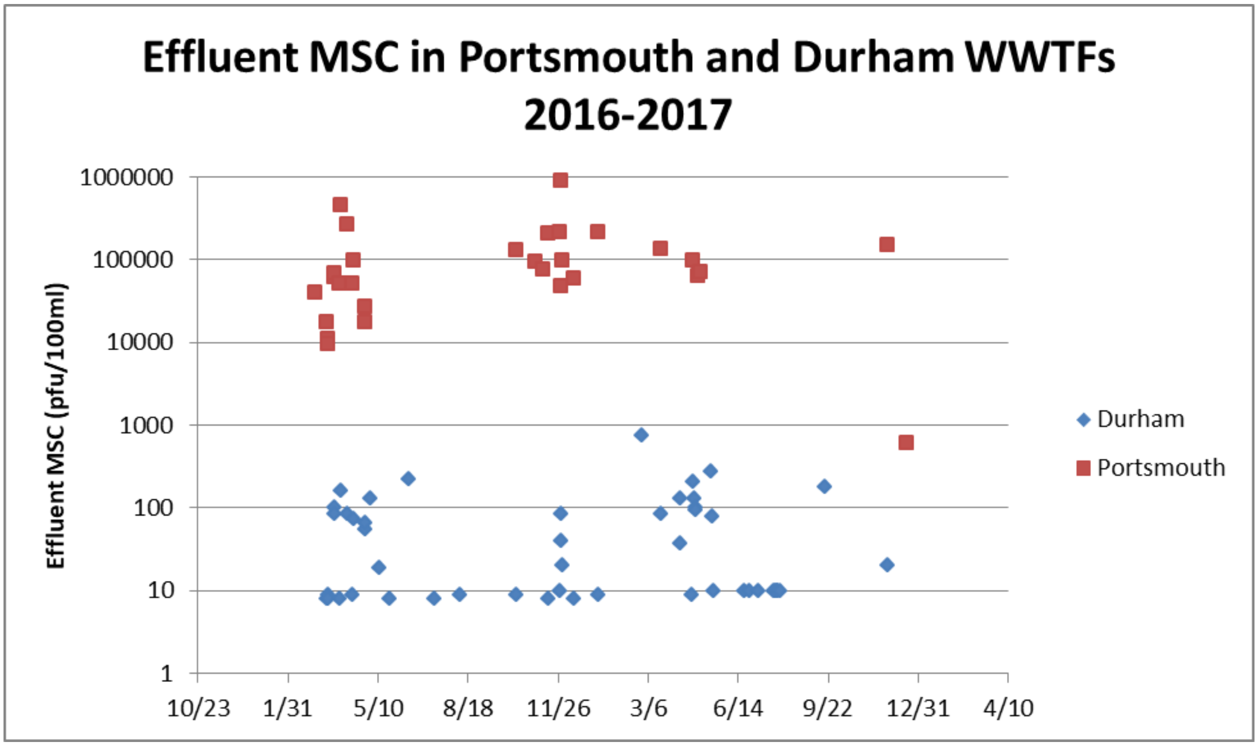


Table 6: Fall/Winter MSC Concentration in Little Bay and Bellamy River Seawater

Year	Date	Little Bay Seawater MSC Concentration (pfu/100ml)	Bellamy River Seawater MSC Concentration (pfu/100ml)
2016	10/11/16	5	---
	10/26/16	5	---
	11/2/16	30	---
	11/9/16	5	---
	11/28/16	25	---
	12/1/16	40	---
	12/13/16	10	---
2017	10/2/17	4.9	---
	10/11/17	10	---
	11/8/17	5	30
	11/27/17	10	15
	12/19/17	2.4	---
2018	2/14/18	15	---
	3/20/18	4.9	---

Wastewater Treatment Facility Infrastructure

In case of a discharge of improperly treated or raw sewage from a WWTF or from sewage collection infrastruction such as pump stations or sewer lines, WWTF staff is required to immediately contact the NHDES Shellfish Program.

In 2017, the Town of Durham reported no sewage overflow events, although they did have one instance of 56,000 gallons of undisinfected effluent discharged to the Oyster River. A May 2017 thunderstorm disrupted chlorine pumps. The City of Dover reported three instances of sewage overflows. Two occurred in the Bellamy River watershed, and the other occurred in the Cocheco River watershed. None were large enough to have affected Bellamy River water quality. The City of Portsmouth reported six instances of sewage discharge. Most were minor in nature, although a February incident involving discharge of 58,000 gallons of raw sewage was significant. A contractor hit a 24-inch sewer line on Peirce Island, near the WWTF, with an excavator. Discharge went into the nearby Piscataqua River (Prohibited). Evaluation of the incident indicated no impact to the Bellamy River.

In 2016, the City of Dover reported two incidents of sewage overflow. One was a 1,000-gallon discharge in the upper reaches of the Bellamy River watershed, far from the Conditionally Approved waters of the Bellamy River. All discharge seeped to the ground with no surface water discharge. The other sewage release in Dover involving a blocked sewer line occurred near the Cocheco River and would not have affected Bellamy River water quality. The Town of Durham reported no infrastructure overflows in 2016. The City of Portsmouth reported several minor discharges and two larger discharges in 2016. The largest involved 52,000 gallons of sewage discharge to the Piscataqua River (classified as Prohibited) from a failed pump station on Deer Street. Another 5,000-gallon discharge of combined sewage overflow to South Mill Pond (classified as Prohibited) occurred during a heavy rainfall event. Both occurred in June 2016, a time when the Bellamy River is closed for harvest.

Two incidents of sewage overflow reported by Dover in 2015, including a significant release of up to 360,000 gallons of sewage from the Varney Brook pump station on the Bellamy River. This April 2015 incident from a broken pipe did cause the closure of the Bellamy River and Little Bay until the issue was cleared. Another smaller incident of 200-300 gallons of overflow from a sewer line on Cornerstone Drive occurred in June 2015. This area is well away from the Bellamy River growing area and would not have affected water quality. The Town of Durham reported two 500-gallon infrastructure overflows in 2015, both occurring in November. The first involved 500 gallons released due to a Baghdad Road sewer line blockage. No discharge reached surface waters. The second involved 500 gallons of sludge from a blown end cap at the WWTF, some of which migrated offsite but did not reach surface waters. The City of Portsmouth reported no infrastructure overflows in 2015.

Other Domestic Waste Discharges

No domestic waste discharges have been confirmed as sources of high bacteria seen at some pollution source stations. Several Bellamy sites have been referred to the NHDES Watershed Assistance Section over the years, including BLMPS011, BLMPS040 (and BLMPS042), BLMPS061, BLMPS067, BLMPS080, BLMPS005, BLMPS016, BLMPS039 (and BLMPS041), BLMPS043, BLMPS059, BLMPS037, and BLMPS062. Evaluations on these sites continue. No other domestic waste discharges, such as failing septic systems, straight-pipe discharges of raw sewage, etc., were identified in the survey area.

Stormwater Discharges

Twelve stormwater culverts and outfalls of varying diameters were identified during the course of the previous and current shoreline surveys. Three of these sources were visited in wet weather during the present study and were found to have no flow. Seven of these sources have shown high FC and/or flow in wet weather that additional evaluation is warranted. These include BLMPS005, BLMPS013, BLMPS015, BLMPS016, BLMPS037, BLMPS069, and BLMPS080.

Road Culverts

Eleven road culverts of varying diameters were identified during the course of the previous and current shoreline surveys. All but one have shown flow in wet weather (BLMPS082, a newly created site, only has one observation taken during dry weather. No wet weather data has been generated for this source yet). Three culverts have shown FC and/or flow in dry and/or wet weather high enough that additional evaluation is warranted. These include BLMPS021, BLMPS039, and BLMPS062.

Tidal Creeks, Rivers and Intermittent Streams

Thirty tidal creeks, streams and wetland discharges were identified during the course of the shoreline surveys. Most of these are located in Prohibited areas. Of the 24 intermittent streams, 15 have shown FC and/or flow in dry and/or wet weather high enough that additional evaluation is warranted. These include BLMPS020, BLMPS024, BLMPS032, BLMPS040, BLMPS041, BLMPS042, BLMPS043, BLMPS045, BLMPS047, BLMPS051, BLMPS052, BLMPS057, BLMPS059, BLMPS68 and BLMPS076. Two tidal creeks (BLMPS055 and BLPPS064 have shown high FC in wet weather, and Varney Brook (BLMPS061) has a long history of high FC in dry weather, and very high FC in wet weather.

Marinas and Mooring Fields

During the summer months, the growing area experiences increased recreational boating activity. Power boats and sailing vessels of various sizes begin to occupy slips and moorings in mid-May, but recreational activity does not typically get underway in earnest until early June. By the end of September, boats are beginning to leave the water for the winter, which is a process that is typically complete by mid/late October. For the period of June through September each year, the discharge of sewage from these boats is considered to be a potential direct pollution source.

In the 2005 sanitary survey, three mooring fields in and near the Bellamy River were evaluated (Bellamy River, Scammel West and Cedar Point East. Figure 5 illustrates a delineation of these mooring fields used in recent annual and triennial reports. Since the 2005 survey, a new mooring field in Royalls Cove has developed, and the Cedar Point East mooring field has expanded (also shown in Figure 5). There are no marinas in the Bellamy River. The NHDES Shellfish Program continues to monitor these mooring fields with periodic seawater sampling for fecal coliform bacteria, as well as monthly weekday inspections/boat counts during the boating season. Late August/early September weekday surveys have included not only a count of boats present, but a count of unoccupied mooring balls. Multiple years of these total mooring ball counts serve as the basis for determining if the mooring field is being expanded, and if the expansion warrants a sewage risk evaluation.

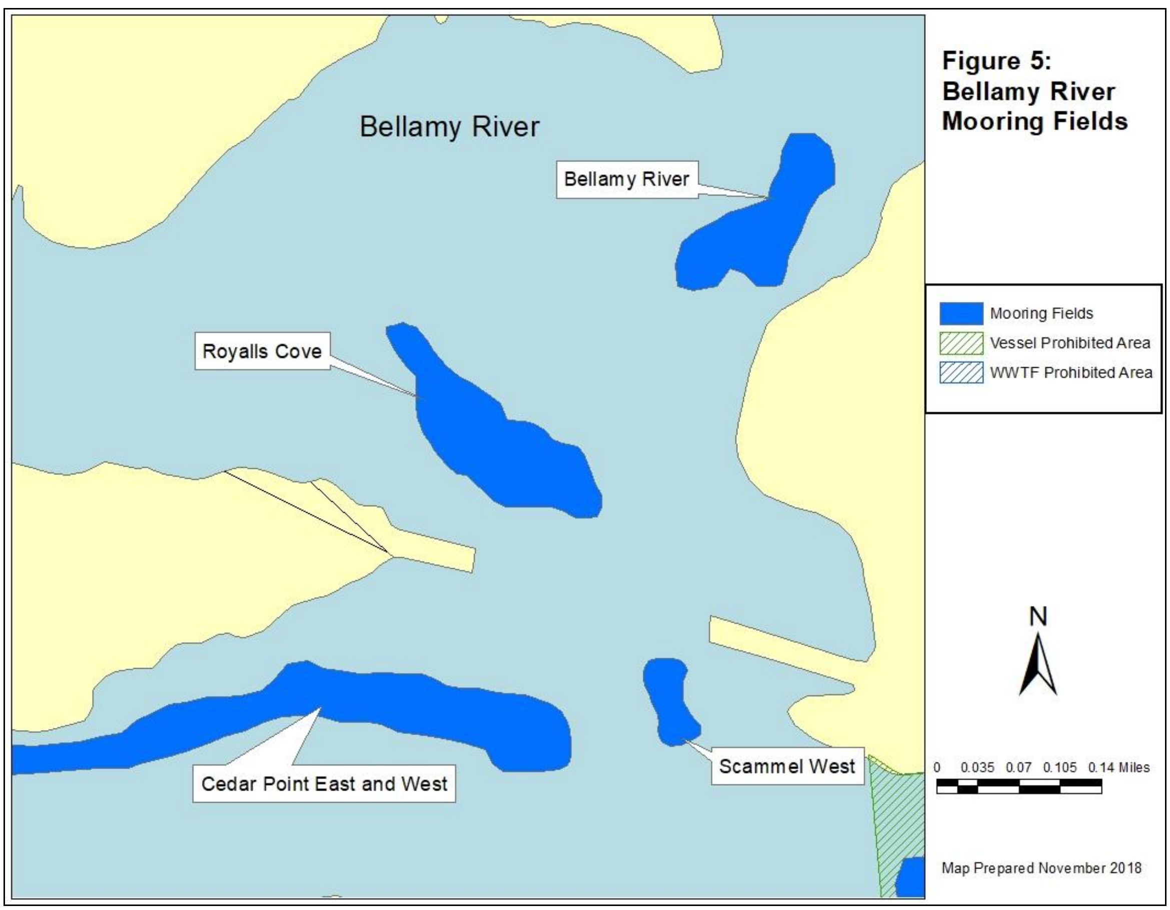


Figure 5: Bellamy River Mooring Fields

For the present sanitary survey, NHDES Shellfish inspected each mooring field shown in Figure 5, and re-assessed each area. The reassessment first involved GPS identification of the location of all mooring balls, then plotting the results on GIS. A 50-foot circle around each mooring ball was drawn to represent the variation in the mooring ball location over the course of an ebbing or flooding tide. To delineate an updated representation of a mooring field, mooring balls that were within 200-250 feet of each other were deemed to be part of a common mooring field. A polygon was then drawn around the 50-foot circles of all mooring balls in the group. Figure 6 illustrates how this was done for the Bellamy River mooring fields. The result was a new representation of mooring fields in the Bellamy River (Figure 7, Table 7).

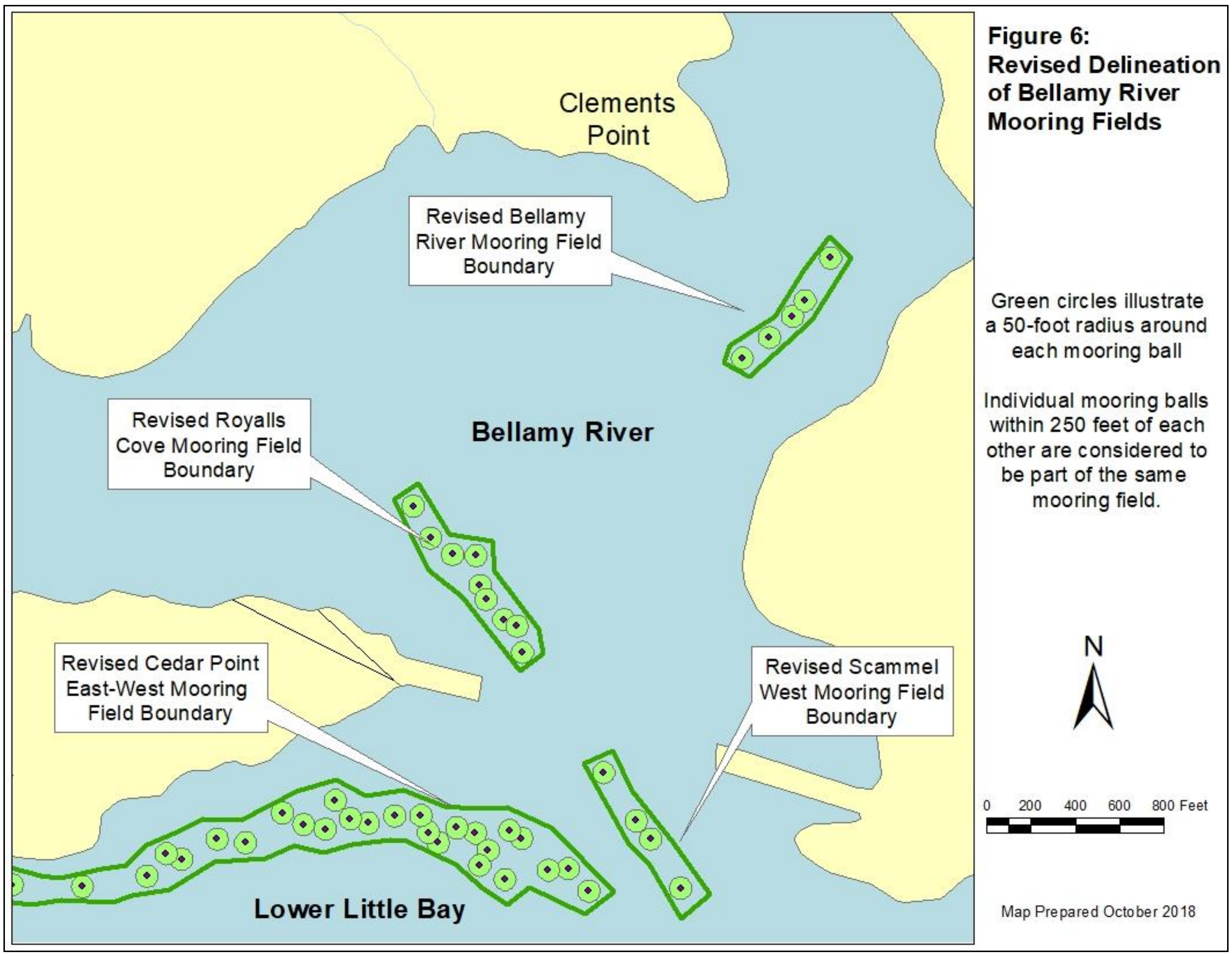
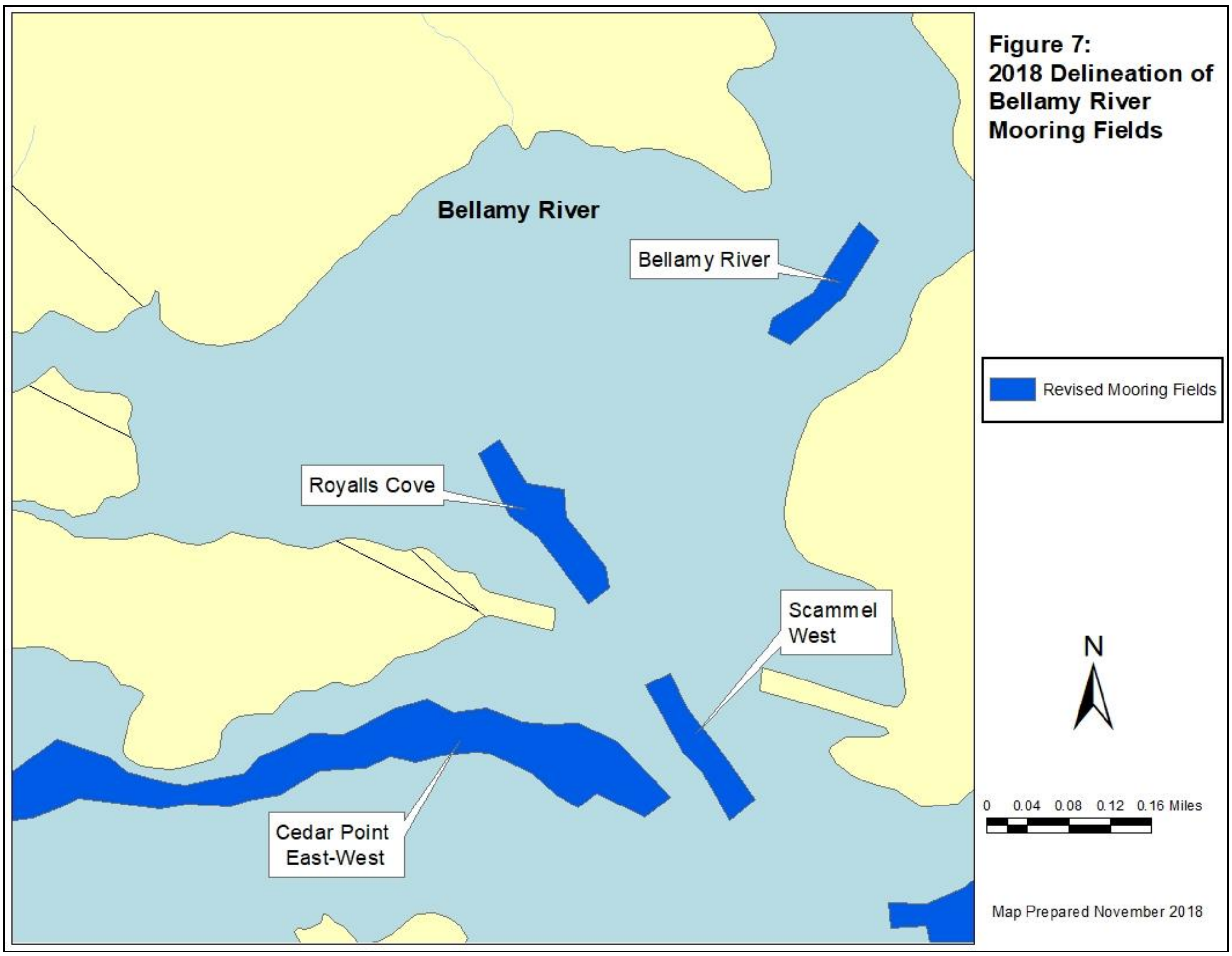


Figure 6: Revised Delineation of Bellamy River Mooring Fields

Table 7: Revised List of Mooring Fields in/near the Bellamy River

	Average Low Tide Water Depth (ft)	Maximum # Boats Observed, 2013-2018	Maximum # Boats with Sanitary Facilities Observed, 2013-2018	Hypothetical Mooring Field Fecal Coliform Load (per day)	Area of Mooring Field (sq ft)	Hypothetical FC per 100 mL in Mooring Field
Cedar Point East-West	20	16	9	9.00E+09	804,499	2.0
Royalls Cove	10	8	2	2.00E+09	174,766	4.2
Bellamy River	2	7	2	2.00E+09	103,507	42.6
Scammel West	9	1	1	1.00E+09	118,631	3.4



To evaluate the potential sewage risk in these areas, each marina and mooring field was evaluated according to the following procedure, using monthly boat count survey data from 2014, 2015, 2016, and 2017:

1. Over the four years, identify the maximum number of boats present. Areas with more than 10 vessels present were deemed to be a sewage risk and were further evaluated in Step 2.
2. Over the four years, identify the maximum number of boats with an onboard sanitary facility present (recreational vessels with enclosed cabins are assumed to have a sanitary facility). If there were more than 10 vessels with sanitary facilities, the sewage dilution calculation proceeded using steps 3-6 below. If there were 10 or less vessels with facilities, the mooring field was deemed to be a minimal sewage risk and no further evaluation was conducted.
3. For mooring fields with 11 or more boats with sanitary facilities, estimate the number of boats that may be discharging at any given time. A conservative assumption of 50%of the vessels with facilities has historically been used by the NHDES Shellfish Program. However, after reviewing over 10 years of survey and occupancy data, the assumed percentage of discharging boats is being modified to 25 percent for mooring fields, and 37%for marinas, to more closely reflect actual conditions. Marina occupancy on two Labor Day weekends surveyed were 20%and 37%, so the more conservative 37%figure is used. Mooring field occupancies on the weekend have typically been under 10 %, so a conservative 25%figure is used.
4. Assume each boat has two people on board, and each person generates two billion fecal coliform per day, per standard NSSP assumptions.
5. Assume sewage discharge is completely mixed through the water column.
6. Estimate the fecal coliform load from each mooring field:

$$\text{FC load} = (\text{\# boats with facilities}) * (0.25) * (2 \times 10^9 \text{ FC/person}) * (2 \text{ persons/boat})$$

The next step involves determining the volume of water available for dilution within the mooring field, calculated by using the GIS to determine the area of the mooring field, and multiplying the area by low tide water depth. To determine low tide water depth, the mooring points in the mooring field were plotted on a NOAA navigation chart (shows depth at mean lower low water). For small mooring fields with few boats, the depths of all mooring points were determined, and an average was calculated. For large mooring fields with many boats, one-third of the total mooring points, representative of the range of depths in the mooring field, were selected. The average depth of the selected mooring points was calculated, then divided into the FC load to yield a value of FC per milliliter. That value was multiplied by 100 to give a value of FC per 100ml. If that value was less than 14, then the conclusion is that there is sufficient water within the mooring field to dilute the sewage risk. The resulting classification would then include a Prohibited zone encompassing the mooring field.

None of the Bellamy River mooring fields ever had more than 10 vessels with sanitary facilities present. Thus, none currently require delineation of a Prohibited area around them, and two lines of evidence suggest they are not growing in size:

- Monthly NHDES Shellfish Program surveys of these areas do not indicate expansion of the marina areas over the last several years.
- Additionally, lists of mooring permits published online by the NH Division of Ports and Harbors for 2013, 2015, 2017, and 2018 show total number of Bellamy mooring permits to be 15, 18, 13, and 15, respectively. No significant change is indicated by these numbers.

Monthly surveys for the other mooring fields should continue to ensure that any mooring fields that grow in size are identified, and evaluated for sewage contamination risk as appropriate.

Agricultural Sources

No significant sources of agricultural pollution were identified in the survey area, though there were four agricultural properties identified during the sanitary survey. Two of these properties are hay fields owned by the State of New Hampshire and leased to local residents. No pesticides or fertilizers are currently spread on either of these properties. The third property is a Spur Road residence, just north of ambient monitoring site GB33, which houses two horses. This property employs a number of best management practices to control bacterial and sediment pollution, including a waste storage facility, roof runoff management (gutters to reduce erosion), and fencing. Inspection of the shoreline revealed no conveyances of runoff from the waste storage facility, nor any other potential pollution sources that would warrant creating a sampling station. Another property is a combination residence and horse stable/boarding property off of Piscataqua Road. It has a stable and paddock area for eight horses (five are boarders). Manure is stored onsite and periodically hauled away in winter. The paddock area is approximately 400 feet from surface waters (intermittent stream that leads to the Bellamy River).

Wildlife Areas

The salt marshes and mudflats of the Bellamy River provide valuable habitat to a variety of wildlife. The NH Audubon Society owns and operates a large parcel on the western side of the river as a 30-acre wildlife sanctuary, adjacent to a 270-acre NH Fish and Game Wildlife Management Area. Another 68 acres of undeveloped/wildlife land (3 parcels owned by NH Fish and Game and the City of Dover, NH) are located directly north of the 270-acre parcel. Commonly observed bird species include a variety of gulls, sea and inland ducks, cormorants, geese, great blue herons, egrets, swans, and others. Mammals living within the growing area include dogs, cats, whitetail deer, muskrat, squirrels, chipmunks, rabbits, moles, mice, bats, shrews, weasels, skunks, raccoons and others. New Hampshire Fish and Game surveys indicate that migratory waterfowl numbers begin to increase in the early autumn months, and typically peak in late fall or early winter. Although large numbers of birds can, in theory, pose a threat to the water quality of the growing area, such occurrences are very difficult to conclusively document. No such significant water quality impacts have been documented for the area to date.

Industrial Wastes

Commercial/industrial activities on the shores of the survey area are minimal. Portsmouth Christian Acadamy is a private school on the shores of the Bellamy River. The other two commercial industrial properties, located on Mill Stree near the head of tide, house a wood products business and a municipal sewage pump station. None of these properties would have activities that would generate or discharge industrial wastes.

Dredging

No large-scale channel maintenance dredging activity has recently occurred in the survey area. The presence of the Route 4/Scammell Bridge at the mouth of the river precludes the passage of large vessels that might require channel maintenance dredging, as it is a fixed-span bridge.

D. Evaluation of Pollution Sources

Durham Wastewater Treatment Facility

A hydrographic dye study was initially conducted on the Durham WWTF in 2002 (Nash and Bridges, 2003). That study involved a relatively short (3-hour) injection time of dye into the effluent stream, and surface tracking of dye on the ebbing tide using fluorometers towed behind boats. That study focused on tracking dye levels in the Oyster River and in Little Bay. Data for the Bellamy River were not specifically developed. Subsequent Bellamy River Conditional Area Management Plans conservatively assumed the Durham WWTF could impact Bellamy River water quality, until more data could be developed.

An updated hydrographic dye study for the Durham WWTF was conducted in May 2017. This study was designed to incorporate different injection and data analysis protocols more recently adopted in the NSSP, namely, a 12.4-hour injection of dye, in-situ measurements of dye concentration at fixed stations to allow for estimation of steady-state dilution, mobile fluorometer tracking, and vertical profiling of dye concentration at selected locations. The injection began at 1:53am on 5/3/17 (slack low tide), continued through the flooding tide (slack high at the WWTF was around 7:20am on 5/3/17), and then continued through the ebbing tide. The injection was terminated at 2:17pm on 5/3/18.

For the 2017 study, fluorometers at fixed locations were placed in various locations in the Oyster River, Little Bay, Bellamy River, and Great Bay. Station locations, as well as the estimated steady state dilution for each station, are illustrated in Figure 8. Note that Station 9 was located at Fox Point and the instrument never turned on, so no data are available at that site. Data for Station 8 in the Bellamy River, and Station 6 in Great Bay at Nannie Island, are still being developed. However, the station data clearly show that the minimum 1000:1 dilution line is in Little Bay, so the Bellamy River does not need to be included within the Prohibited zone around the Durham outfall.

Surface dye tracking with mobile fluorometers in the 2017 study included tracking in the Bellamy River. During the morning ebbing tide, surface tracking showed no dye in the Bellamy River on 5/3/18, the day of the injection. During the afternoon flood tide, some of the dye that had been previously transported to Lower Little Bay was pushed into the Bellamy River, although the concentrations were relatively low. Dilution data such as these are useful in determining if a lapse in disinfection at Durham could negatively impact Bellamy River water quality in the first 6-12 hours (full ebbing tide, followed by the next flooding tide) of a lapse in disinfection.

For this analysis, an assumption of fecal coliform concentration in treated but undisinfected Durham effluent needs to be made. Fecal coliform concentration of Durham's undisinfected effluent from NHDES Shellfish Program sampling data is presented in Table 8. Data from 2000 and 2001 show much higher fecal coliform values than later data. This is likely due to multiple upgrades to the facility over the last few years. Geometric means and estimated 90th percentiles are calculated on the Table 8 data for two time periods: the first time period is all the data (2000-2017), and the second time period is 2011-2017. One conservative approach to estimating predisinfection effluent fecal coliform is to adopt a "high-end" estimate using the estimated 90th percentile of the dataset. Using all of the data in Table 8, this would be a fecal coliform value of 504,000/100ml. For the more recent data, the value would be 37,608 per 100ml. To dilute these numbers to a seawater fecal coliform concentration of 14/100ml, dilution values of 36,000:1 and 2,686:1 would be needed. The dye tracking data from the flooding tide sampling on 5/3/18 are converted to dilution values and plotted on Figure 9.

Table 8: Fecal Coliform Concentration in Undisinfected Durham WWTF Effluent

Sample Date	FC/100ml
7/31/2000	50,000
8/17/2000	80,000
9/26/2000	30,000
11/20/2000	50,000
12/6/2000	300,000
2/22/2001	14,000
4/10/2001	140,000
6/18/2001	490,000
6/18/2001	490,000
8/13/2001	130,000
10/16/2001	220,000
12/3/2001	7,900
5/28/2008	<20
7/30/2008	<20
8/27/2008	<20
10/14/2008	24,000
6/23/2011	1,700
8/1/2012	40,000
4/16/2014	790
3/14/2016	330
6/8/2016	4,900
2/22/2017	13,000
2/27/2017	24,000
3/20/2017	3,300
4/6/2017	14,000
Geomean, all data	10,630
Est. 90th, all data	504,305
Dilution Value to 14 FC/100ml	36,022:1

Sample Date	FC/100ml
Geomean, 2011-2017	4,759
Est. 90th, 2011-2017	37,608
Dilution Value to 14 FC/100ml	2,686:1

The tracking data suggest that the Durham WWTF is not likely to adversely affect water quality in the Bellamy River, even under a scenario of an extended (12.4 hour) disinfection failure. Stations in the Conditionally Approved area all show a dilution greater than 2,686:1. However, until all of the Durham WWTF dye study data are analyzed, performance standards for the Durham WWTF will remain in the Bellamy River Conditional Area Management Plan. Once the study is finished, this decision should be revisited, and the Durham WWTF should be removed from the management plan if appropriate.

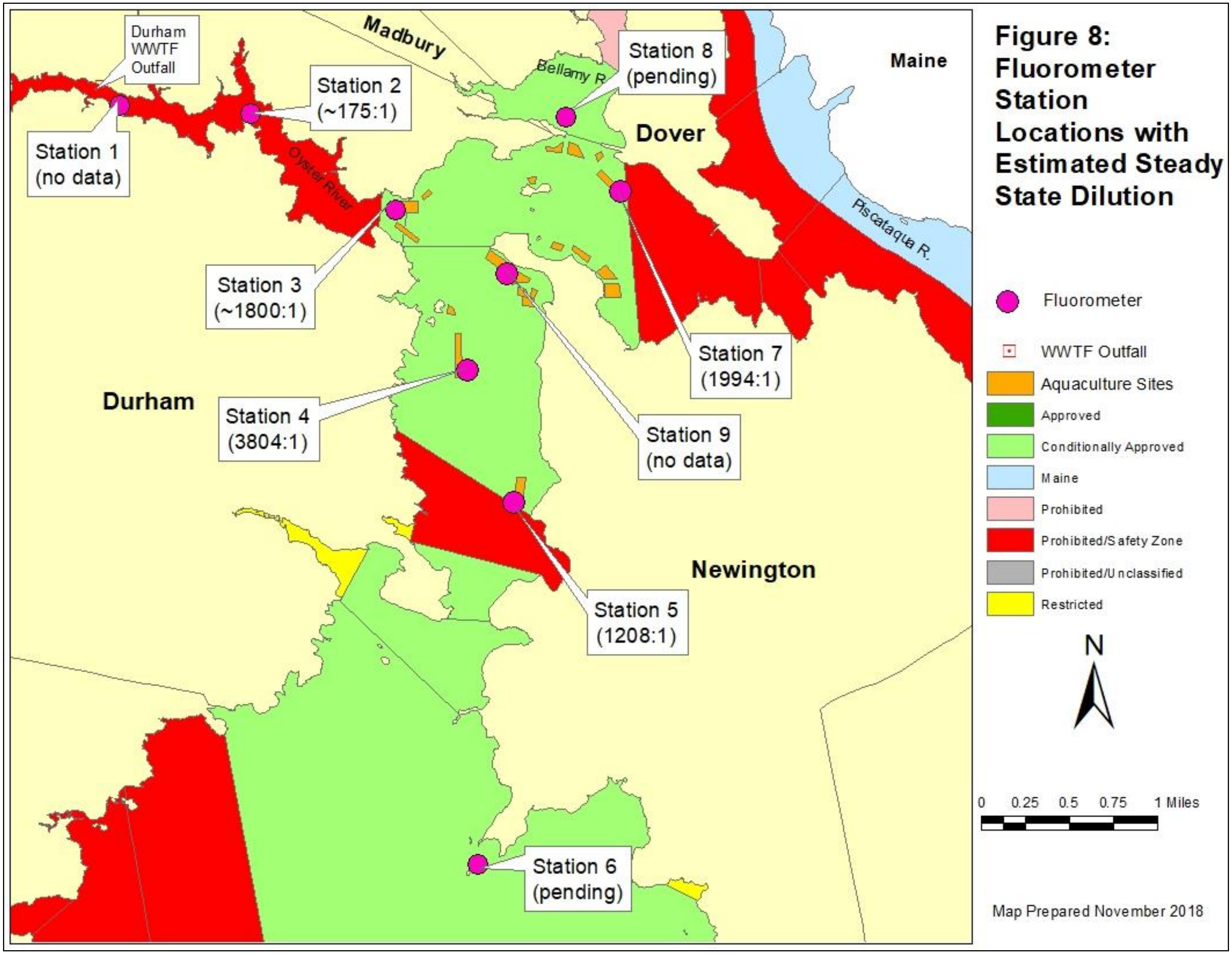
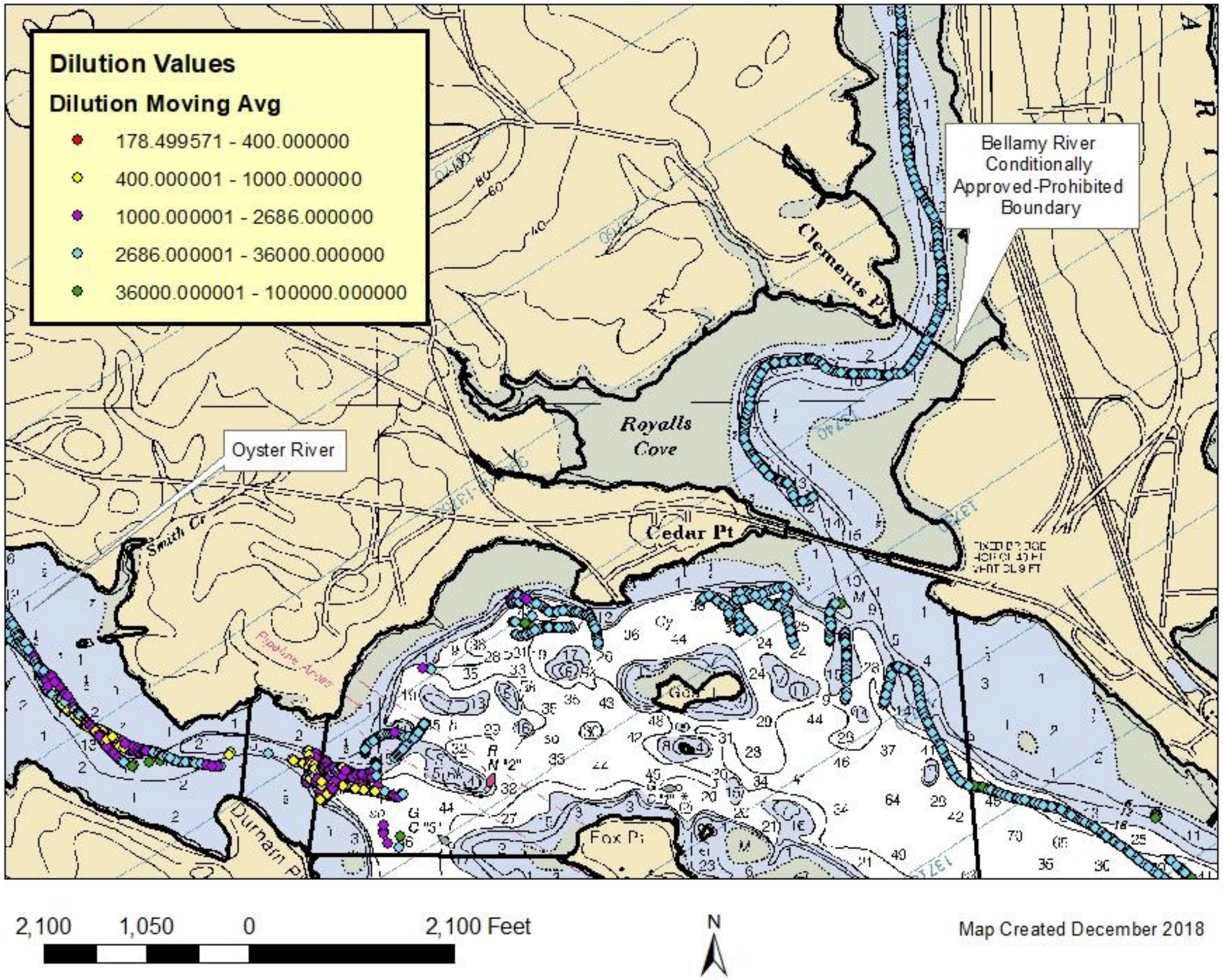


Figure 8:
Fluorometer
Station
Locations with
Estimated Steady
State Dilution
Durham WWTF Outfall
Madbury
Bellamy R.
Station 8
(pending)
Maine
Station 2
(~175:1)
Station 1
(no data)
Dover
Oyster River
Piscataqua R.
Station 3
(~1800:1)
Station 7
(1994:1)
Durham
Station 4
(3804:1)
Station 9
(no data)
Station 5
(1208:1)
Newington
Station 6
(pending)
Fluorometer
WWTF Outfall
Aquaculture Sites
Approved
Conditionally Approved
Maine
Prohibited
Prohibited/Safety Zone
Prohibited/Unclassified
Restricted
N
0 0.25 0.5 0.75 1 Miles
Map Prepared November 2018

Figure 9: Flooding Tide Surface Water Dilutions During the May 3, 2017 Durham Wastewater Dye Study



Dover Wastewater Treatment Facility

A flooding tide dye/dilution study of the Dover wastewater treatment facility effluent's impact on the Upper Piscataqua River, Cocheco River and Salmon Falls River was conducted in June 2004, while an ebb tide study was performed in September 2004 (Nash, Carr, and Bridges, 2005). These studies simulated a hypothetical disinfection system failure at the plant, and recommended boundaries for a Prohibited Area, using assumptions of WWTF flow of 4.02 MGD and an effluent bacteria concentration of 281,000 FC/100ml.

The ebbing tide study showed that for a worst-case discharge beginning near the time of high tide, insufficiently diluted effluent would be located near Dover Point and farther downstream in sections of the Piscataqua River, at low tide. Approximately halfway into the next flood tide, insufficiently diluted dye was observed throughout Lower Little Bay, thus indicating the plant's potential to adversely impact the water quality of Little Bay following a prolonged lapse in disinfection. The resources available for the study did not allow an evaluation of dilution and transport into the Bellamy River, so it is unknown how much of the river would have been adversely affected, but plume position data suggest there could be some adverse impact. Therefore, the highest classification of waters within the Bellamy River would be Conditionally Approved, with one of the conditions being that the area should be placed in the closed status when the Dover WWTF experiences a partial or complete failure of its disinfection (UV) system. When and if the Dover WWTF is evaluated with a new dye study, its impact on the Bellamy River should be part of the study to determine if Dover actually should be included in the Bellamy River Conditional Area Management Plan.

Portsmouth Wastewater Treatment Facility

As noted previously, the Portsmouth WWTF is currently a primary treatment facility that will be upgraded to secondary treatment by 2020. When the new secondary facility is operational, the effect of a disinfection failure on the Bellamy River growing area can be revisited because the assumed fecal coliform concentration of effluent under a disinfection failure scenario will probably be much lower than 1,000,000 FC/100ml. The current primary treatment facility does have the potential to impact Little Bay water quality under a disinfection failure scenario.

The current primary treatment facility has very high levels of male specific coliphage in finished effluent. A multi-year study showed levels were typically well over 10,000 plaque-forming units per 100ml, and sometimes approached 1,000,000 pfu/100ml (Figure 4). This is a very high value compared to MSC levels in other coastal WWTFs, all of which employ more advanced treatment technologies. MSC values at these secondary treatment facilities typically range from <10 – 250 pfu/100ml, and rarely exceed a value of 1,000 pfu/100ml. The 2012 dye study of this facility established a steady state dilution value at Dover Point (entrance to Little Bay) of approximately 4,600:1, which is not sufficient to adequately dilute the virus levels, especially in the colder months of the year when MSC particles persist in the environment. This is confirmed by cold-weather sampling of seawater in Little Bay and in the Bellamy River (Table 6)

The combination of high MSC concentration in Portsmouth effluent, insufficient dilution at Dover Point, and unacceptably high MSC concentration in seawater entering Little Bay during the fall and winter months, prompted NHDES to implement a seasonal closure of Lower Little Bay and the Bellamy River in

October 2018. The seasonal closure will be lifted on April 1, 2019. A similar closure will be implemented October 2019-March 2020. The Portsmouth WWTF upgrade to secondary treatment, which is expected to dramatically reduce effluent MSC levels, is scheduled for completion in April 2020. The continuation of seasonal cold-weather closures in Lower Little Bay and the Bellamy River will be revisited once MSC levels in effluent from the upgraded facility are confirmed.

Marinas and Mooring Fields

Mooring fields in and near the Bellamy River are listed in Table 8. There are no marinas in the Bellamy River. Evaluation of mooring fields' boat sewage risk and their potential to impact FC levels in the growing waters is necessary for facilities with more than ten boats. For the period of 2013-2018, none of the Bellamy River mooring fields ever had more than 10 boats present. The Cedar Point East-West is located in Little Bay, just outside the mouth of the Bellamy River. During the 2013-2018 time period, this mooring field had 16 boats present in one of those years, but only nine of them were large enough to have onboard sanitary facilities. Thus, they are deemed to be a minimal risk for sewage contamination. Hypothetical sewage dilution calculations were run for all mooring fields anyway (Table 7), and all showed hypothetical fecal coliform concentrations of less than 43/100ml. Dilution calculations used assumptions of two people on board each boat with sanitary facilities, 25% of said boats discharging sewage, and complete mixing of discharge sewage within the mooring field using the volume of water present at low tide.

Shoreline Pollution Sources

Since the 2005 sanitary survey, some pollution sources have been given extra sampling attention to better understand their potential to impact the growing waters. This is particulary true for BLMPS005, BLMPS011, BLMPS016, BLMPS040 and 042, BLMPS039 and 041, BLMPS043, BLMPS037, BLMPS059, BLMPS061, BLMPS062, BLMPS064, BLMPS067 and BLMPS080. For the 2017 survey, these and all pollution sources in the growing area were reevaluated using sampling data from the present study, and historical data from the last 10 years. Sources that had shown elevated fecal coliform were selected for additional evaluation regarding potential impact to the growing area (Figure 10). Using the highest observed fecal coliform level and the highest observed flow from that period (not necessarily data from the same sample date), a hypothetical radius for a semicircular area necessary to achieve dilution to 14/100ml was calculated, assuming the discharge is mixed through an area with a depth of four feet (Table 9). Note: The dilution radii in Table 9 are not intended to predict the spatial extent of these sources' water quality impact. Rather, they are intended to identify which sources have flow and fecal coliform characteristics that might cause significant water quality impacts. Those impacts are then subsequently explored through repetitive water quality sampling at and around the sources.

The calculations summarized in Table 9 indicate that BLPS003 (the Bellamy River near the head of tide), BLMPS061 (Varney Brook), and BLMPS080 (stormwater outfall in the upper section of the river) showed the greatest potential to negatively impact growing waters. The locations of these sources are illustrated in Figure 10. Because they are in areas classified as prohibited safety zones, the concern for impacts to public health is minimal. Two of the three sources in the Conditionally Approved area, BLMPS062 and BLMPS064 have historically shown relatively low fecal coliform, and low flow has led to little fecal coliform loading. A larger concern is BLMPS037, which up until the summer of 2018 had not shown much in terms of high fecal coliform or flow. But after just 0.85 inches of rain on 8/22/18, this site showed much higher flow than it ever had shown, and its fecal coliform was the highest ever measured, at 3400/100ml. Another high value was seen on 9/12/18 (>1600 FC/100ml), although almost 1.4 inches of rain had fallen in the two days prior to the sample being collected. The year 2018 was a much wetter summer than the previous two summers, so this source should be closely monitored, especially since it discharges directly to the Conditionally Approved area in the Bellamy River.

BLMPS003 is a site used to monitor the freshwater portion of the Bellamy River, about 2,500 feet upstream of where tidal influence begins. This sampling site will be undergoing significant changes in 2018, when two dams at the Sawyer Mills Apartment complex are removed, restoring the river to a free-flowing condition. Dam removal may not be complete until 2019. This sampling site may need to be relocated after all dam removal activities are completed.

Figure 10: Pollution Sources with Potenially High Fecal Coliform Loading

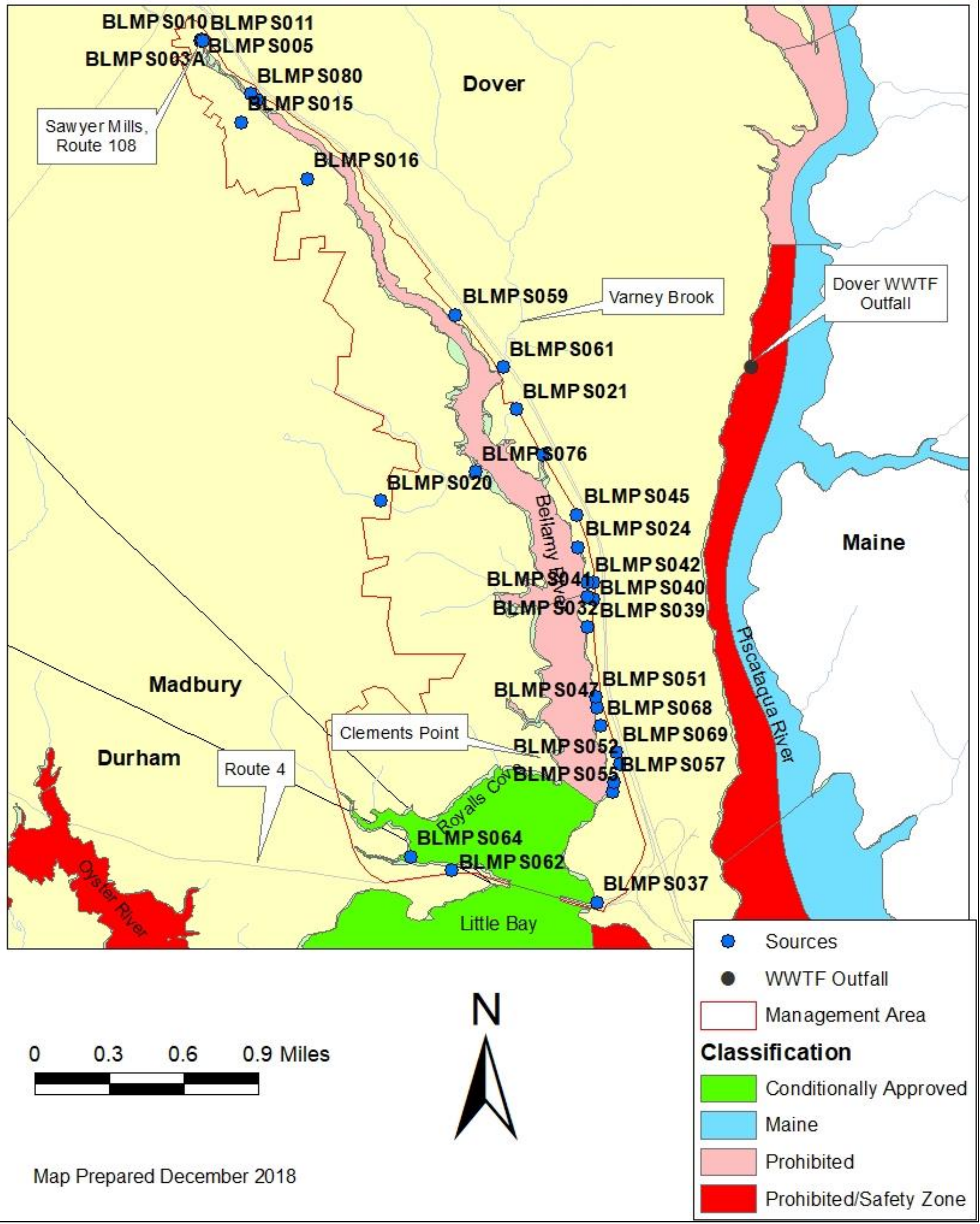


Table 9: Hypothetical Fecal Coliform Loading and Dilution Radii for Selected Pollution Sources

StationID	FC (per 100ml)	Flow (cfs)	Dilution Radius (ft)*
BLMPS003A	5300	58.000	6,145
BLMPS005	1400	0.023	63
BLMPS010	800	0.002	47
BLMPS011	6500	0.107	292
BLMPS013	20000	0.022	234
BLMPS015	7200	0.103	301
BLMPS016	10000	0.022	165
BLMPS020	1900	0.477	334
BLMPS021	200	0.011	17
BLMPS024	290	0.002	9
BLMPS032	1800	0.072	126
BLMPS037	1410	0.002	20
BLMPS039	3800	0.178	288
BLMPS040	2500	0.071	148
BLMPS041	2600	0.056	134
BLMPS042	4500	0.065	190
BLMPS043	2300	0.175	222
BLMPS045	120	0.022	18
BLMPS047	4800	0.017	100
BLMPS051	7900	0.002	46
BLMPS052	300	0.011	20
BLMPS055	380	0.032	39
BLMPS057	110	0.022	17
BLMPS059	2000	0.750	429
BLMPS061	16000	5.360	3,246
BLMPS062	7100	0.022	139
BLMPS064	150	0.002	6
BLMPS068	640	0.022	42
BLMPS069	130	0.011	13
BLMPS076	200	0.022	23
BLMPS080	20000	0.117	535

*dilution radius calculations assume a water depth of four feet and a loading time of 3 hours.

V. Hydrographic and Meteorological Characteristics

The Bellamy River is part of the Great Bay Estuary, the largest estuary in New Hampshire. With a drainage area of approximately 33 square miles, the Bellamy River is similar in size to the Oyster River. Both are among the smallest tributaries to the Great Bay Estuary. The tidal portion of the river begins just downstream of the Route 108 bridge at Sawyer Mills, and extends approximately four miles to the river mouth at the Route 4/Scammel Bridge (Figure 1). Tidal flow comes into the River from Lower Little Bay. Ballestero (1993) reports that approximately 0.75 billion gallons of water flow into the Bellamy River on the flood tide, with 0.36 billion gallons remaining in the river at low tide. The Bellamy River includes approximately 432 acres of tidal waters, with 12 miles of tidal shoreline. Ballestero (1993) found similar water elevations on either side of the Scammel Bridge and to a distance of two miles upstream, indicating the river water elevations are controlled by the tides – the Scammel Bridge was not found to be a flow restriction in the 1993 study. In fact, the bridge was reconstructed in the mid/late 1990s to include a wider span.

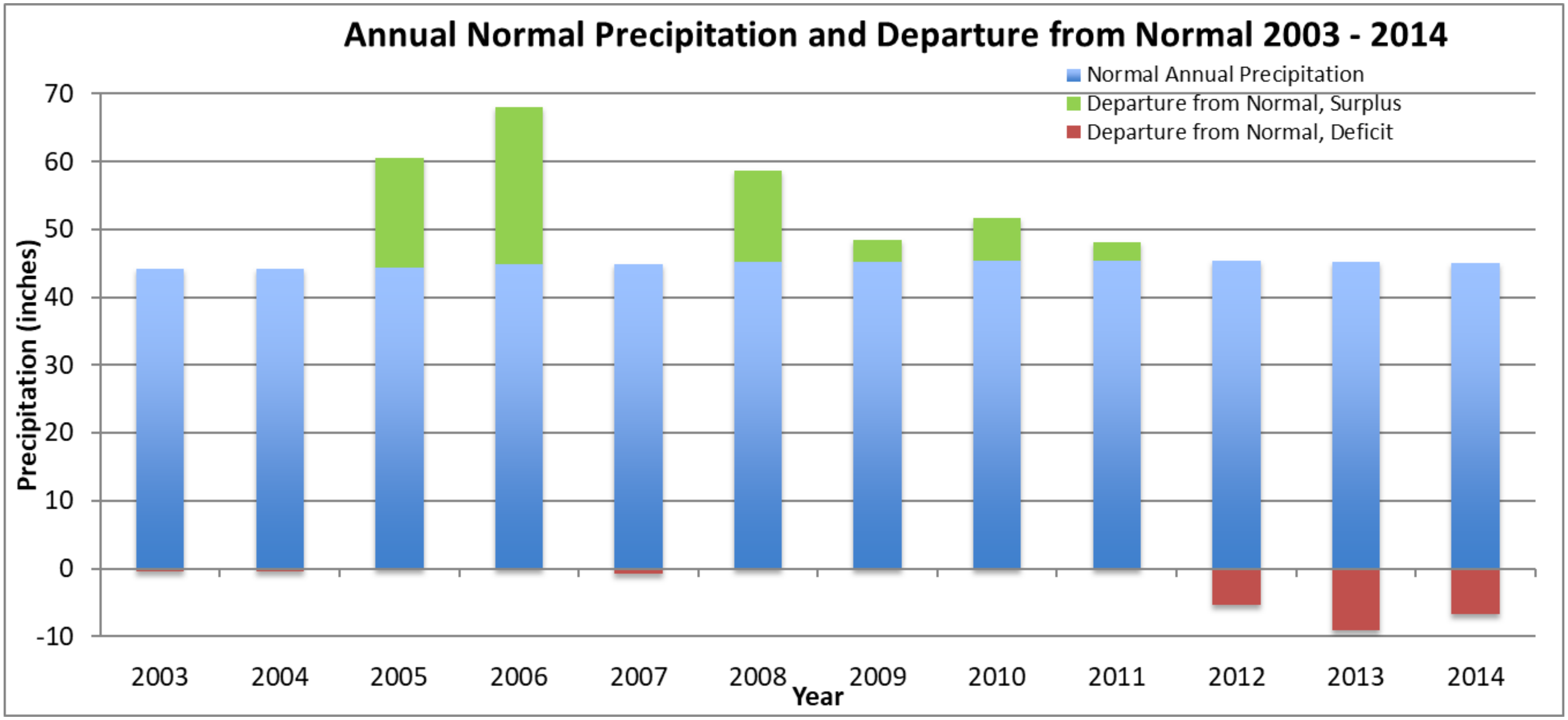
A. Tides

Coastal New Hampshire experiences a mixed, semi-diurnal tide, with diurnal inequalities that are more pronounced on spring tides. National Oceanic and Atmospheric Administration data for a station at Dover Point indicate a mean tidal range of 6.4 feet, a spring tidal range of 7.4 feet, and a mean tide level of 3.4 feet above mean lower low water. Currents in the area are predominantly driven by the tides. Ballestero (1993) reports a typical tidal range of 7 feet for the Bellamy River, and an average high tide current velocity of 1.3 fps at the river mouth (center of Scammel Bridge).

B. Rainfall

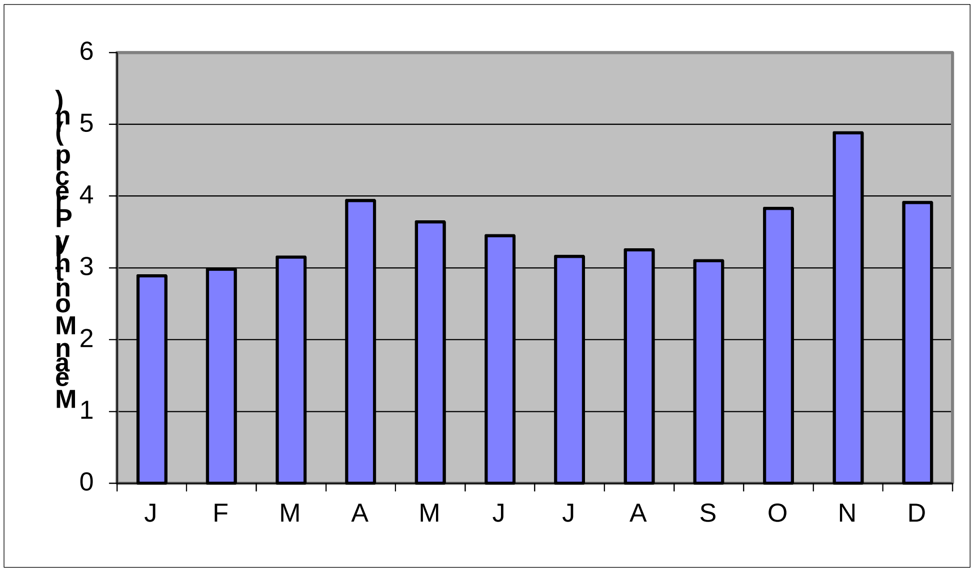
The Portsmouth weather station at the Pease International Tradeport indicates a long term average annual precipitation value of approximately 45 inches. Total precipitation for each year for the period of 2003 through 2014 is shown in Figure 11. This figure depicts long-term annual mean precipation (blue bars), along with departures from the annual mean (surplus precipitation in green, and deficits in red).

Figure 11: Portsmouth, New Hampshire Annual Normal Precipitation and Departure from Normal, 2003-2014



Precipitation is not evenly distributed throughout the year, with spring and fall having higher monthly averages of precipitation than other seasons (Figure 12).

Figure 12: Portsmouth, New Hampshire Mean Monthly Precipitation



An analysis of precipitation events recorded at the Pease/Portsmouth, New Hampshire station over a seven-year period from 2008 to 2014 was used to examine the frequency of various-sized storms, where size is defined as total precipitation of the storm (Figure 13a). The histogram in Figure 10a is further broken down by season to help identify if various-sized storms occur with greater frequency in a particular season. The reader should note that sizes of storms which occurred over more than one day are characterized in terms of total cumulative precipitation, not precipitation per 24 hours. Figure 13b presents the same data, although the y-axis scale is adjusted to improve readability of the graph for storms over one inch, as the larger storms are of greater interest because they often warrant harvest closures.

The Bellamy River Conditional Area Management Plan calls for rainfall closures following storms of over 1 inch. Figure 13b shows that such storms have occurred 96 times over the seven years examined or, on average, 13.7 times per year. These large storms occur, on average, once in the winter, once in the spring, three times in the summer, and twice in the fall.

Figure 13a: Distribution of Rainfall Events by Total Rainfall by Season (based on data from Pease/Portsmouth Weather Station, 2008-2014)

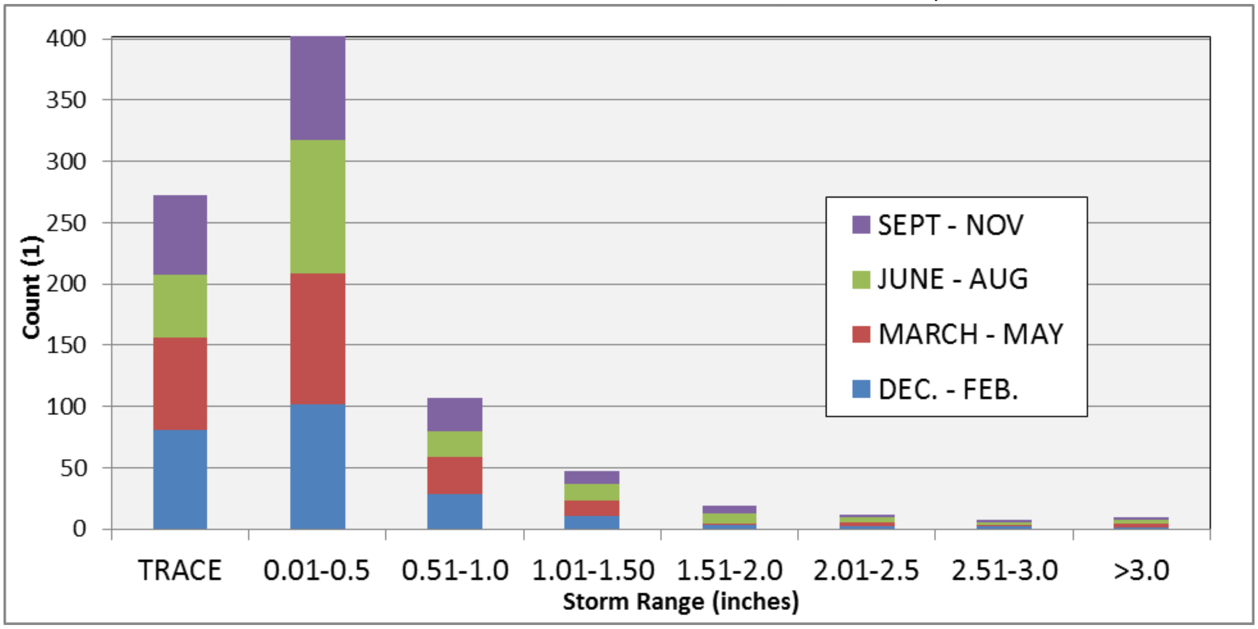
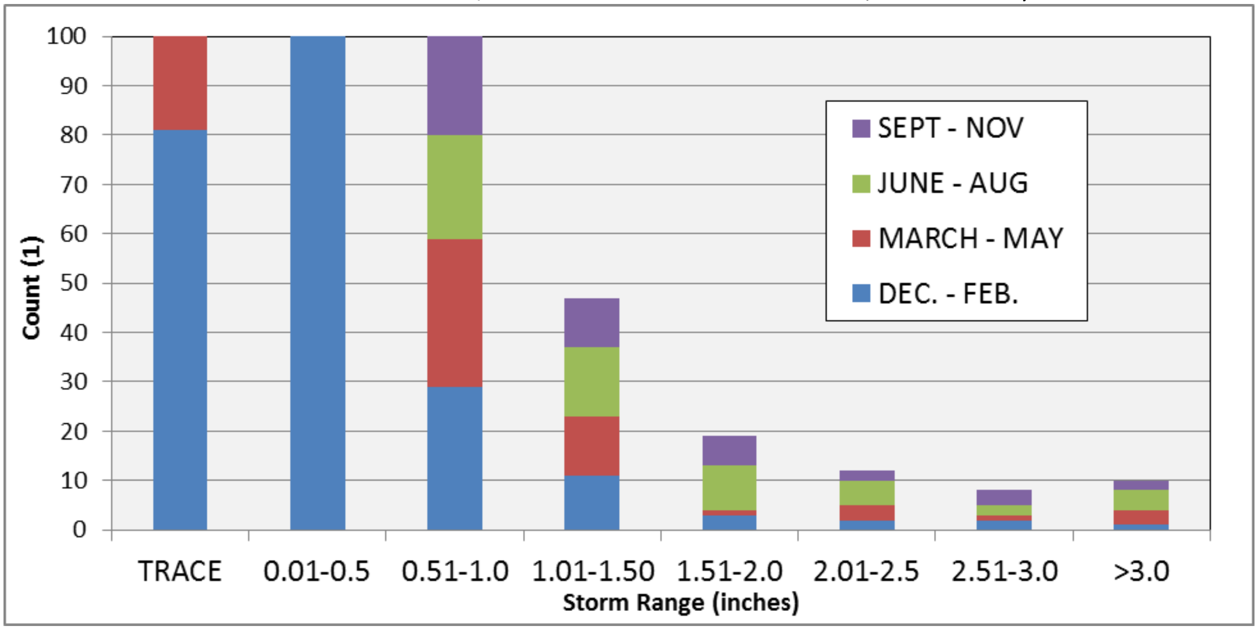


Figure 13b: Scale-Adjusted Distribution of Rainfall Events by Total Rainfall by Season (based on data from Pease/Portsmouth Weather Station, 2008-2014)



C. Winds

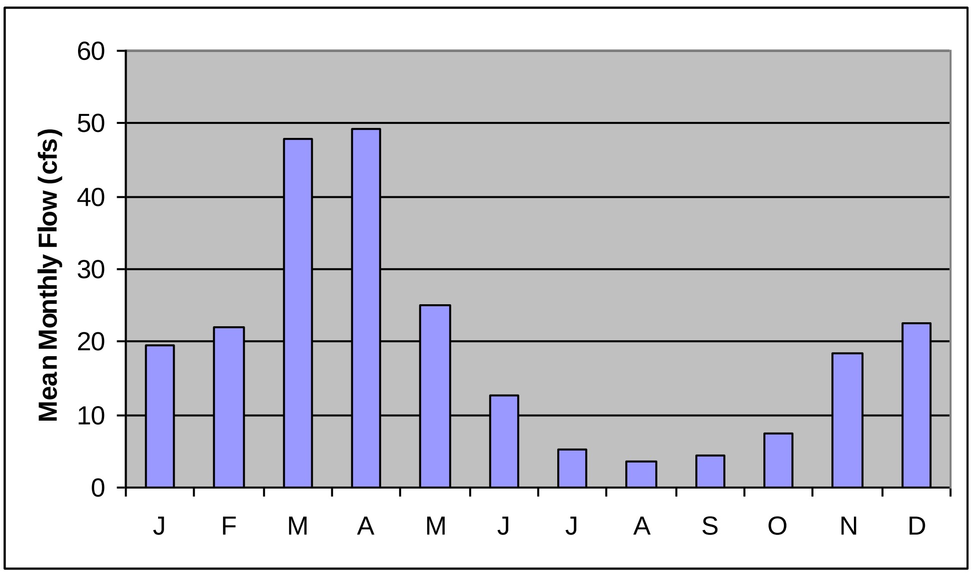
According to Normandeau Associates Inc. (1975), winter winds in coastal New Hampshire are typically from the west and northwest. In the spring, predominant winds are from the northwest, but northeast and southeast winds become more prevalent during this season.; inds from these directions, although less frequent, are typically stronger than winds from the northwest. In the summer, winds tend to be from either the southwest and northwest or southeast and are weaker than at other times of the year.

In general, circulation in the growing area is tidally driven. However, sustained winds have been observed to modify current speed and direction. For the Bellamy River, this is especially true of a sustained wind from the north or south.

D. River Discharges

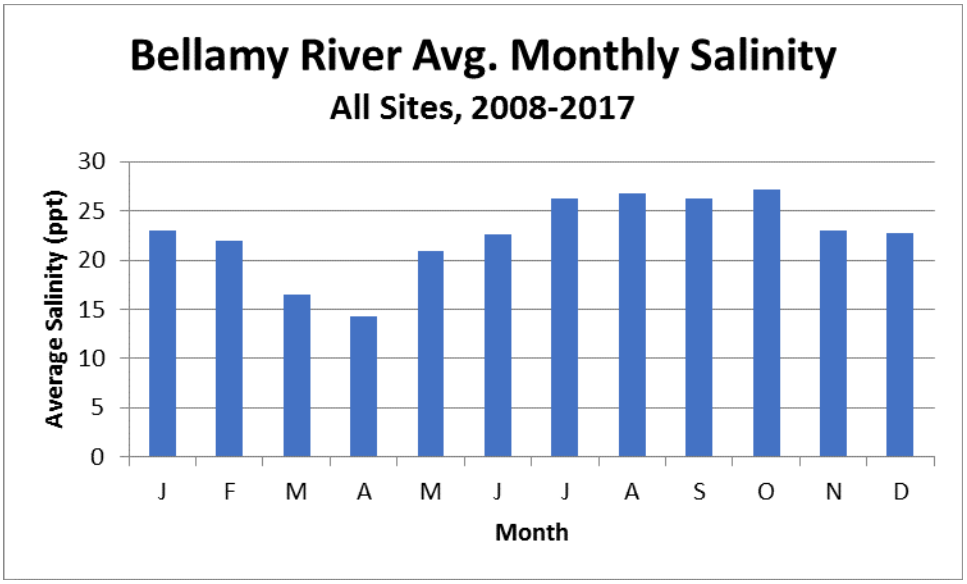
Streamflow in southeastern New Hampshire exhibits seasonal variation, with the highest flows occurring in the spring (due to snowmelt, spring rains and low evapotranspiration) and the mid-to late fall (due to fall rains and low evapotranspiration). Streamflow on the Bellamy River is not measured by the U.S. Geological Survey; however, a river with similar watershed size, the Oyster River, does have a U.S. Geological Survey gauging station. To illustrate the seasonality of streamflow in southeastern New Hampshire, mean monthly flow for the Oyster River, Durham, New Hampshire, is plotted in Figure 14.

Figure 14: Mean Monthly Flow, Oyster River, Durham, New Hampshire



Salinity data from monitoring sites in the Bellamy River were queried from the NHDES Shellfish monitoring database for the period of 2008-2017 and sorted by month. Average salinity for each month approximates the seasonal streamflow pattern and influence of fresh water inputs on the growing area (Figure 15).

Figure 15: Average Monthly Salinity at All Bellamy River Sites, 2008-2017



Salinity tends to be lowest in the spring, due to spring rains and snowmelt/runoff. Summer and (early) autumn show the highest values of salinity, due to the relatively low streamflows at this time of year.

E. Stratification

The Bellamy River is a shallow river with relatively small input of freshwater discharge (Ballestero [1993] estimates that at low tide, approximately 0.2%of the river volume is fresh water); thus, it is generally well-mixed. However, partial salinity stratification can occur during times of heavy rainfall and runoff, which typically occurs in spring and in the late fall. NHDES Shellfish Program staff measured changes in water column salinity and temperature (two-foot intervals) at several sites in the Bellamy River during different times of the year (March 2002, July 2002, September 2002, and November 2002). Maximum top-to-bottom salinity differences were nearly three parts per thousand (March data, low and high tide measurements), although differences were generally under one part per thousand for other observations. Temperature generally varied by less than one degree Centigrade.

F. Summary Discussion Concerning Actual or Potential Transport Effects on Pollution to the Harvest Area

One of the most important aspects of hydrography and its influence on pollutant transport in the Oyster River is the pattern of tidal current speed and direction, and how that influences the dispersion of effluent from the wastewater treatment facilities, especially if the Durham, Dover, or Portsmouth WWTF experiences a lapse in normal treatment. Treatment lapses at the Portsmouth WWTF have the potential to quickly affect the Bellamy River. A hydrographic dye study of the Portsmouth plan simulated a “worst case scenario” of a disinfection failure occurring at slack low tide (Ao et. al, 2017). The study showed insufficiently diluted effluent reaching the Bellamy during the first flooding tide.

The NHDES Shellfish Program maintains a pager for WWTF operator use to facilitate immediate notification regarding discharges of improperly treated sewage. Because Shellfish staff is on call from 6am-9pm, problems at the WWTFs occurring after 9pm may not be responded to until the following morning. Experience with the WWTFs that can affect Bellamy River water quality show they detect and report issues quickly, allowing NHDES and NH Fish and Game to implement harvest closures quickly. However, overnight issues would not be acted upon until the following morning, which means harvest areas could potentially be adversely affected before a harvest closure is put in place. This reality requires strict control of harvest practices. For recreational harvesting in the Bellamy River, this control is achieved by only allowing harvest on Saturdays, 9am-sunset. The 9am start time gives the WWTF, NHDES, and NHF&G staff sufficient time to discover any WWTF treatment lapses that might have occurred overnight on Friday, and to implement any necessary harvest closures before recreational harvesting begins on Saturday. For commercial harvesting in the Bellamy River (none presently, but there may be farms licensed in the near future), aquaculturists would be required to seek approval for each harvest from NHDES, so there is already adequate control over harvest practices. For that reason, commercial harvesting would not be limited to Saturdays as recreational harvesting is. Commercial harvest can occur 7 days per week, as long as other performance standards in the Bellamy River Conditional Area Management Plan are met.

None of the shoreline pollution sources in the Conditionally Approved area have historically shown fecal coliform and high flow that would warrant a closure zone around them. This appears to continue to be true, although the very high bacteria and flow levels observed at BLMPS037 warrant continued evaluation. These high values could have been related to the time of year (summer, when there is a seasonal closure) or they might have been due to unusually wet weather during the summer of 2018. All other sources with significantly high fecal coliform (e.g., BLMPS061, Varney Brook) discharge to Prohibited waters.

VI. Water Quality Studies

A. Sampling Stations

The northern portion of the Bellamy River (head-of-tide to Clements Point) is classified as Prohibited and the southern portion of the Bellamy River (Clements Point to the Route 4/Scammel Bridge) is classified as Conditionally Approved (Figure 2). These areas are sampled by boat for fecal coliform bacteria under the Systematic Random Sampling strategy (Table 10 and Figure 2).

Table 10: Bellamy River Ambient Sampling Stations

Site	Latitude	Longitude	General Description	Rationale for Selection
GB2	43°07’46”N	70°50’58”W	Mouth of Bellamy River at Scammel Bridge, Lower Little Bay	Document general water quality from Bellamy River
GB34	43°08’06”N	70°50’44”W	Mid channel of Bellamy River, adjacent to Clements Point	Document general water quality
GB33	43°08’44”N	70°50’47”W	Mid channel of Bellamy River, north of Clements Point	Document general water quality; classification boundary site

B. Sampling Plan and Justification

The Bellamy River is sampled using a Systematic Random Sampling strategy. The Systematic Random strategy is favored over the Adverse Condition strategy because it provides for a better evaluation of the effects of intermittent, random sources of pollution. New Hampshire's classification procedures account for the significant impacts of major point source pollution to shellfish growing areas through the establishment of Prohibited Zones around the discharges. These zones define the area of impact of the discharges; therefore, ambient monitoring need not be designed to evaluate water quality within these zones, as they are closed to all harvesting. The primary concern for the ambient program is detecting random, intermittent occurrences of pollution, and the Systematic Random Sampling Strategy is better suited for this purpose. The Systematic Random Strategy should also detect the impacts of any unidentified, chronic sources of pollution (point and nonpoint) that might affect growing area water quality.

Per the NSSP guidelines for systematic random sampling, a monitoring schedule was established at the start of the year to ensure sample collection under a variety of environmental (seasonal, tidal, meteorological, etc.) conditions. Runs are scheduled to begin between 7am and 10am to randomize the tidal stage at which samples are collected. Sampling runs were rescheduled as a result of extenuating circumstances or when conditions were deemed unsafe. All samples were analyzed for fecal coliform MPN/100ml (5-tube method) by the New Hampshire DHHS/Public Health Laboratory.

Because the Bellamy River Conditional Area Management Plan includes provisions for closure related to issues with the operation and performance of wastewater treatment facilities, monthly water samples are required when the growing area is in the Open status (ISSC, 2017). If the area happened to be in the Closed status when the prescheduled systematic random sampling run was conducted, a second sampling run is done during the same month when the area is in the Open status.

C. Sample Data Analysis and Presentation

NSSP statistics for systematic random and open status samples collected from 2014 through 2017 are presented in Table 11. All sites meet NSSP fecal coliform criteria for Approved waters (geometric mean $\leq$ 14/100ml and the estimated 90^{th} percentile statistic $\leq$ 43/100ml). However, analysis of the data clearly illustrates rainfall effects, as well as the potential for adverse effects from a lapse in treatment at various WWTFs, so an Approved classification would not be appropriate. Due to rainfall and other effects, this site is classified as Conditionally Approved. When the conditions specified in the Conditional Area Management Plan are applied to the data (i.e., exclusion of samples collected during times when the area was in the Closed status, indicated by shading in Table 11), all stations meet NSSP criteria for Approved waters.

Table 11: NSSP Bacterial Data and Statistics for Bellamy River Monitoring Stations, 2014-2017
(shaded cells were collected when the area was in the Closed status).

3-Day Rain Total (in)	Collection Date	GB2	GB33	GB34
0.30	1/13/2014	**49**	---	---
0.71	2/24/2014	4	---	4.5
0.00	3/11/2014	<2	<2	<2
0.95	4/8/2014	2	17	2
0.05	5/6/2014	<2	7.8	11
0.09	6/11/2014	<2	23	7.8
2.44	7/7/2014	9.3	14	7.8
0.25	8/6/2014	4.5	6.8	4.5
0.09	9/2/2014*	7.8	4.5	7.8
0.30	10/6/2014	2	14	2
0.19	11/5/2014	6.8	4	4.5
0.00	12/1/2014	2	6.8	7.8
0.14	1/20/15	49	---	31
0.72	3/30/15	49	13	4
0.13	4/6/15	4.5	13	4.5
0.02	4/15/15	2	13	2
0.00	5/5/15	<2	7.8	<2
0.00	5/12/15	<2	4.5	<2
0.00	6/9/15	4.5	2	4.5
0.13	7/13/15	<2	2	2
0.74	8/13/15	2	33	6.8
1.60	9/14/15	---	33	7.8
1.60	9/14/15	17	---	---
0.00	10/15/15	<2	<2	<2
0.00	11/9/15	<2	2	4
0.30	12/4/15	7.8	4.5	11
0.00	1/6/16	23	---	23
0.00	2/2/16	7.8	22	7.8
0.00	2/22/16	<2	2	<2
0.00	3/9/16	4.5	4.5	4.5
0.00	4/6/16	27	4.5	7.8
0.00	5/17/16	<2	<2	4.5
0.09	6/13/16	2	7.8	2
0.07	7/13/16	<2	4.5	2
0.62	8/17/16	7.8	**79**	4.5
0.23	9/12/16	4.5	13	4.5
1.28	10/10/16	17	**130**	13
0.00	11/14/16	2	2	2
0.00	12/8/16	7.8	7.8	11
0.00	1/22/17	7.8		2
0.00	2/21/17	2		2
0.00	3/6/17	2		

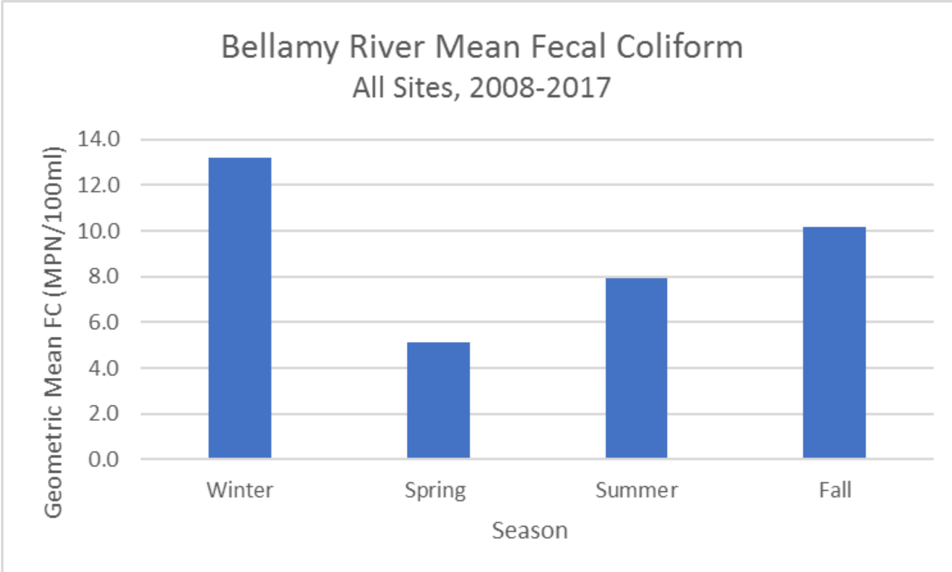
3-Day Rain Total (in)	Collection Date	GB2	GB33	GB34
0.00	4/3/17	1.8	7.8	23
0.34	5/23/17*	7.8	**70**	7.8
1.25	6/7/17	33	**110**	**49**
0.00	7/5/17	2	13	2
0.00	8/1/17	<2	2	2
0.01	9/19/17	2	33	6.8
0.00	10/17/17	13	23	4.5
2.42	11/1/17	**170**	**79**	**70**
0.15	11/15/17	6.8	4.5	7.8
0.07	12/4/17	13	4.5	7.8
Statistics for All Data	Count	51	44	49
	Geomean	5.1	9.1	5.2
	Est 90th	21.8	41.9	16.4
	Water Quality	A	A	A
	Classification	CA	P	P
Statistics for Open Status Data Only	Count	37	29	34
	Geomean	5.3	7.4	5.2
	Est 90th	20.8	29.5	14.3
	Water Quality	A	A	A
	Classification	CA	P	P

*per NSSP, two runs used to reopen a closed area may be used for statistics, per year.

Seasonal Effects on Fecal Coliform Concentrations

To examine how FC levels may vary with the seasons, the historical FC data from the systematic random and Open status sampling programs (2008-2017) were categorized by season (Figure 16). Winter tends to have a higher mean than the other seasons. Winter also has more samples over 43 FC MPN/100ml than other seasons. Higher winter fecal coliform levels are normal for sites in Great Bay estuary. The adverse effects of events such as heavy rainfall tend to persist in these waters during the colder months, as the flushing time for this part of the estuary is several tidal cycles, and bacterial reduction through exposure to UV radiation, predation by microorganisms, and other mechanisms is less pronounced during the winter months.

Figure 16: Mean Fecal Coliform Concentration by Season, All Bellamy River Sites Combined, 2008-2017



An emerging question in the management of the Bellamy River has been the need for a continuation of the summer seasonal closure. Beginning in 2012, the statistics derived from the systematic random sampling program have shown a steady downward trend for both geometric mean and estimated 90th percentile. There has been a steady decrease in the number of samples with high (>43/100ml) fecal coliform. However, because of the summer harvest closure, NHDES has not placed a lot of emphasis on sampling effort in the Bellamy River for those months. The lower number of samples might, in part, explain the apparent downward trend in high bacteria levels. NHDES Shellfish began investigating this issue by augmenting summer sampling of the Bellamy stations to build a larger dataset of summer water quality. Most of this work occurred in 2015-2018. Table 12 illustrates sampling results for the two stations in the Conditionally Approved area (GB2 and GB34). Shading is used to highlight samples with fecal coliform over 43/100ml. Yellow shading indicates prior rainfall was greater than one inch, while orange shading indicates prior rainfall was less than 1 inch).

Table 12: Summer Bacterial Data for Monitoring Stations GB2 and GB34, 2014-2018

(shaded cells highlight results that were >43 FC/100ml. Yellow shading indicates prior rainfall was > one inch, while orange shading indicates prior rainfall was < 1 inch).

Year	Date	3-Day Rainfall	GB2 FC/100ml	GB34 FC/100ml
2014	11-Jun-14	0.09	2	7.8
	07-Jul-14	2.44	9.3	7.8
	08-Jul-14	0.58	11	
	18-Jul-14	1.66	17	
	06-Aug-14	0.25	4.5	4.5
	19-Aug-14	0	4.5	

Year	Date	3-Day Rainfall	GB2 FC/100ml	GB34 FC/100ml
	25-Aug-14	0.17	2	2
2015	03-Jun-15	3.35	**49**	
	08-Jun-15	0	2	
	09-Jun-15	0	4.5	4.5
	06-Jul-15	0.01	17	
	13-Jul-15	0.13	2	2
	23-Jul-15	0.29	2	4
	29-Jul-15		2	13
	05-Aug-15	0.41	13	11
	10-Aug-15	0	2	2
	13-Aug-15	0.74	2	6.8
	20-Aug-15	0.17	4.5	7.8
2016	13-Jun-16	0.09	2	2
	20-Jun-16	0	2	2
	27-Jun-16	0	2	2
	13-Jul-16	0.07	2	2
	19-Jul-16	0.34	4.5	21
	25-Jul-16	1.03	2	6.8
	01-Aug-16	0.37	4.5	13
	17-Aug-16	0.62	7.8	4.5
2017	05-Jun-17	0.21	13	
	07-Jun-17	1.25	33	**49**
	28-Jun-17	0.2	4.5	7.8
	05-Jul-17	0	2	2
	25-Jul-17	0.77	33	**920**
	01-Aug-17	0	2	2
	08-Aug-17	0.3	23	33
	21-Aug-17	1.57	**49**	
	28-Aug-17	0	2	2
2018	12-Jun-18	0	2	2
	10-Jul-18	0	2	6.8
	18-Jul-18	2.4	**49**	
	23-Jul-18	0.32	2	4.5
	05-Aug-18	1.91	**70**	**140**
	07-Aug-18	0.36	13	**79**
	20-Aug-18	0.37	2	17
	23-Aug-18	0.85	17	23
	27-Aug-18	0	**130**	

The early part of the dataset shows very few samples with high fecal coliform, even with some sampling dates with high prior rainfall. 2016 were very dry years in New Hampshire, and there was concern that perhaps the dry conditions were creating an environment that precluded the Bellamy shoreline pollution sources from generating the fecal coliform levels that had been seen in prior years. As more rainfall was experienced in the summers of 2017 and 2018, the number of samples over 43 fecal coliform/100ml increased. There were multiple days with very high bacteria levels when rainfall was under the 1-inch threshold used to close the Bellamy during non-summer months. These results suggest that the current summer harvest closure should remain in place.

Rainfall Effects on Fecal Coliform Concentrations

To examine the effects of rainfall and runoff on FC levels in the growing area, bacterial data at the Bellamy River monitoring stations, collected for the period of 2014-2017, were queried. Data collected as part of routine systematic random sampling, as well as data collected in response to rainfall events, were included in the analysis. Data collected after WWTF treatment lapses were excluded. For the purposes of this analysis, it is assumed that rainfall events would impact the growing areas for a period of up to four days following the end of the event. Accordingly, rainfall data associated with water samples in the NHDES Shellfish database were examined in the context of rainfall that had occurred in the four days prior to sample collection. Data from the the Pease Tradeport weather station in Portsmouth, NH, was used for the analysis.

Specifically, the data were broken up into different ranges of rainfall and the number of high bacteria results (fecal coliform > 43/100ml) were examined in each group. The result of this analysis is presented in Table 13.

Table 13: Bellamy River Fecal Coliform (MPN/100ml) Data for Varying Levels of Rainfall

Amount of Rain Prior to Sample Collection	Number of Samples	Number of Samples with FC > 43/100ml	Percent Samples with FC > 43/100ml
0.00”	82	1	1.2
0.01-0.50"	76	4	5.3
0.51-1.00"	26	2	7.7
1.01-1.5"	19	4	21.1
1.51-2.00"	18	4	22.2
2.00-2.5"	12	5	41.7
Over 2.5”	5	2	40.0

Examination of the fecal coliform data for storms in different ranges of rainfall suggests that adverse fecal coliform concentrations become more frequent when rainfall exceeds one inch. Above this amount, the number of samples showing high fecal coliform is over 20%. The number of samples with high FC takes a noticeable jump when rainfall exceeds two inches. This suggests that a rainfall closure threshold of one inch continues to be an appropriate conservative rainfall closure threshold. Efforts to collect more data, especially for storms in the 1.0-2.0-inch range, should continue so the rainfall closure threshold can be verified for the next triennial report.

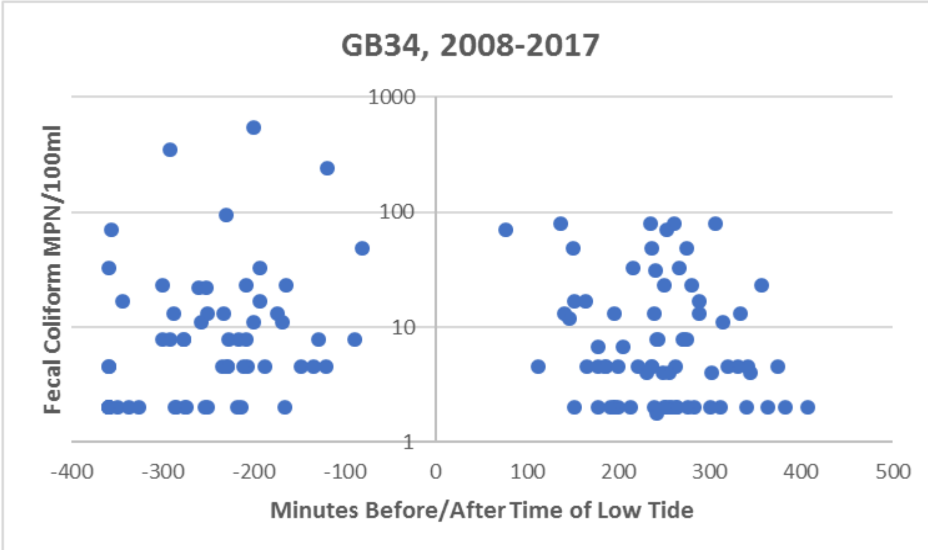
Tidal Effects on Fecal Coliform Concentrations

To examine the effects that tidal stage might have on FC concentrations, data collected under the Systematic Random sampling program, as well as targeted "Open status" sampling, over the last 10 years (2008-2017) were queried for all Bellamy River sites. Figure 17 illustrates the relationship between fecal coliform MPN/100ml and the number of minutes before/after low tide the sample was collected at Site GB34. Plots for all sites are presented in Appendix III.

The pattern illustrated in Figure 21 does not illustrate a relationship between tide stage and FC concentrations that would warrant targeting future systematic random sampling on a particular tide stage. The ebbing tide data and flooding tide data seem to be equally scattered. There were three observations with FC >100/100ml, all of them occurring on an ebbing tide. These values seem to have had more to do with rainfall effects than with tidal effects:

- 9/9/2008 FC=350/100ml. Flooding tide sample was collected three days after a 5-inch rainstorm associated with Tropical Storm Hannah.
- 12/3/2008 FC=240/100ml. Ebbing tide sample was collected a few days after a 0.83-inch rainfall event.
- 6/15/2009 FC=540/100ml. Ebbing tide sample was collected one day after four consecutive days of rain, including one day with 1.3 inches of rain (2.01 inches of total rain over the four-day period). Also note that because of other water quality effects unrelated to rainfall, the Bellamy River is closed during the summer, so this June 2009 sample may have also had an elevated FC level due to other factors.

Figure 17: Fecal Coliform Concentration vs. Tide Stage at Site GB34


GB34, 2008-2017
Fecal Coliform MPN/100ml
1000
100
10
1
-400
-300
-200
-100
0
100
200
300
400
500
Minutes Before/After Time of Low Tide

VII. Interpretation of Data in Determining Area Classification

The shoreline survey data, pollution source impact evaluations, analyses of tidal, seasonal and rainfall effects, ambient water quality data, and the hydrographic information support the following statements regarding the sanitary quality of the Bellamy River:

- The waters of the Bellamy River can be adversely impacted by releases of improperly treated sewage from the wastewater treatment facilities in Dover, Durham, and Portsmouth.
- Impacts from the existing primary treatment WWTF in Portsmouth include rapid transport of insufficiently diluted effluent in the event of a lapse in disinfection, as well as chronic input of viral indicators during the fall, winter, and spring. These impacts require restrictions on the timing of recreational harvest in the Bellamy River (Saturday only, 9am-sunset). Furthermore, due to chronic input of viral indicators from Portsmouth and their persistence in the environment during cold weather months, no commercial or recreational shellfish harvest during the period of October through March should be allowed in the Bellamy River.
- Rainfall events of over one inch appear to adversely affect the water quality of the Bellamy River.
- The incidence of high bacteria levels at Bellamy River water sampling stations in the summer months of June, July and August appears to be rising, even after relatively modest rainfall events. A continuation of the seasonal summer closure is warranted.
- Existing pollution sources in the northern section of the river (north of station GB33), preclude an approved or conditionally approved classification for northern sections of the Bellamy River.

The aforementioned statements suggest the following classifications are appropriate:

- The northern section of the Bellamy River, from head-of-tide to Clements Point, shall be classified as Prohibited (228.3 acres).
- The southern section of the Bellamy River from Clements Point to the river mouth at the Route 4/Scammel Bridge, shall be classified as Conditionally Approved (161.8 acres), with one of the conditions relating to proper facility operation and treatment of effluent at the Durham, Dover, and Portsmouth WWTFs, in accordance with the facilities' most recent National Pollutant Discharge Elimination System permit. The timing of recreational harvest in the Bellamy River shall be restricted to Saturday only, 9am-sunset. Furthermore, this area should also be placed in the closed status for all harvest for the period of early October to end of March each year, until the Portsmouth WWTF upgrade is complete (projected to be done by April 2020). A seasonal summer closure should also be implemented for the months of June, July, and August due to unpredictable water quality. The area should also be closed following rainfall events of greater than one inch per 24 hours, although closures may be implemented for other storms (for example, storms of 1 inch or more occurring over more than 24 hours).

VIII. Conclusions

A. Legal Description

The northern portion of the Bellamy River (head of tide to Clements Point) shall be classified as Prohibited. For the purposes of this classification, the northern boundary of the prohibited area is the approximate location of the limit of tidal influence, located a line running northeasterly from 43^{0}10’33.4”N, 70^{0}52’17.7”W to 43^{0}10’33.6”N, 70^{0}52’17.4”W. The southern boundary of the Prohibited area is defined by a line extending from the western shore of the Bellamy River at Clements Point (43^{0}08’08.9”N, 70^{0}50’48.5”W) to the eastern shore of the Bellamy River opposite of Clements Point (43^{0}08’03.5”N, 70^{0}50’38.5”W).

The southern portion of the Bellamy River (Clements Point to the Route 4/Scammel Bridge) shall be classified as Conditionally Approved. For the purposes of this classification, the northern boundary of the conditionally approved area is defined by a line extending from the western shore of the Bellamy River at Clements Point (43^{0}08’08.9”N, 70^{0}50’48.5”W) to the eastern shore of the Bellamy River opposite of Clements Point (43^{0}08’03.5”N, 70^{0}50’38.5”W).

The southern boundary of the Conditionally Approved Area is at the mouth of the Bellamy River, defined by a line starting at the western side of the Route 4/Scammel Bridge (43^{0}07’47.0”N, 70^{0}51’3.4”W) and running easterly to the eastern side of the Scammel Bridge (43^{0}07’44.0”N, 70^{0}50’49.2”W).

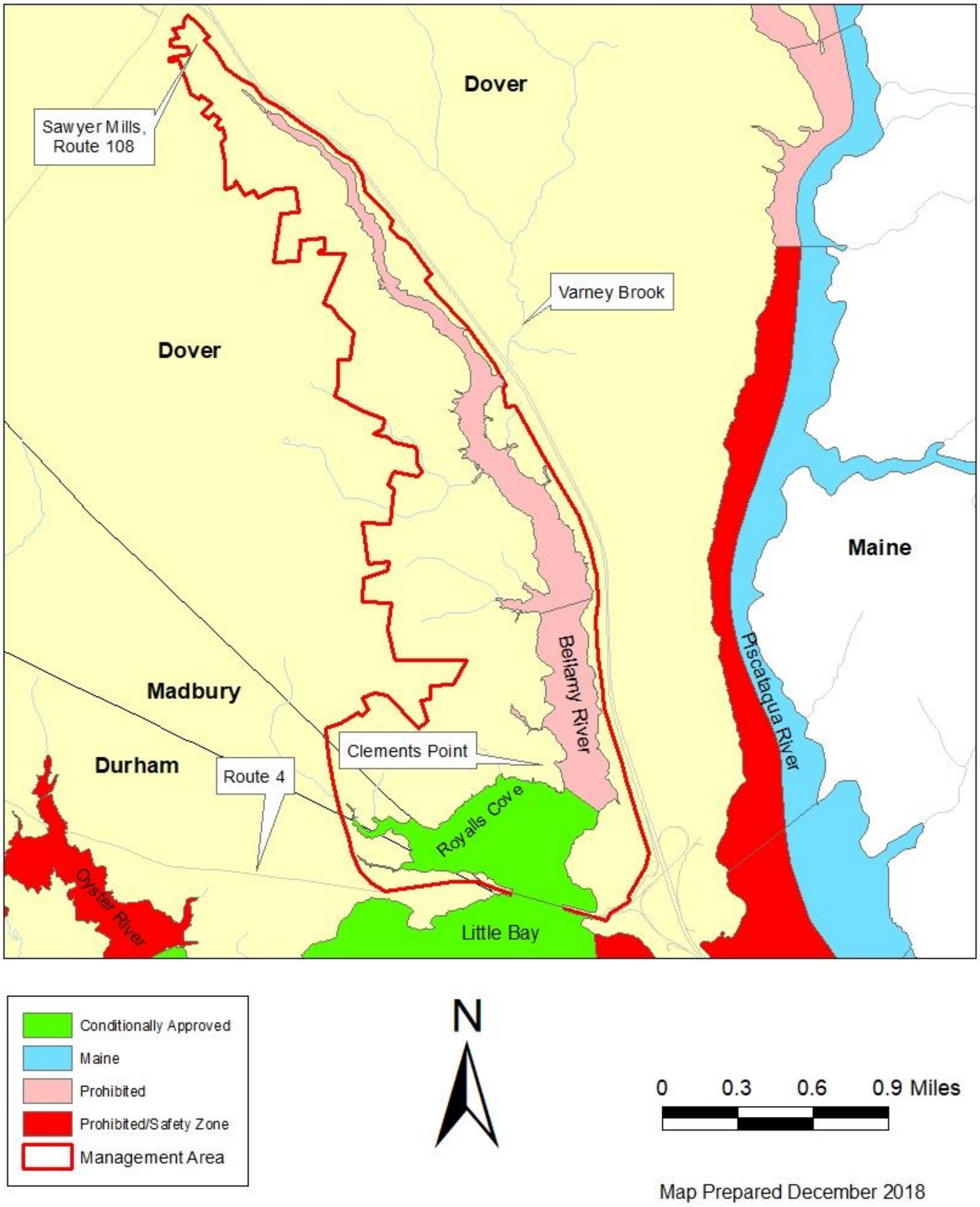
The western boundary of the Conditionally Approved area is bounded by each tidal creek’s intersection with Piscataqua Road, the limit of the tidal influence.

For the purposes of this classification, all Conditionally Approved waters are closed for harvesting following rainfall events of over one inch. A seasonal closure for the months of June July, and August will be implemented. Furthermore, these waters will be closed following discharges of improperly treated sewage from the Durham WWTF, the Dover WWTF, or the Portsmouth WWTF. Until the Portsmouth WWTF is upgraded from its current technology of primary treatment, two additional harvest restrictions are necessary. The first restriction is that recreational harvest shall be restricted to Saturdays only, 9am-sunset, when the area is in the open status. The second restriction is that the Conditionally Approved waters shall be placed in the closed status for all harvest for the period of early October to end of March each year, until the Portsmouth WWTF upgrade is complete (projected to be done by April 2020).

Figure 18 depicts revised classifications. The overall classification of the area did not change from the previous annual report, with the exception of an adjustment to the location of the limit of tidal influence. After conferring with the NH Fish and Game Department regarding the removal of dams at Sawyer Mills, NHF&G provided clarification on the approximate location of head of tide, and the location was moved downstream approximately 2,000 feet. The specific conditions under which the Conditionally Approved areas will be placed in the closed status for calendar years 2017 and 2018 are described in Appendix IV. The specific conditions under which the Conditionally Approved areas will be placed in the closed status for calendar year 2019 are described in Appendix V.

At the discretion of NHDES, some or all of the Conditionally Approved waters may be placed in the closed status, per emergency closure protocols, when unusual or rare conditions that may endanger public health exist. Such conditions include but are not limited to episodes of high shellfish toxicity from harmful algal blooms, spills of petroleum products or other poisonous/deleterious substances, or other conditions. NHDES will determine when the areas will be re-opened for harvest on a case-by-case basis, utilizing procedures outlined in the National Shellfish Sanitation Program and/or State of New Hampshire Interagency Memoranda of Agreement regarding NSSP implementation in New Hampshire.

Figure 18: Revised Classification of the Bellamy River



B. Recommendations for Sanitary Survey Improvement

1. Complete a final report on the May 2017 Durham Wastewater Treatment Facility Dye Study, and amend the Bellamy River Conditional Area Management Plan (particularly with respect to performance standards for Durham WWTF flow, and/or whether or not Durham should even be included in the Bellamy River Conditional Area Management Plan, as appropriate.
2. When the Portsmouth WWTF is upgraded to secondary treatment, re-examine the assumed bacteria concentration in undisinfected effluent through repetitive sampling in multiple seasons. If the assumed concentration can be reduced from the current assumption of 1,000,000 fecal coliform per 100ml, revisit the need for inclusion of the Portsmouth WWTF performance in the Bellamy River Conditional Area Management Plan, including the need for the recreational harvest restriction of Saturdays only, 9am-sunset.
3. When the Portsmouth WWTF is upgraded to secondary treatment, re-examine the assumed virus concentration in fully treated effluent through repetitive sampling in multiple seasons. If the assumed concentration can be reduced from the current range of 10-40 male specific coliphage plaque forming units per 100ml, revisit the need for inclusion of the Portsmouth WWTF performance in the Bellamy River Conditional Area Management Plan, including the need for the seasonal closure of all harvest for the period of October through March.
4. Consider conducting a 1,000:1 steady state dye study at the Pease WWTF. This study should be designed to examine effluent time-of-travel and concentrations on a spring flooding tide. Particular emphasis should be placed on quantifying dye concentrations in the vicinity of Dover Point and in other areas of Little Bay and Great Bay.
5. Consider updating the hydrographic studies of the Dover WWTF, using new procedures recommended by the USFDA to delineate the steady state 1,000:1 zone of dilution (or 400:1, if appropriate) around the outfall.
6. Continue to develop background data on male-specific coliphage levels in Bellamy River seawater and shellfish in various seasons, and from WWTFs affecting Little Bay, to be used to help determine when the area can be reopened for harvest following a significant release of sewage from local WWTF and/or sewage collection infrastructure.
7. Continue monthly boat counts on Bellamy River mooring fields in the summer and fall. As time and funding allow, conduct weekend boat occupancy surveys.
8. Continue with wet and dry weather sampling of pollution sources affecting the Bellamy River, particularly those that have been referred to the NHDES Watershed Assistance Section. These would include BLMPS011, BLMPS040 (and BLMPS042), BLMPS061, BLMPS067, BLMPS080, BLMPS005, BLMPS016, BLMPS039 (and BLMPS041), BLMPS043, BLMPS059, BLMPS037, and BLMPS062.
9. More water samples should be collected after storms in the 0.5-1.5 inch range at sites GB2, GB34, and GB33 to further examine if the rainfall closure threshold should be changed. With more data, a look at seasonal changes in rainfall impacts for different levels of rain would also be useful.
10. Continue to augment summer sampling at sites GB2, GB34, and GB33 under dry weather conditions (<0.5 inches rain), particularly in years where summer precipitation is above normal, to further examine if it would be appropriate to change the Bellamy River Conditional Area Management Plan to allow for summer harvesting.

11. Continue sampling of shellfish meats and waters in the days before and after heavy (> one inch) rainfall events, significant sewage discharges, etc. , in order to continue developing data on how quickly high bacterial levels in the Bellamy River dissipate, and how quickly the shellfish purge themselves of high bacteria.
12. Consider a classification revision from Prohibited to Restricted for the area between ambient monitoring sites GB33 and GB34. Both sites have bacteriological water quality that meet Approved criteria under certain conditions; however, the area has remained in the Prohibited classification because of its proximity to sewage infrastructure (Varney Brook pump station), and because of questions about summer water quality following rainfall events. The risk of an accidental sewage release from the infrastructure around the Varney Brook pump station and rapid contamination of the river would make managing recreational harvest difficult, but maintaining adequate control of harvest from commercial entities could be managed under a Restricted classification, should the State of New Hampshire develop regulatory programs to properly and safely manage commercial harvest from such waters. As more data on summer wet weather water quality is developed, and as management discussions with the other state agencies continue, it may be appropriate in the future to consider a Restricted classification for this section of the Bellamy River.

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Appendix I: Shoreline Survey Pollution Source Sampling Plan

StationID	2011 plan	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Soure Type
BLMPS001	BLMPS001	Sample in wet and/or dry	10/23/2017 (dry weather; no flow)	Visit/observe to see if brush is cleared and site is flowing	Dover	12 Inch corrugated Metal Pipe	Pipe
BLMPS002	BLMPS002	Sample in wet and/or dry	7/12/2017 (dryweather; no flow) 7/13/2017 (wetweather; no flow) 10/23/2017 (dry weather; no flow)	Visit to confirm no flow	Dover	12 Inch Metal Pipe with Splash Guard	Pipe
BLMPS003	BLMPS003	Sample in wet and/or dry	7/12/2017 (dryweather, FC = 750 CTS) 7/13/2017 (wetweather, FC = 320 CTS)	Discontinue sampling as dam is set to be removed 2018/2019	Dover	Bellamy River at Dam of Sawyer Mill	River/Stream
BLMPS003A	BLMPS003A	Sample in wet and/or dry	7/12/2017 (dry weather, FC = 370), 7/13/2017 (wet weather, FC = 5300) 10/23/2017 (dry weather, FC = 420 CTS, MSC = 13 PFU)	Consider minimal sampling until dam removal completed.	Dover	Bellamy River Downstream of Dam	River/Stream
BLMPS004	BLMPS004	Sample in wet and/or dry	6/28/2017 (dry weather; no flow) 7/13/2017 (wet weather; no flow)	Visit to confirm no flow	Dover	5 Inch Pink Plastic Pipe	Pipe
BLMPS005	BLMPS005	Sample in wet and/or dry, target wet weather	6/28/2017 (dry weather, FC = <10 CTS) 7/25/17 (wet weather, FC = 100 CTS) 10/23/2017 (dry weather, FC = <10 CTS, MSC = <13.4 PFU)	Sample with a focus on wet weather	Dover	10 Inch Aqua Plastic Pipe	Pipe
BLMPS006	BLMPS006	Sample in wet and/or dry	6/28/2017 (dry weather; no flow) 7/13/2017 (wet weather; no flow)	Visit to confirm no flow	Dover	4 Inch White Plastic Pipe	Pipe

StationID	2011 plan	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Soure Type
BLMPS007	BLMPS007	Sample in wet and/or dry	6/28/2017 (dry weather; no flow) 7/13/2017 (wet weather; no flow)	Visit to confirm no flow	Dover	5 Inch Pink Plastic Pipe	Pipe
BLMPS008	BLMPS008	Sample in wet and/or dry	6/28/2017 (dry weather; no flow) 7/13/2017 (wet weather; no flow)	Visit to confirm no flow	Dover	5 Inch Pink Plastic Pipe	Pipe
BLMPS009	BLMPS009	Sample in wet and/or dry	6/28/2017 (dry weather; no flow) 7/13/2017 (wet weather; no flow)	Visit to confirm no flow	Dover	5 Inch Pink Plastic Pipe	Pipe
BLMPS010	BLMPS010	Sample in wet and/or dry	7/12/2017 (dry weather, FC = 800 CTS) 7/25/2017 (wet weather; no flow) 10/23/2017 (dry weather; no flow)	Sample with a focus on wet weather	Dover	10 Inch Aqua Plastic Pipe	Pipe
BLMPS011	BLMPS011	Sample in wet and/or dry, target wet weather	6/28/2017 (dry weather, FC = <10 CTS) 7/13/2017 (wet weather, FC = >5400 CTS) 7/25/2017 (wet weather, FC = 90 CTS) 10/23/2017 (dry weather, FC = <10 CTS, MSC = <13.4 CFU)	Sample with a focus on wet weather	Dover	12 Inch Concrete Pipe in Concrete Headwall	Pipe
BLMPS012	BLMPS012	Sample in wet and/or dry	7/12/17 (dry weather; no flow) 7/13/2017 (wet weather, FC = 9 CTS) 10/23/2017 (dry weather; no flow)	Sample with a focus on wet weather	Dover	12 Inch Metal Pipe	Pipe
BLMPS013	BLMPS013	Sample in wet and/or dry, target wet weather	7/12/2017 (dry weather; no flow) 7/13/2017 (wet weather, FC = >20000 CTS) 10/23/2017 (dry weather; no flow)	Sample with a focus on wet weather	Dover	24 Inch Concrete Stormwater Outfall	Storm Sewer

StationID	2011 plan	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Soure Type
BLMPS014	BLMPS014	Sample in wet and/or dry	7/12/2017 (dry weather; no flow) 7/13/2017 (wet weather; no flow) 10/23/2017 (dry weather; no flow)	Visit to confirm no flow	Dover	24 Inch Concrete Stormwater Outfall	Storm Sewer
BLMPS015	BLMPS015	Sample in wet and/or dry, target wet weather	7/12/2017 (dry weather; no flow) 7/13/2017 (wet weather, FC = 7200 CTS) 10/23/2017 (dry weather; no flow)	Sample with a focus on wet weather	Dover	14 Inch Concrete Stormwater Outfall	Storm Sewer
BLMPS016	BLMPS016	Sample in wet and/or dry, target wet weather	6/28/2017 (dry weather, FC = <10 CTS) 7/13/2017 (wet weather, FC = 1300 CTS) 7/25/2017 (wet weather, FC = 670 CTS) 10/23/2017 (dry weather; no flow)	Sample with a focus on wet weather	Dover	20 Inch CMP at Ford's Landing Condos	Storm Sewer
BLMPS017	BLMPS017	no sampling; inactive site		Inactivated			
BLMPS018	BLMPS018	no sampling; inactive site		Inactivated			
BLMPS019	BLMPS019	Sample in dry weather	6/28/2017 (dry weather, FC = 50 CTS; by boat)	Sample with a focus on Fall dry weather	Dover	48 Inch Metal Pipe Under Dirt Rd	Culvert
BLMPS020	BLMPS020	Sample in wet and/or dry	7/12/2017 (dry weather, FC = 900 CTS) 7/13/2017 (wet weather, FC = 1900 CTS)	Sample	Dover	Intermittent Stream	River/Stream

StationID	2011 plan	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Soure Type
BLMPS021	BLMPS021	Sample in wet and/or dry	7/17/2017 site visit only 6/25/2018 (wet weather, FC =)	Sample	Dover	36 Inch Corrugated Metal Culvert Under Spur Rd	Culvert
BLMPS022	BLMPS022	Sample in wet and/or dry		Sample	Dover	6 Inch Corrugated Metal Foundation Drain	Pipe
BLMPS023	BLMPS023	Sample in wet and/or dry		Sample	Dover	4 Inch White Plastic Pipe	Pipe
BLMPS024	BLMPS024	Sample in wet and/or dry	6/25/18 (wet weather, overgrown with poison ivy)	Sample	Dover	Intermittent Stream	River/Stream
BLMPS025	BLMPS025	no sampling; inactive site		Inactivated			
BLMPS026	BLMPS026	Sample in wet and/or dry	6/25/18 (wet weather, to low to sample)	Sample	Dover	4 Inch Black Corrugated Plastic Foundation Drain	Pipe
BLMPS027	BLMPS027	Sample in wet and/or dry		Sample	Dover	4 Inch White PVC Foundation Drain	Pipe
BLMPS028	BLMPS028	Sample in wet and/or dry	Not found in 7/17/2017	Sample	Dover	4 Inch White PVC Pipe	Pipe
BLMPS029	BLMPS029	Sample in wet and/or dry		Sample	Dover	4 Inch Black Corrugated Plastic Foundation Drain	Pipe
BLMPS030	BLMPS030	Sample in wet and/or dry		Sample	Dover	4 Inch Black Corrugated Plastic Foundation Drain	Pipe

StationID	2011 plan	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Soure Type
BLMPS031	BLMPS031	Sample in wet and/or dry	7/17/2017 (dry weather; no flow)	Inactivated			
BLMPS032	BLMPS032	Sample in wet and/or dry	7/17/2017 (dry weather; no flow)	Sample	Dover	Intermittent Stream	River/Stream
BLMPS033	BLMPS033	Sample in wet and/or dry		Sample	Dover	2 Inch Black PVC Pipe	Pipe
BLMPS034	BLMPS034	no sampling; inactive site		Inactivated			
BLMPS035	BLMPS035	Sample in wet and/or dry	7/17/2017 (dry weather; no flow) 11/7/2017 (wet weather; no flow)	Sample	Dover	2 (12 Inch) Concrete Road Culverts	Culvert
BLMPS036	BLMPS036	Sample in wet and/or dry	7/17/2017 (dry weather; no flow) 11/7/2017 (wet weather; no flow)	Sample	Dover	18 Inch Black Plastic Stormwater Culvert	Culvert
BLMPS037	BLMPS037	Sample in wet and/or dry, target wet weather	6/28/2017 (dry weather, FC = 9 CTS) 7/13/2017 (wet weather, FC = 20 CTS) 7/25/2017 (wet weather, FC = 120 CTS) 10/23/2017 (dry weather; no flow)	Sample with a focus on wet weather	Dover	30 Inch Concrete Stormwater Culvert Under Spur Rd	Storm Sewer
BLMPS038	BLMPS038	Sample in wet and/or dry	7/17/2017 (dry weather; no flow) 10/23/2017 (dry weather; no flow)	Sample	Dover	6 Inch Black Corrugated Plastic Culvert	Storm Sewer
BLMPS039	BLMPS039	Sample in wet and/or dry, target wet weather	6/28/2017 (dry weather, FC = >=1100 CTS) 7/25/2017 (wet weather, FC = 140 CTS) 10/23/2017 (dry weather, FC = 70 CTS, MSC = <13.4 PFU)	Sample with a focus on wet weather	Dover	30 Inch Concrete Stormwater Culvert Under Spur Rd	Culvert

StationID	2011 plan	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Soure Type
BLMPS040	BLMPS040	Sample in wet and/or dry, target wet weather	6/28/2017 (dry weather, FC = 9 CTS) 7/25/2017 (wet weather, FC = 230 CTS) 10/23/2017 (dry weather, FC = 1080 CTS, MSC = <13.4 PFU)	Sample with a focus on wet weather	Dover	30 Inch Concrete Culvert Under Spur Rd	Culvert
BLMPS041	BLMPS041	Sample in wet and/or dry, target wet weather	6/28/2017 (dry weather, FC = 140 CTS) 7/25/2017 (wet weather, FC = 350 CTS) 10/23/2017 (dry weather, FC = 40 CTS, MSC = <13.4 PFU)	Sample with a focus on wet weather	Dover	Intermittent Stream	River/Stream
BLMPS042	BLMPS042	Sample in wet and/or dry, target wet weather	6/28/2017 (dry weather, FC = <10 CTS) 7/25/2017 (wet weather, FC = 2100 CTS) 10/23/2017 (dry weather, FC = 280 CTS, MSC = <13.4 PFU)	Sample with a focus on wet weather	Dover	Intermittent Stream	River/Stream
BLMPS043	BLMPS043	Sample in wet and/or dry, target wet weather	6/28/2017 (dry weather, FC = 30 CTS) 7/25/2017 (wet weather, FC = 320 CTS) 10/23/2017 (dry weather, FC = 500 CTS, MSC = 187 PFU)	Sample with a focus on wet weather	Dover	24 Inch CMP Under Spur Rd	Culvert
BLMPS044	BLMPS044	Sample in wet and/or dry	7/17/2017 (dry weather; no flow)	Sample	Dover	4 Inch Green PVC Foundation Drain	Pipe
BLMPS045	BLMPS045	Sample in wet and/or dry	12/06/2017 (wet weather, FC = 120 CTS, MSC <13.4 PFU) 6/25/2018 (wet weather, FC =)	Sample	Dover	Intermittent Stream Running Through Granite Culvert	Culvert

StationID	2011 plan	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Soure Type
BLMPS046	BLMPS046	Sample in wet and/or dry	7/17/2017 site visit only 12/6/2017 (dry weather; no flow)	Sample	Dover	36 Inch Concrete Culvert with Broken Flared End Under Spur Rd	Culvert
BLMPS047	BLMPS047	Sample in wet and/or dry		Sample	Dover	30 Inch Corrugated Metal Culvert Under Spur Rd	Culvert
BLMPS048	BLMPS048	Sample in wet and/or dry		Sample	Dover	4 Inch White PVC Pipe	Pipe
BLMPS049	BLMPS049	Sample in wet and/or dry		Sample	Dover	4 Inch White PVC Pipe	Pipe
BLMPS050	BLMPS050	Sample in wet and/or dry		Sample	Dover	4 Inch White PVC with Black Cover	Pipe
BLMPS051	BLMPS051	Sample in wet and/or dry	6/25/2018 (wet weather, too overgrown to sample)	Sample	Dover	24 Inch Black Plastic Pipe Under Spur Rd	Storm Sewer
BLMPS052	BLMPS052	Sample in wet and/or dry	7/17/2017 (dry weather, FC = 300 CTS) 11/7/2017 (wet weather; no flow)	Sample	Dover	24 Inch Concrete Culvert Under Spur Rd	Culvert
BLMPS053	BLMPS053	Site visit	7/17/2017 (site visit only)	Inactivated			
BLMPS054	BLMPS054	Site visit	7/17/2017 (dry weather; no flow)	Inactivated			
BLMPS055	BLMPS055	Sample in wet and/or dry	7/17/2017 (dry weather, FC = 20 CTS) 11/7/2017 (wet weather, FC = 9 CTS, MSC =)	Sample	Dover	Mouth of Intermittent Stream	Wetland Estuarine-Emergent
BLMPS056	BLMPS056	Site visit	7/17/2017 site visit only	Inactivated			

StationID	2011 plan	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Soure Type
BLMPS057	BLMPS057	Sample in wet and/or dry	7/17/2017 (dry weather, FC = 20 CTS) 11/7/2017 (wet weather, FC = 80 CTS, MSC =)	Sample	Dover	Mouth of Intermittent Stream	River/Stream
BLMPS058	BLMPS058	Sample in wet and/or dry	11/7/2017 (wet weather; no flow) 12/6/2017 (dry weather; no flow)	Sample	Dover	16 Inch Concrete Culvert Under Spur Rd	Culvert
BLMPS059	BLMPS059	Sample in wet and/or dry	6/28/2017 (dry weather, FC = 30 CTS) 7/25/2017 (wet weather, FC = 60 CTS) 10/23/2017 (dry weather, FC = 90 CTS, MSC = <13.4 PFU)	Sample	Dover	30 Inch Concrete Culvert Under Spur Rd	Culvert
BLMPS060	BLMPS060	Sample in wet and/or dry	6/25/2018 (wet weather, FC =)	Sample	Dover	30 Inch Concrete Culvert Under Spur Rd	Culvert
BLMPS061	BLMPS061	Sample in wet and/or dry, target wet weather	6/28/2017 (dry weather, FC = 1100 CTS) 7/25/2017 (wet weather, FC = 3500 CTS) 10/23/2017 (dry weather, FC = 180 CTS, MSC = 13 PFU)	Sample with a focus on wet weather	Dover	Varney Brook	River/Stream
BLMPS061A	BLMPS061A	Sample only if needed to assess results on 061		Use to assess unusual results	Dover	Varney Brook Transect	River/Stream
BLMPS061B	BLMPS061B	Sample only if needed to assess results on 061		Use to assess unusual results	Dover	Varney Brook Transect	River/Stream
BLMPS061C	BLMPS061C	Sample only if needed to assess results on 061		Use to assess unusual results	Dover	Varney Brook	River/Stream

StationID	2011 plan	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Soure Type
BLMPS062	BLMPS062	Sample in wet and/or dry	10/23/2017 (dry weather; no flow)	Sample with a focus on wet weather	Durham	18 Inch Concrete Stormwater Culvert	Culvert
BLMPS063	BLMPS063	Site visit	7/17/2017 (dry weather; no flow)	Inactivated			
BLMPS064	BLMPS064	Sample in dry weather	6/28/2017 (dry weather, FC = 150 CTS; by boat)	Sample with a focus on Fall dry weather	Durham	Broken Wooden Bridge	Wetland Estuarine-Emergent
BLMPS065	BLMPS065	Site visit		Inactivated			
BLMPS066	BLMPS066	Sample in dry weather	6/28/2017 (dry weather, FC = <10 CTS; by boat)	Sample with a focus on Fall dry weather	Madbury	Mouth of Tidal Creek to Royals Cove	Wetland Estuarine-Emergent
BLMPS067	BLMPS067	Sample in wet and/or dry	6/28/2017 (dry weather, FC = 220 CTS) 7/13/2017 (wet weather, FC = 700 CTS) 7/25/2017 (wet weather, FC = 960 CTS) 10/23/2017 (dry weather, FC = , MSC = <13)	Sample	Madbury	48 Inch Metal Culvert Under Piscataqua Rd	Culvert
BLMPS068	BLMPS068	Sample in wet and/or dry, target wet weather	7/17/2017 site visit only 12/6/2017 (dry weather; no weather)	Sample	Dover	36 Inch Concrete Culvert Under Spur Rd	Culvert
BLMPS069	BLMPS069	Sample in wet and/or dry	7/17/2017 (dry weather, FC = 130 CTS) 11/7/2017 (wet weather, FC = 20 CTS, MSC =)	Sample	Dover	18 Inch Concrete Stormwater Culvert	Culvert
BLMPS070	BLMPS070	no sampling; inactive site		Inactivated			
BLMPS071	BLMPS071	no sampling; inactive site		Inactivated			
BLMPS072	BLMPS072	no sampling; inactive site		Inactivated			

StationID	2011 plan	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Soure Type
BLMPS073	BLMPS073	no sampling; inactive site		Inactivated			
BLMPS074	BLMPS074	no sampling; inactive site		Inactivated			
BLMPS075	BLMPS075	no sampling; inactive site		Inactivated			
BLMPS076	BLMPS076	Sample in dry weather	6/28/2017 (dry weather, FC = 90 CTS; by boat)	Sample with a focus on Fall dry weather	Dover	Intermittent Stream	River/Stream
BLMPS077	BLMPS077	Sample in dry weather	6/28/2017 (dry weather, FC = 9 CTS; by boat)	Sample with a focus on Fall dry weather	Dover	River Station	River/Stream
BLMPS078	BLMPS078	Sample in dry weather	6/28/2017 (dry weather, FC = 20 CTS; by boat)	Sample with a focus on Fall dry weather	Dover	Intermittent Stream	River/Stream
BLMPS079	BLMPS079	Sample in dry weather	6/28/2017 (dry weather, FC = 40 CTS; by boat)	Sample with a focus on Fall dry weather	Dover	Intermittent Stream	River/Stream
BLMPS080	BLMPS080	Sample in wet and/or dry, target wet weather	6/28/2017 (dry weather, FC = 280 CTS) 7/13/2017 (wet weather, FC = >20000 CTS) 7/25/2017 (wet weather, FC = 1200 CTS) 10/23/2017 (dry weather, FC = 50 CTS, MSC = 27 PFU)	Sample with a focus on wet weather	Dover	24 Inch Concrete Stormwater Outfall	Pipe
BLMPS081	BLMPS081	Sample in wet and/or dry	6/28/2017 (dry weather; no flow) 7/13/2017 (wet weather; no flow) 10/23/2017 (dry weather; no flow)	Visit to confirm no flow	Dover	4 Inch White PVC in Concrete Headwall	Pipe
BLMPS082		Sample in wet and/or dry	10/23/2017 (dry weather; no flow)	Visit to confirm no flow	Dover	12 Inch Black Corrugated Plastic Culvert Under Spur Rd	Culvert

StationID	2011 plan	2017 Plan	2017 Conclusions	Post 2017 Recommendations	Town	Source Description	Soure Type
BLMPS083		Sample in dry weather	9/25/2017 (dry weather, FC = <10 CTS)	Mooring field, possibly sample if boats present	Dover	Royalls Cove Mooring Field	Estuary
BLMPS084		Sample in dry weather	9/25/2017 (dry weather, FC = <10 CTS)	Mooring field, possibly sample if boats present	Dover	Bellamy River Mooring Field	Estuary

Appendix II: Shoreline Pollution Source Sampling Data

Station ID	Project ID	Pollution Source	Date	FC/100ml	FC Units	Comments
BLMPS001	DRY	STORMWATER OUTFALL	4/6/2011	<10	#/100ML	
			10/31/2001			NO DATA
			4/21/2011	<	#/100ML	
			10/23/2017		#/100ML	NO DATA
			10/30/2001			NO DATA
	WET	STORMWATER OUTFALL	4/11/2011	<10	#/100ML	
			4/13/2011	60	#/100ML	
			7/28/2008	460	#/100ML	
			11/29/2001			NO DATA
			6/12/2002	<100	#/100ML	
BLMPS002	DRY	STORMWATER OUTFALL	10/30/2001			NO DATA
			10/31/2001			NO DATA
			9/24/2008		#/100ML	NO DATA
			4/6/2011		#/100ML	NO DATA
			4/21/2011	<	#/100ML	
			7/12/2017		#/100ML	NO DATA
			10/23/2017		#/100ML	NO DATA
	WET	STORMWATER OUTFALL	11/29/2001			NO DATA
			6/12/2002			NO DATA
			7/28/2008		#/100ML	NO DATA
			4/11/2011		#/100ML	NO DATA
			4/13/2011		#/100ML	NO DATA
			7/12/2017		#/100ML	NO DATA
			7/13/2017		#/100ML	NO DATA
BLMPS003	DRY	FRESHWATER RIVER	9/24/2008	540	MPN/100ML	
			10/7/2008	79	MPN/100ML	
			7/12/2017	750	#/100ML	
			10/30/2001	33	#/100ML	
			10/31/2001	825	#/100ML	
			3/30/2011		#/100ML	NO DATA
	WET	FRESHWATER RIVER	9/16/2008	540	MPN/100ML	
			10/23/2008	46	MPN/100ML	
			7/13/2017	320	#/100ML	
			11/29/2001	200	#/100ML	
			6/12/2002	1100	#/100ML	
BLMPS003A	DRY	PERENNIAL STREAM	3/31/2011	13	MPN/100ML	
			4/5/2011	4.5	MPN/100ML	

			10/12/2011	1100	MPN/100ML	
			11/9/2011	6.8	MPN/100ML	
			12/19/2011	7.8	MPN/100ML	
			7/12/2017	370	#/100ML	
			10/23/2017	420	#/100ML	
			11/3/2011	49	MPN/100ML	
	WET	PERENNIAL STREAM	4/11/2011	23	MPN/100ML	
			4/13/2011	49	MPN/100ML	
			4/13/2011	49	MPN/100ML	
			4/14/2011	33	MPN/100ML	
			10/13/2011	330	MPN/100ML	
			5/19/2009	920	MPN/100ML	
			7/13/2017	5300	#/100ML	
BLMPS004	DRY	STORMWATER OUTFALL	10/30/2001			NO DATA
			10/31/2001			NO DATA
			9/24/2008		#/100ML	NO DATA
			3/31/2011		#/100ML	NO DATA
			4/5/2011		#/100ML	NO DATA
			6/28/2017		#/100ML	NO DATA
	WET	STORMWATER OUTFALL	11/29/2001			NO DATA
			6/12/2002			NO DATA
			7/28/2008		#/100ML	NO DATA
			4/11/2011		#/100ML	NO DATA
			4/13/2011		#/100ML	NO DATA
			7/13/2017		#/100ML	NO DATA
BLMPS005	DRY	STORMWATER OUTFALL	3/31/2011	<10	#/100ML	
			4/5/2011	20	#/100ML	
			8/4/2015	100	#/100ML	
			6/28/2017	<10	#/100ML	
			10/23/2017	<10	#/100ML	
			10/30/2001	3	#/100ML	
			10/31/2001	0	#/100ML	
			9/24/2008		#/100ML	NO DATA
	WET	STORMWATER OUTFALL	4/11/2011	140	#/100ML	
			4/13/2011		#/100ML	TNTC
			6/2/2015	1400	#/100ML	
			7/28/2008	60	#/100ML	
			7/25/2017	100	#/100ML	
			11/29/2001	200	#/100ML	
			6/12/2002	100	#/100ML	
			8/23/2018		#/100ML	NO DATA

BLMPS006	DRY	PIPE	10/30/2001			NO DATA
			10/31/2001			NO DATA
			9/24/2008		#/100ML	NO DATA
			3/31/2011		#/100ML	NO DATA
			4/5/2011		#/100ML	NO DATA
			6/28/2017		#/100ML	NO DATA
	WET	PIPE	11/29/2001			NO DATA
			6/12/2002			NO DATA
			7/28/2008		#/100ML	NO DATA
			4/11/2011		#/100ML	NO DATA
			4/13/2011		#/100ML	NO DATA
			7/13/2017		#/100ML	NO DATA
BLMPS007	DRY	PIPE	10/30/2001			NO DATA
			10/31/2001			NO DATA
			9/24/2008		#/100ML	NO DATA
			3/31/2011		#/100ML	NO DATA
			4/5/2011		#/100ML	NO DATA
			6/28/2017		#/100ML	NO DATA
	WET	PIPE	11/29/2001			NO DATA
			6/12/2002			NO DATA
			7/28/2008		#/100ML	NO DATA
			4/11/2011		#/100ML	NO DATA
			4/13/2011		#/100ML	NO DATA
			7/13/2017		#/100ML	NO DATA
BLMPS008	DRY	PIPE	10/30/2001			NO DATA
			10/31/2001			NO DATA
			9/24/2008		#/100ML	NO DATA
			3/31/2011		#/100ML	NO DATA
			4/5/2011		#/100ML	NO DATA
			7/12/2017		#/100ML	NO DATA
	WET	PIPE	11/29/2001			NO DATA
			6/12/2002			NO DATA
			7/28/2008		#/100ML	NO DATA
			4/11/2011		#/100ML	NO DATA
			4/13/2011		#/100ML	NO DATA
			7/13/2017		#/100ML	NO DATA
BLMPS009	DRY	PIPE	10/30/2001			NO DATA
			10/31/2001			NO DATA
			9/24/2008		#/100ML	NO DATA
			3/31/2011		#/100ML	NO DATA
			4/5/2011		#/100ML	NO DATA

			7/12/2017		#/100ML	NO DATA
	WET	PIPE	11/29/2001			NO DATA
			6/12/2002			NO DATA
			7/28/2008		#/100ML	NO DATA
			4/11/2011		#/100ML	NO DATA
			4/13/2011		#/100ML	NO DATA
			7/13/2017		#/100ML	NO DATA
BLMPS010	DRY	PIPE	7/12/2017	800	#/100ML	
			10/30/2001	5	#/100ML	
			10/31/2001	35	#/100ML	
			9/24/2008		#/100ML	NO DATA
			3/31/2011		#/100ML	NO DATA
			4/5/2011		#/100ML	NO DATA
			10/23/2017		#/100ML	NO DATA
	WET	PIPE	4/13/2011	>=710	#/100ML	
			11/29/2001	30	#/100ML	
			6/12/2002	1600	#/100ML	
			7/28/2008		#/100ML	NO DATA
			4/11/2011		#/100ML	NO DATA
			7/25/2017		#/100ML	NO DATA
BLMPS011	COASTINV	PIPE	6/22/2011	460	#/100ML	
	DRY	PIPE	3/31/2011	130	#/100ML	
			4/5/2011	2150	#/100ML	
			10/12/2011	<10	#/100ML	
			11/3/2011	30	#/100ML	
			11/9/2011	<10	#/100ML	
			12/19/2011	<10	#/100ML	
			8/4/2015	9	#/100ML	
			6/28/2017	<10	#/100ML	
			10/23/2017	<10	#/100ML	
			10/30/2001	3	#/100ML	
			10/31/2001	3	#/100ML	
			9/24/2008		#/100ML	NO DATA
	WET	PIPE	4/11/2011	800	#/100ML	
			4/13/2011	90	#/100ML	
			4/13/2011	380	#/100ML	
			10/13/2011	6500	#/100ML	
			6/2/2015	1720	#/100ML	
			7/28/2008	2100	#/100ML	
			7/13/2017	>5400	#/100ML	
			7/25/2017	90	#/100ML	

			11/29/2001	360	#/100ML	
			6/12/2002	<100	#/100ML	
			8/23/2018		#/100ML	NO DATA
BLMPS012	DRY	PIPE	10/30/2001			NO DATA
			10/31/2001			NO DATA
			9/24/2008		#/100ML	NO DATA
			4/6/2011		#/100ML	NO DATA
			4/21/2011	<	#/100ML	
			7/12/2017		#/100ML	NO DATA
			10/23/2017		#/100ML	NO DATA
	WET	PIPE	4/13/2011	60	#/100ML	
			7/13/2017	9	#/100ML	
			11/29/2001			NO DATA
			11/29/2001			NO DATA
			6/12/2002			NO DATA
			7/28/2008		#/100ML	NO DATA
			4/11/2011		#/100ML	NO DATA
BLMPS013	DRY	STORMWATER OUTFALL	10/30/2001			NO DATA
			10/31/2001			NO DATA
			9/24/2008		#/100ML	NO DATA
			4/5/2011		#/100ML	NO DATA
			7/12/2017		#/100ML	NO DATA
			10/23/2017		#/100ML	NO DATA
	WET	STORMWATER OUTFALL	4/13/2011	60	#/100ML	
			7/13/2017	>20000	#/100ML	
			11/29/2001			NO DATA
			6/12/2002			NO DATA
			7/28/2008		#/100ML	NO DATA
			4/11/2011		#/100ML	NO DATA
BLMPS014	DRY	STORMWATER OUTFALL	10/30/2001	23	#/100ML	
			10/31/2001	545	#/100ML	
			9/24/2008		#/100ML	NO DATA
			4/5/2011		#/100ML	NO DATA
			7/12/2017		#/100ML	NO DATA
			10/23/2017		#/100ML	NO DATA
	WET	STORMWATER OUTFALL	11/29/2001	4500	#/100ML	
			6/12/2002	100	#/100ML	
			4/28/2008		#/100ML	NO DATA
			7/28/2008		#/100ML	NO DATA
			4/11/2011		#/100ML	NO DATA
			4/13/2011		#/100ML	NO DATA

			7/13/2017		#/100ML	NO DATA
BLMPS015	DRY	STORMWATER OUTFALL	4/6/2011	<10	#/100ML	
			10/30/2001			NO DATA
			10/31/2001			NO DATA
			9/24/2008		#/100ML	NO DATA
			4/21/2011	<	#/100ML	
			7/12/2017		#/100ML	NO DATA
			10/23/2017		#/100ML	NO DATA
	WET	STORMWATER OUTFALL	4/11/2011	<10	#/100ML	
			4/13/2011	10	#/100ML	
			7/13/2017	7200	#/100ML	
			11/29/2001	10	#/100ML	
			6/12/2002	<100	#/100ML	
BLMPS016	DRY	STORMWATER OUTFALL	6/28/2017	<10	#/100ML	
			10/30/2001			NO DATA
			10/31/2001			NO DATA
			4/21/2011	<	#/100ML	
			8/4/2015		#/100ML	NO DATA
			10/23/2017		#/100ML	NO DATA
	WET	STORMWATER OUTFALL	4/12/2011	<10	#/100ML	
			4/13/2011		#/100ML	TNTC
			10/13/2011	10000	#/100ML	
			6/2/2015	>=3400	#/100ML	
			7/13/2017	1300	#/100ML	
			7/25/2017	670	#/100ML	
			8/23/2018	3700	CFU/100ML	
			11/29/2001	1400	#/100ML	
			6/12/2002	165	#/100ML	
BLMPS017	COASTRES	INTERMITTENT STREAM	3/13/2006	355	#/100ML	
			3/28/2006	8	#/100ML	
			3/28/2006	6	#/100ML	
			4/4/2006	4400	#/100ML	
			4/4/2006	4400	#/100ML	
			4/11/2006	8	#/100ML	
			4/25/2006	39	#/100ML	
			5/2/2006	960	#/100ML	
			5/2/2006	860	#/100ML	
			5/9/2006	46	#/100ML	
	DRY	INTERMITTENT STREAM	10/30/2001	28	#/100ML	
			10/31/2001	1708	#/100ML	
	SURVEY	INTERMITTENT	3/13/2006	355	#/100ML	

		STREAM	3/13/2006	400	#/100ML	
	WET	INTERMITTENT STREAM	11/29/2001	390	#/100ML	
			6/12/2002	227.5	#/100ML	
			4/28/2008		#/100ML	NO DATA
BLMPS018	DRY	PIPE	10/30/2001			NO DATA
			10/31/2001			NO DATA
	WET	PIPE	11/29/2001			NO DATA
			6/12/2002			NO DATA
BLMPS019	DRY	SEWER LINE	6/28/2017	50	#/100ML	
			10/30/2001	5	#/100ML	
			10/31/2001	0	#/100ML	
	WET	SEWER LINE	4/12/2011	20	#/100ML	
			11/29/2001	10	#/100ML	
			6/12/2002	40	#/100ML	
BLMPS020	DRY	INTERMITTENT STREAM	4/6/2011	10	#/100ML	
			9/24/2008	510	#/100ML	
			7/12/2017	900	#/100ML	
			10/30/2001	10	#/100ML	
			10/31/2001	18	#/100ML	
			4/21/2011	<	#/100ML	
	WET	INTERMITTENT STREAM	4/11/2011	160	#/100ML	
			4/13/2011	170	#/100ML	
			7/28/2008	270	#/100ML	
			7/13/2017	1900	#/100ML	
			11/29/2001	60	#/100ML	
			6/12/2002	240	#/100ML	
BLMPS021	DRY	ROAD CULVERT	3/31/2011	<10	#/100ML	
			4/5/2011	<10	#/100ML	
			12/6/2017	190	#/100ML	
			10/30/2001	0	#/100ML	
			10/31/2001	0	#/100ML	
			7/17/2017		#/100ML	NO DATA
	WET	ROAD CULVERT	4/11/2011	50	#/100ML	
			4/13/2011	100	#/100ML	
			6/5/2008	200	#/100ML	
			6/25/2018	170	CFU/100ML	
			11/29/2001	650	#/100ML	
			6/12/2002	<100	#/100ML	
			6/2/2008		#/100ML	NO DATA
BLMPS022	DRY	FOUNDATION DRAIN	10/30/2001			NO DATA
			10/31/2001			NO DATA

	WET	FOUNDATION DRAIN	11/29/2001			NO DATA
			6/12/2002			NO DATA
			9/3/2008		#/100ML	NO DATA
			4/14/2011		#/100ML	NO DATA
BLMPS023	DRY	FOUNDATION DRAIN	10/30/2001			NO DATA
			10/31/2001			NO DATA
	WET	FOUNDATION DRAIN	11/29/2001			NO DATA
			6/12/2002			NO DATA
			9/3/2008		#/100ML	NO DATA
BLMPS024	DRY	INTERMITTENT STREAM	12/6/2017	100	#/100ML	
			10/30/2001			NO DATA
			10/31/2001			NO DATA
	WET	INTERMITTENT STREAM	4/14/2011	10	#/100ML	
			7/28/2008	290	#/100ML	
			11/29/2001			NO DATA
			6/12/2002	<100	#/100ML	
			6/25/2018		#/100ML	NO DATA
BLMPS025	DRY	ROAD CULVERT	10/30/2001			NO DATA
			10/31/2001			NO DATA
	WET	ROAD CULVERT	4/14/2011	20	#/100ML	
			11/29/2001			NO DATA
			6/12/2002	400	#/100ML	
BLMPS026	DRY	FOUNDATION DRAIN	10/30/2001			NO DATA
			10/31/2001			NO DATA
	WET	FOUNDATION DRAIN	11/29/2001	<10	#/100ML	
			6/12/2002			NO DATA
			7/28/2008		#/100ML	NO DATA
			4/14/2011		#/100ML	NO DATA
			6/25/2018		#/100ML	NO DATA
BLMPS027	DRY	FOUNDATION DRAIN	10/30/2001			NO DATA
			10/31/2001			NO DATA
	WET	FOUNDATION DRAIN	11/29/2001			NO DATA
			6/12/2002	<100	#/100ML	
			7/28/2008		#/100ML	NO DATA
			4/14/2011		#/100ML	NO DATA
BLMPS028	DRY	PIPE	4/5/2011	<10	#/100ML	
			10/30/2001	23	#/100ML	
			10/31/2001	15	#/100ML	
			9/24/2008		#/100ML	NO DATA
			10/7/2008		#/100ML	NO DATA
			3/31/2011		#/100ML	NO DATA

	WET	PIPE	4/11/2011	<10	#/100ML	
			4/13/2011	<10	#/100ML	
			11/29/2001	1220	#/100ML	
			6/12/2002			NO DATA
			7/24/2008		#/100ML	NO DATA
			8/4/2008		#/100ML	NO DATA
BLMPS029	DRY	FOUNDATION DRAIN	10/30/2001			NO DATA
			10/31/2001			NO DATA
	WET	FOUNDATION DRAIN	11/29/2001			NO DATA
			6/12/2002			NO DATA
			7/24/2008		#/100ML	NO DATA
			4/14/2011		#/100ML	NO DATA
BLMPS030	DRY	FOUNDATION DRAIN	10/30/2001			NO DATA
			10/31/2001			NO DATA
	WET	FOUNDATION DRAIN	11/29/2001	<10	#/100ML	
			6/12/2002	<50	#/100ML	
			7/24/2008		#/100ML	NO DATA
			4/14/2011		#/100ML	NO DATA
BLMPS031	DRY	ROAD CULVERT	10/30/2001	60	#/100ML	
			10/31/2001			NO DATA
			3/31/2011		#/100ML	NO DATA
			7/17/2017		#/100ML	NO DATA
	WET	ROAD CULVERT	4/11/2011	<10	#/100ML	
			4/12/2011	10	#/100ML	
			4/13/2011	130	#/100ML	
			7/24/2008	1200	#/100ML	
			11/29/2001	210	#/100ML	
			6/12/2002	<100	#/100ML	
BLMPS032	DRY	INTERMITTENT STREAM	9/24/2008	<10	#/100ML	
			10/7/2008	40	#/100ML	
			12/6/2017	70	#/100ML	
			10/30/2001			NO DATA
			10/31/2001			NO DATA
			7/17/2017		#/100ML	NO DATA
	WET	INTERMITTENT STREAM	4/12/2011	5	#/100ML	
			4/13/2011	190	#/100ML	
			6/2/2008	50	#/100ML	
			7/24/2008	1800	#/100ML	
			11/29/2001	>20000	#/100ML	
			6/12/2002	400	#/100ML	
BLMPS033	DRY	PIPE	10/30/2001			NO DATA

			10/31/2001			NO DATA
	WET	PIPE	11/29/2001			NO DATA
			6/12/2002			NO DATA
			4/14/2011		#/100ML	NO DATA
BLMPS034	DRY	PIPE	10/30/2001	>8000	#/100ML	
			10/31/2001			NO DATA
	WET	PIPE	11/29/2001	80	#/100ML	
			6/12/2002	>8000	#/100ML	
BLMPS035	DRY	STORMWATER CULVERT	10/30/2001			NO DATA
			10/31/2001			NO DATA
			4/6/2011		#/100ML	NO DATA
			7/17/2017		#/100ML	NO DATA
	WET	STORMWATER CULVERT	11/29/2001			NO DATA
			6/12/2002			NO DATA
			4/28/2008		#/100ML	NO DATA
			6/2/2008		#/100ML	NO DATA
			4/11/2011		#/100ML	NO DATA
			4/13/2011		#/100ML	NO DATA
			11/7/2017		#/100ML	NO DATA
BLMPS036	DRY	STORMWATER CULVERT	10/30/2001			NO DATA
			10/31/2001	0	#/100ML	
			7/17/2017		#/100ML	NO DATA
	WET	STORMWATER CULVERT	4/13/2011	<10	#/100ML	
			11/29/2001	160	#/100ML	
			6/12/2002	960	#/100ML	
			6/2/2008		#/100ML	NO DATA
			8/4/2008		#/100ML	NO DATA
			11/7/2017		#/100ML	NO DATA
BLMPS037	DRY	STORMWATER CULVERT	4/6/2011	<10	#/100ML	
			8/4/2015	320	#/100ML	
			6/28/2017	9	#/100ML	
			10/30/2001			NO DATA
			10/31/2001	0	#/100ML	
			10/23/2017		#/100ML	NO DATA
			8/28/2018		#/100ML	NO DATA
	WET	STORMWATER CULVERT	4/11/2011	<10	#/100ML	
			4/13/2011	1410	#/100ML	
			6/2/2015	9	#/100ML	
			7/13/2017	20	#/100ML	
			7/25/2017	120	#/100ML	
			8/23/2018	3400	CFU/100ML	

			11/29/2001	60	#/100ML	
			6/12/2002	130	#/100ML	
			6/2/2008		#/100ML	NO DATA
			8/4/2008		#/100ML	NO DATA
			10/13/2011		#/100ML	NO DATA
			9/11/2018		#/100ML	NO DATA
BLMPS038	DRY	ROAD CULVERT	10/30/2001			NO DATA
			10/31/2001			NO DATA
			4/6/2011		#/100ML	NO DATA
			7/17/2017		#/100ML	NO DATA
			10/23/2017		#/100ML	NO DATA
	WET	ROAD CULVERT	11/29/2001			NO DATA
			6/12/2002	12.5	#/100ML	
			6/2/2008		#/100ML	NO DATA
			8/4/2008		#/100ML	NO DATA
			4/11/2011		#/100ML	NO DATA
			4/13/2011		#/100ML	NO DATA
BLMPS039	DRY	ROAD CULVERT	4/5/2011	<10	#/100ML	
			6/28/2017	>=100	#/100ML	
			10/23/2017	70	#/100ML	
			10/30/2001			NO DATA
			10/31/2001	10	#/100ML	
			10/7/2008		#/100ML	NO DATA
			3/31/2011		#/100ML	NO DATA
			8/4/2015		#/100ML	NO DATA
	WET	ROAD CULVERT	4/11/2011	<10	#/100ML	
			4/13/2011	400	#/100ML	
			10/13/2011	3800	#/100ML	
			6/2/2015	3000	#/100ML	
			7/25/2017	140	#/100ML	
			8/23/2018	1400	CFU/100ML	
			11/29/2001	2200	#/100ML	
			6/12/2002	<100	#/100ML	
BLMPS040	COASTINV	INTERMITTENT STREAM	6/22/2011	<10	#/100ML	
	DRY	INTERMITTENT STREAM	10/12/2011	1120	#/100ML	
			11/3/2011	2000	#/100ML	
			11/9/2011	2300	#/100ML	
			12/19/2011	2500	#/100ML	
			8/4/2015	70	#/100ML	
			10/7/2008	60	#/100ML	
			6/28/2017	9	#/100ML	

			10/23/2017	1080	#/100ML	
			10/30/2001	633	#/100ML	
			10/31/2001	18	#/100ML	
			3/31/2011		#/100ML	NO DATA
	WET	INTERMITTENT STREAM	6/2/2015	890	#/100ML	
			7/24/2008	2100	#/100ML	
			8/4/2008	440	#/100ML	
			7/25/2017	230	#/100ML	
			8/23/2018	510	CFU/100ML	
			11/29/2001	420	#/100ML	
			6/12/2002	200	#/100ML	
			9/3/2008		#/100ML	NO DATA
BLMPS041	DRY	INTERMITTENT STREAM	3/31/2011	5	#/100ML	
			4/5/2011	<5	#/100ML	
			9/24/2008	8	#/100ML	
			6/28/2017	140	#/100ML	
			10/23/2017	40	#/100ML	
			10/30/2001	8	#/100ML	
			10/31/2001			NO DATA
			10/7/2008		#/100ML	NO DATA
			8/4/2015		#/100ML	NO DATA
	WET	INTERMITTENT STREAM	4/11/2011	10	#/100ML	
			4/13/2011	500	#/100ML	
			6/2/2015	2500	#/100ML	
			7/24/2008	2600	#/100ML	
			8/4/2008	490	#/100ML	
			7/25/2017	350	#/100ML	
			8/23/2018	1200	CFU/100ML	
			11/29/2001	1010	#/100ML	
			6/12/2002	400	#/100ML	
BLMPS042	COASTINV	INTERMITTENT STREAM	6/22/2011	<10	#/100ML	
	DRY	INTERMITTENT STREAM	3/31/2011	50	#/100ML	
			4/5/2011	260	#/100ML	
			8/4/2015	40	#/100ML	
			10/7/2008	20	#/100ML	
			6/28/2017	<10	#/100ML	
			10/23/2017	280	#/100ML	
			10/30/2001			NO DATA
			10/31/2001	103	#/100ML	
	WET	INTERMITTENT STREAM	4/11/2011	390	#/100ML	
			4/13/2011	4500	#/100ML	

			6/2/2015	1580	#/100ML	
			4/28/2008	30	#/100ML	
			7/24/2008	1300	#/100ML	
			8/4/2008	440	#/100ML	
			7/25/2017	2100	#/100ML	
			8/23/2018	1000	CFU/100ML	
			11/29/2001			NO DATA
			6/12/2002			NO DATA
			9/3/2008		#/100ML	NO DATA
BLMPS043	DRY	INTERMITTENT STREAM	3/31/2011	<10	#/100ML	
			4/5/2011	<10	#/100ML	
			8/4/2015	110	#/100ML	
			6/28/2017	30	#/100ML	
			10/23/2017	500	#/100ML	
			10/30/2001	5	#/100ML	
			10/31/2001	3	#/100ML	
	WET	INTERMITTENT STREAM	4/11/2011	30	#/100ML	
			4/13/2011	630	#/100ML	
			10/13/2011	2300	#/100ML	
			6/2/2015	1290	#/100ML	
			6/2/2008	<5	#/100ML	
			7/25/2017	320	#/100ML	
			8/23/2018	150	CFU/100ML	
			11/29/2001	30	#/100ML	
			6/12/2002	<100	#/100ML	
BLMPS044	DRY	FOUNDATION DRAIN	10/30/2001			NO DATA
			10/31/2001			NO DATA
			7/17/2017		#/100ML	NO DATA
	WET	FOUNDATION DRAIN	4/14/2011	<10	#/100ML	
			11/29/2001	390	#/100ML	
			6/12/2002			NO DATA
			4/12/2011		#/100ML	NO DATA
			6/2/2008		#/100ML	NO DATA
BLMPS045	DRY	INTERMITTENT STREAM	3/31/2011	<10	#/100ML	
			4/5/2011	<10	#/100ML	
			12/6/2017	120	#/100ML	
			10/30/2001	113	#/100ML	
			10/31/2001	3	#/100ML	
			4/21/2011	<	#/100ML	
	WET	INTERMITTENT STREAM	4/11/2011	30	#/100ML	
			4/13/2011	10	#/100ML	

			6/25/2018	>2000	CFU/100ML	
			11/29/2001	380	#/100ML	
			6/12/2002	<100	#/100ML	
			4/28/2008		#/100ML	NO DATA
			7/28/2008		#/100ML	NO DATA
BLMPS046	DRY	INTERMITTENT STREAM	12/6/2017	20	#/100ML	
			10/30/2001			NO DATA
			10/31/2001			NO DATA
			10/7/2008		#/100ML	NO DATA
			7/17/2017		#/100ML	NO DATA
	WET	INTERMITTENT STREAM	4/14/2011	80	#/100ML	
			11/29/2001	110	#/100ML	
			6/2/2008		#/100ML	NO DATA
			8/4/2008		#/100ML	NO DATA
BLMPS047	DRY	INTERMITTENT STREAM	10/30/2001			NO DATA
			10/31/2001			NO DATA
			10/7/2008		#/100ML	NO DATA
	WET	INTERMITTENT STREAM	4/14/2011	<10	#/100ML	
			7/24/2008	4800	#/100ML	
			6/12/2002			NO DATA
BLMPS048	DRY	FOUNDATION DRAIN	10/30/2001			NO DATA
			10/31/2001			NO DATA
			10/7/2008		#/100ML	NO DATA
	WET	FOUNDATION DRAIN	11/29/2001			NO DATA
			6/12/2002			NO DATA
			7/24/2008		#/100ML	NO DATA
			4/14/2011		#/100ML	NO DATA
BLMPS049	DRY	FOUNDATION DRAIN	10/30/2001			NO DATA
			10/31/2001			NO DATA
			10/7/2008		#/100ML	NO DATA
	WET	FOUNDATION DRAIN	11/29/2001			NO DATA
			6/12/2002			NO DATA
			7/24/2008		#/100ML	NO DATA
			4/14/2011		#/100ML	NO DATA
BLMPS050	DRY	FOUNDATION DRAIN	10/30/2001			NO DATA
			10/31/2001			NO DATA
			10/7/2008		#/100ML	NO DATA
	WET	FOUNDATION DRAIN	6/12/2002			NO DATA
			7/24/2008		#/100ML	NO DATA
			4/14/2011		#/100ML	NO DATA
BLMPS051	DRY	INTERMITTENT	10/30/2001			NO DATA

		STREAM	10/31/2001			NO DATA
			10/7/2008		#/100ML	NO DATA
	WET	INTERMITTENT STREAM	4/14/2011	20	#/100ML	
			7/24/2008	7900	#/100ML	
			11/29/2001			NO DATA
			6/12/2002			NO DATA
			6/25/2018		#/100ML	NO DATA
BLMPS052	DRY	INTERMITTENT STREAM	9/24/2008	<10	#/100ML	
			7/17/2017	300	#/100ML	
			10/30/2001			NO DATA
			10/31/2001			NO DATA
			10/7/2008		#/100ML	NO DATA
			3/31/2011		#/100ML	NO DATA
	WET	INTERMITTENT STREAM	4/11/2011	<10	#/100ML	
			4/13/2011	150	#/100ML	
			6/2/2008	90	#/100ML	
			11/29/2001	220	#/100ML	
			6/12/2002	260	#/100ML	
			8/4/2008		#/100ML	NO DATA
			11/7/2017		#/100ML	NO DATA
BLMPS053	DRY	INTERMITTENT STREAM	10/7/2008	<10	#/100ML	
			10/30/2001			NO DATA
			10/31/2001	10	#/100ML	
			4/6/2011		#/100ML	NO DATA
	WET	INTERMITTENT STREAM	11/29/2001	10	#/100ML	
			6/12/2002	405	#/100ML	
BLMPS054	DRY	INTERMITTENT STREAM	10/30/2001	860	#/100ML	
			10/31/2001	0	#/100ML	
			10/7/2008		#/100ML	NO DATA
			4/6/2011		#/100ML	NO DATA
			7/17/2017		#/100ML	NO DATA
	WET	INTERMITTENT STREAM	11/29/2001	210	#/100ML	
			6/12/2002	7.5	#/100ML	
BLMPS055	DRY	TIDAL CREEK	3/31/2011	<10	#/100ML	
			10/7/2008	9	#/100ML	
			7/17/2017	20	#/100ML	
			10/30/2001	60	#/100ML	
			10/31/2001			NO DATA
	WET	TIDAL CREEK	4/11/2011	<5	#/100ML	
			4/13/2011	<10	#/100ML	
			6/2/2008	140	#/100ML	

			8/4/2008	380	#/100ML	
			11/7/2017	9	#/100ML	
			11/29/2001	<10	#/100ML	
			6/12/2002	220	#/100ML	
			4/28/2008		#/100ML	NO DATA
			9/3/2008		#/100ML	NO DATA
BLMPS056	DRY	INTERMITTENT STREAM	10/30/2001	3	#/100ML	
			10/31/2001			NO DATA
			10/7/2008		#/100ML	NO DATA
			4/6/2011		#/100ML	NO DATA
			7/17/2017		#/100ML	NO DATA
	WET	INTERMITTENT STREAM	11/29/2001	280	#/100ML	
			6/12/2002	>1000	#/100ML	
BLMPS057	DRY	INTERMITTENT STREAM	4/6/2011	5	#/100ML	
			9/24/2008	9	#/100ML	
			7/17/2017	20	#/100ML	
			10/30/2001			NO DATA
			10/31/2001			NO DATA
			10/7/2008		#/100ML	NO DATA
	WET	INTERMITTENT STREAM	4/11/2011	<10	#/100ML	
			4/13/2011	80	#/100ML	
			6/2/2008	110	#/100ML	
			11/7/2017	80	#/100ML	
			6/12/2002	440	#/100ML	
			8/4/2008		#/100ML	NO DATA
BLMPS058	DRY	INTERMITTENT STREAM	10/7/2008	60	#/100ML	
			10/30/2001			NO DATA
			10/31/2001			NO DATA
			3/31/2011		#/100ML	NO DATA
			12/6/2017		#/100ML	NO DATA
	WET	INTERMITTENT STREAM	4/11/2011	<10	#/100ML	
			4/13/2011	<10	#/100ML	
			11/29/2001			NO DATA
			6/12/2002	67.5	#/100ML	
			4/28/2008		#/100ML	NO DATA
			11/7/2017		#/100ML	NO DATA
BLMPS059	DRY	INTERMITTENT STREAM	3/31/2011	60	#/100ML	
			4/5/2011	10	#/100ML	
			8/4/2015	60	#/100ML	
			6/28/2017	30	#/100ML	
			10/23/2017	90	#/100ML	

			10/30/2001	138	#/100ML	
			10/31/2001	108	#/100ML	
	WET	INTERMITTENT STREAM	4/11/2011	<10	#/100ML	
			4/13/2011	>2000	#/100ML	
			10/13/2011	650	#/100ML	
			6/2/2015	250	#/100ML	
			4/28/2008	70	#/100ML	
			6/5/2008	<10	#/100ML	
			7/25/2017	60	#/100ML	
			8/23/2018	370	CFU/100ML	
			11/29/2001	180	#/100ML	
			6/12/2002	<100	#/100ML	
BLMPS060	DRY	ROAD CULVERT	4/5/2011	<10	#/100ML	
			10/30/2001	3	#/100ML	
			10/31/2001	0	#/100ML	
			3/31/2011		#/100ML	NO DATA
			12/6/2017		#/100ML	NO DATA
	WET	ROAD CULVERT	4/11/2011	<10	#/100ML	
			4/13/2011	<10	#/100ML	
			6/5/2008	<10	#/100ML	
			6/25/2018	<10	CFU/100ML	
			11/29/2001	40	#/100ML	
			6/12/2002	<100	#/100ML	
BLMPS061	COASTINV	PERENNIAL STREAM	6/22/2011	810	#/100ML	
	DRY	PERENNIAL STREAM	3/31/2011	2	MPN/100ML	
			4/5/2011	2	MPN/100ML	
			10/12/2011	490	MPN/100ML	
			11/9/2011	170	MPN/100ML	
			12/19/2011	>1600	MPN/100ML	
			8/4/2015	560	#/100ML	
			8/25/2008	480	#/100ML	
			9/22/2008	440	#/100ML	
			11/5/2008	540	MPN/100ML	
			11/5/2008	110	MPN/100ML	
			11/5/2008	220	MPN/100ML	
			11/5/2008	240	MPN/100ML	
			11/5/2008	350	MPN/100ML	
			11/5/2008	79	MPN/100ML	
			11/6/2008	920	MPN/100ML	
			11/6/2008	33	MPN/100ML	
			11/6/2008	110	MPN/100ML	

			11/6/2008	140	MPN/100ML	
			11/6/2008	79	MPN/100ML	
			6/28/2017	1100	#/100ML	
			10/23/2017	180	#/100ML	
			10/30/2001	178	#/100ML	
			10/31/2001	68	#/100ML	
			11/3/2011	130	MPN/100ML	
	SFOPSTATVAR	PERENNIAL STREAM	11/13/2008	110	MPN/100ML	
	WET	PERENNIAL STREAM	4/11/2011	540	MPN/100ML	
			4/13/2011	4.5	MPN/100ML	
			4/13/2011	1600	MPN/100ML	
			4/14/2011	220	MPN/100ML	
			10/13/2011	16000	MPN/100ML	
			6/2/2015	>1600	MPN/100ML	
			4/28/2008	60	#/100ML	
			6/2/2008	640	#/100ML	
			6/5/2008	5100	#/100ML	
			7/29/2008	360	#/100ML	
			8/4/2008	2200	#/100ML	
			10/23/2008	70	#/100ML	
			7/25/2017	3500	#/100ML	
			8/23/2018	3400	CFU/100ML	
			11/29/2001	150	#/100ML	
			6/12/2002	1500	#/100ML	
BLMPS061A	DRY	PERENNIAL STREAM	3/31/2011	7.8	MPN/100ML	
			8/25/2008	310	#/100ML	
			9/22/2008	150	#/100ML	
	WET	PERENNIAL STREAM	4/14/2011	240	MPN/100ML	
			7/29/2008	330	#/100ML	
			8/4/2008	2300	#/100ML	
			10/23/2008	70	#/100ML	
BLMPS061B	DRY	PERENNIAL STREAM	3/31/2011	7	MPN/100ML	
			8/25/2008	60	#/100ML	
			9/22/2008	70	#/100ML	
	WET	PERENNIAL STREAM	4/14/2011	140	MPN/100ML	
			7/29/2008	230	#/100ML	
			10/23/2008	70	#/100ML	
BLMPS061C	DRY	PERENNIAL STREAM	3/31/2011	4.5	MPN/100ML	
			4/5/2011	6.8	MPN/100ML	
			11/24/2008	95	MPN/100ML	
			11/24/2008	350	MPN/100ML	

			11/24/2008	>1600	MPN/100ML	
			11/24/2008	>1600	MPN/100ML	
			11/24/2008	920	MPN/100ML	
			11/24/2008	540	MPN/100ML	
			11/10/2008		#/100ML	NO DATA
			11/13/2008		#/100ML	NO DATA
			11/18/2008		#/100ML	NO DATA
			11/18/2008		#/100ML	NO DATA
			11/19/2008		#/100ML	NO DATA
			11/19/2008		#/100ML	NO DATA
			11/19/2008		#/100ML	NO DATA
	SFBLMDYE	PERENNIAL STREAM	11/24/2008	95	MPN/100ML	
			11/24/2008	350	MPN/100ML	
			11/24/2008	>1600	MPN/100ML	
			11/24/2008	>1600	MPN/100ML	
			11/24/2008	920	MPN/100ML	
			11/24/2008	540	MPN/100ML	
			11/10/2008		#/100ML	NO DATA
			11/13/2008		#/100ML	NO DATA
			11/18/2008		#/100ML	NO DATA
			11/18/2008		#/100ML	NO DATA
			11/19/2008		#/100ML	NO DATA
			11/19/2008		#/100ML	NO DATA
			11/19/2008		#/100ML	NO DATA
	WET	PERENNIAL STREAM	4/11/2011	350	MPN/100ML	
			4/13/2011	4.5	MPN/100ML	
			4/13/2011	1600	MPN/100ML	
BLMPS062	DRY	ROAD CULVERT	10/30/2001			NO DATA
			10/31/2001			NO DATA
			4/6/2011		#/100ML	NO DATA
			4/21/2011	<	#/100ML	
			8/4/2015		#/100ML	NO DATA
			10/23/2017		#/100ML	NO DATA
	WET	ROAD CULVERT	4/11/2011	5	#/100ML	
			4/13/2011	2160	#/100ML	
			6/2/2015	7100	#/100ML	
			11/29/2001	<10	#/100ML	
			6/12/2002	2580	#/100ML	
			4/28/2008		#/100ML	NO DATA
			10/13/2011		#/100ML	NO DATA
BLMPS063	DRY	ROAD	4/6/2011	<10	#/100ML	

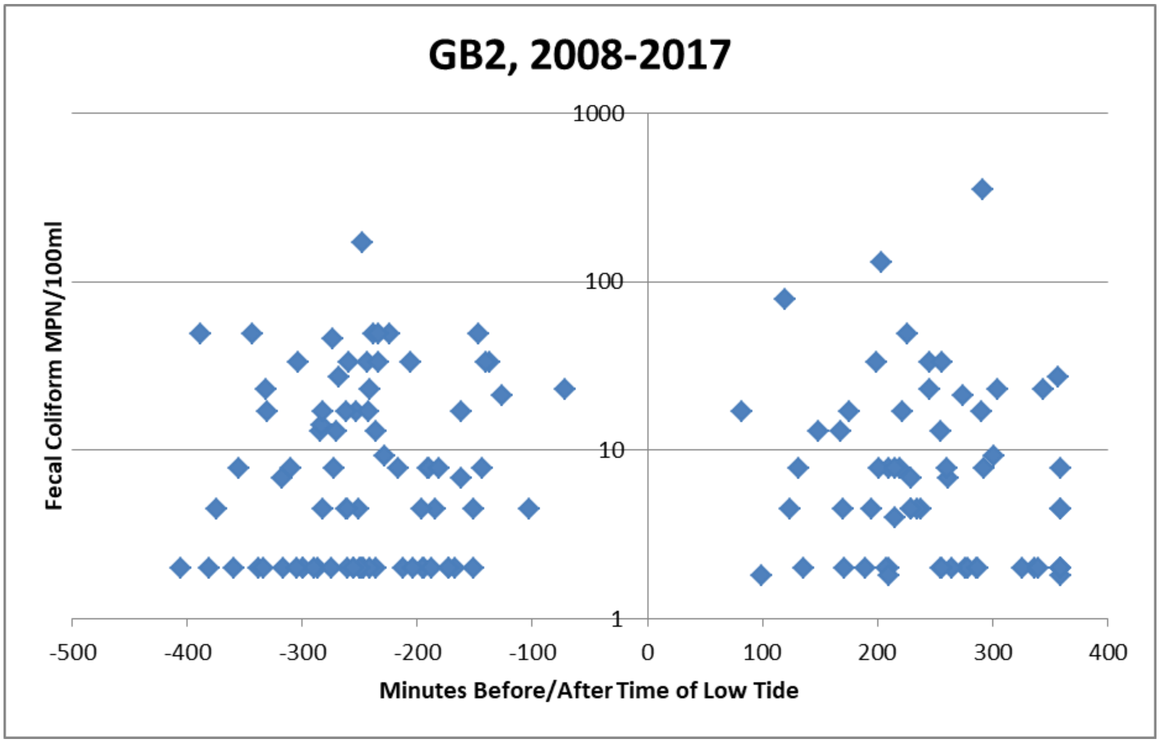
		CULVERT	9/24/2008	<10	#/100ML	
			10/7/2008	<10	#/100ML	
			10/30/2001			NO DATA
			10/31/2001			NO DATA
			4/21/2011	<	#/100ML	
			7/17/2017		#/100ML	NO DATA
	WET	ROAD CULVERT	6/5/2008	460	#/100ML	
			11/29/2001	10	#/100ML	
			6/12/2002	160	#/100ML	
			10/23/2008		#/100ML	NO DATA
BLMPS064	DRY	TIDAL CREEK	3/31/2011	<10	#/100ML	
			8/25/2008	<10	#/100ML	
			9/22/2008	30	#/100ML	
			9/24/2008	30	#/100ML	
			10/7/2008	<10	#/100ML	
			6/28/2017	150	#/100ML	
			10/30/2001	3	#/100ML	
			10/31/2001	0	#/100ML	
	WET	TIDAL CREEK	4/14/2011	<10	#/100ML	
			6/5/2008	100	#/100ML	
			7/29/2008	20	#/100ML	
			10/23/2008	20	#/100ML	
			11/29/2001	20	#/100ML	
			6/12/2002	600	#/100ML	
BLMPS065	DRY	ROAD CULVERT	4/6/2011	<10	#/100ML	
			10/30/2001			NO DATA
			10/31/2001			NO DATA
			4/21/2011	<	#/100ML	
	WET	ROAD CULVERT	11/29/2001	120	#/100ML	
			6/12/2002	1575	#/100ML	
BLMPS066	DRY	TIDAL CREEK	3/31/2011	10	#/100ML	
			8/25/2008	<10	#/100ML	
			9/22/2008	<10	#/100ML	
			9/24/2008	<10	#/100ML	
			10/7/2008	<10	#/100ML	
			6/28/2017	<10	#/100ML	
			10/30/2001	38	#/100ML	
			10/31/2001	5	#/100ML	
	WET	TIDAL CREEK	4/14/2011	20	#/100ML	
			6/5/2008	50	#/100ML	
			7/29/2008	50	#/100ML	

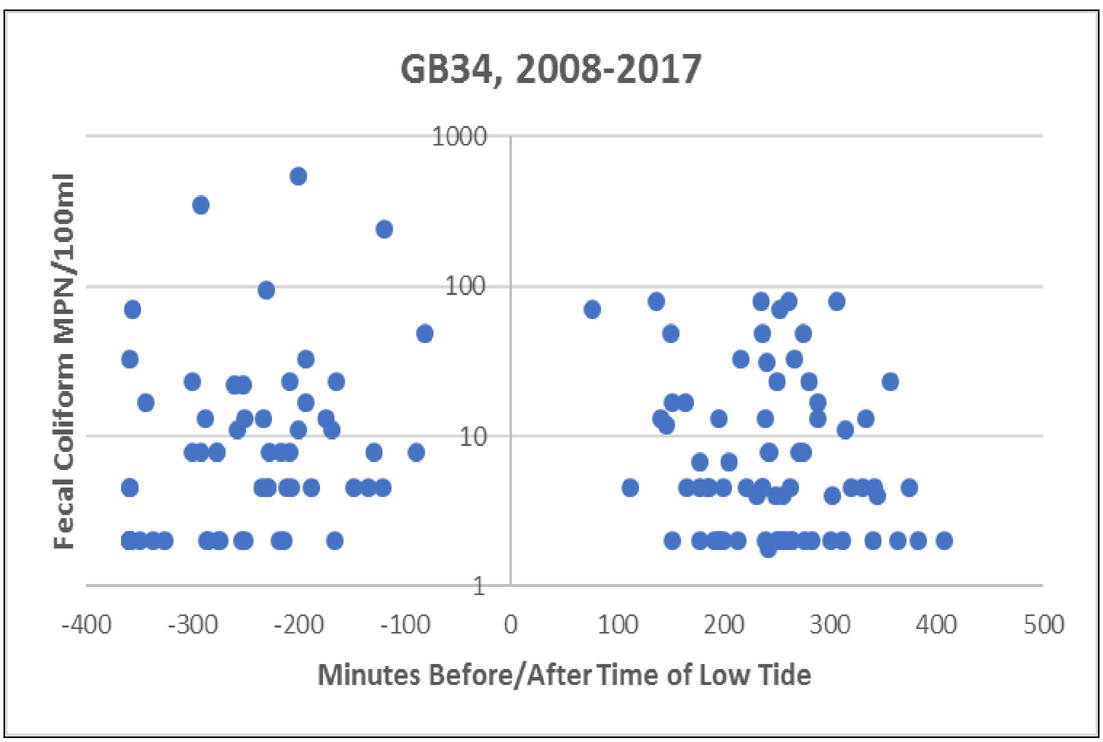
			10/23/2008	9	#/100ML	
			11/29/2001	<10	#/100ML	
			6/12/2002	140	#/100ML	
BLMPS067	COASTINV	PERENNIAL STREAM	6/22/2011	360	#/100ML	
	DRY	PERENNIAL STREAM	4/6/2011	<10	#/100ML	
			10/12/2011	20	#/100ML	
			11/3/2011	80	#/100ML	
			11/9/2011	30	#/100ML	
			12/19/2011	9	#/100ML	
			8/4/2015	380	#/100ML	
			9/24/2008	70	#/100ML	
			10/7/2008	120	#/100ML	
			6/28/2017	220	#/100ML	
			10/23/2017	50	#/100ML	
			10/30/2001	53	#/100ML	
			10/31/2001	58	#/100ML	
			4/21/2011	<	#/100ML	
	WET	PERENNIAL STREAM	10/13/2011	3000	#/100ML	
			6/2/2015	250	#/100ML	
			6/5/2008	1260	#/100ML	
			10/23/2008	30	#/100ML	
			7/13/2017	700	#/100ML	
			7/25/2017	960	#/100ML	
			11/29/2001	<10	#/100ML	
			6/12/2002	97.5	#/100ML	
			8/23/2018		#/100ML	NO DATA
BLMPS068	DRY	INTERMITTENT STREAM	10/7/2008		#/100ML	NO DATA
			7/17/2017		#/100ML	NO DATA
			12/6/2017		#/100ML	NO DATA
	WET	INTERMITTENT STREAM	4/14/2011	5	#/100ML	
			6/2/2008	90	#/100ML	
			8/4/2008	640	#/100ML	
			11/29/2001	530	#/100ML	
			6/12/2002	660	#/100ML	
			4/28/2008		#/100ML	NO DATA
			9/3/2008		#/100ML	NO DATA
BLMPS069	DRY	STORMWATER OUTFALL	7/17/2017	130	#/100ML	
			10/7/2008		#/100ML	NO DATA
			3/31/2011		#/100ML	NO DATA
	WET	STORMWATER OUTFALL	4/11/2011	<10	#/100ML	
			4/13/2011	10	#/100ML	

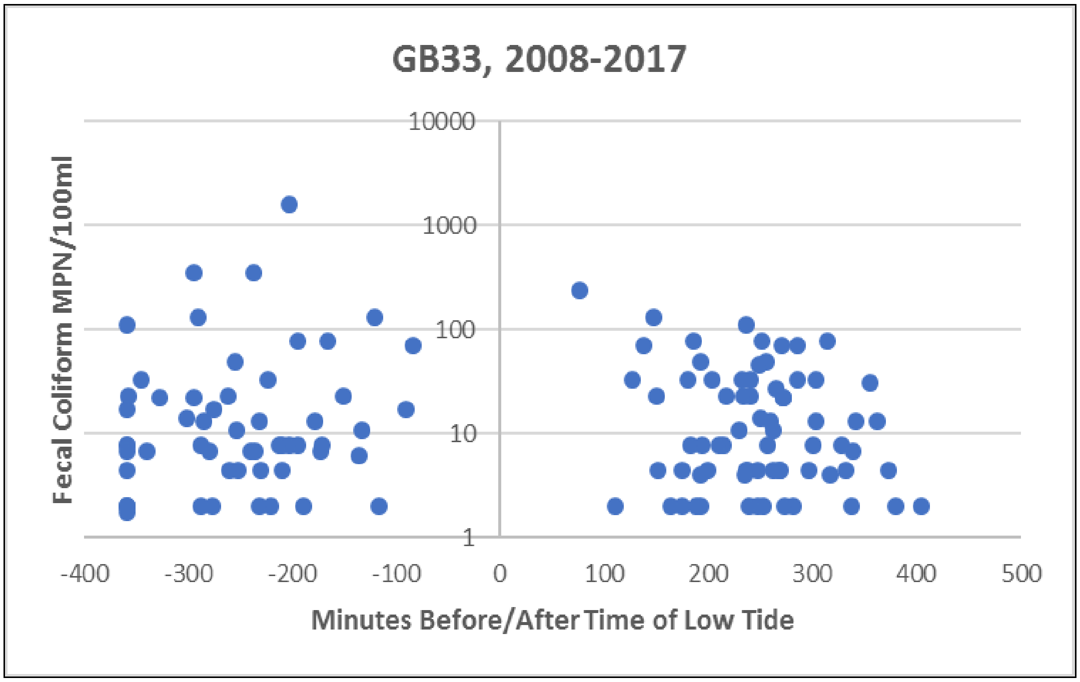
			11/7/2017	20	#/100ML	
			11/29/2001	10	#/100ML	
			6/12/2002	300	#/100ML	
			4/28/2008		#/100ML	NO DATA
			6/2/2008		#/100ML	NO DATA
			8/4/2008		#/100ML	NO DATA
			9/3/2008		#/100ML	NO DATA
BLMPS070	DRY	ROAD CULVERT	10/7/2008		#/100ML	NO DATA
			3/31/2011		#/100ML	NO DATA
	WET	ROAD CULVERT	11/29/2001	220	#/100ML	
			6/12/2002	540	#/100ML	
BLMPS071	DRY	PUMP STATION	4/6/2011		#/100ML	NO DATA
BLMPS074	DRY	PUMP STATION	4/5/2011		#/100ML	NO DATA
BLMPS075	DRY	PUMP STATION	4/5/2011		#/100ML	NO DATA
BLMPS076	DRY	INTERMITTENT STREAM	3/31/2011	<10	#/100ML	
			9/3/2015	20	#/100ML	
			8/25/2008	20	#/100ML	
			9/22/2008	200	#/100ML	
			6/28/2017	90	#/100ML	
	WET	INTERMITTENT STREAM	4/14/2011	90	#/100ML	
			7/29/2008	150	#/100ML	
			10/23/2008	30	#/100ML	
BLMPS077	DRY	INTERMITTENT STREAM	3/31/2011	<10	#/100ML	
			9/3/2015	9	#/100ML	
			8/25/2008	<10	#/100ML	
			9/22/2008	40	#/100ML	
			6/28/2017	9	#/100ML	
	WET	INTERMITTENT STREAM	4/14/2011	40	#/100ML	
			7/29/2008	50	#/100ML	
			10/23/2008	<10	#/100ML	
BLMPS078	DRY	INTERMITTENT STREAM	3/31/2011	<10	#/100ML	
			9/3/2015	50	#/100ML	
			8/25/2008	10	#/100ML	
			9/22/2008	50	#/100ML	
			6/28/2017	20	#/100ML	
	WET	INTERMITTENT STREAM	4/14/2011	20	#/100ML	
			7/29/2008	70	#/100ML	
			10/23/2008	9	#/100ML	
BLMPS079	DRY	INTERMITTENT	3/31/2011	<5	#/100ML	

		STREAM	9/3/2015	9	#/100ML	
			8/25/2008	30	#/100ML	
			9/22/2008	20	#/100ML	
			6/28/2017	40	#/100ML	
	WET	INTERMITTENT STREAM	4/14/2011	20	#/100ML	
			7/29/2008	50	#/100ML	
			10/23/2008	30	#/100ML	
BLMPS080	DRY	STORMWATER OUTFALL	10/12/2011	2200	#/100ML	
			11/3/2011	430	#/100ML	
			11/9/2011	280	#/100ML	
			12/19/2011	620	#/100ML	
			6/28/2017	280	#/100ML	
			10/23/2017	50	#/100ML	
			8/4/2015		#/100ML	NO DATA
	WET	STORMWATER OUTFALL	4/11/2011	10	#/100ML	
			4/12/2011	30	#/100ML	
			4/13/2011	230	#/100ML	
			10/13/2011	17300	#/100ML	
			6/2/2015	>=3300	#/100ML	
			7/13/2017	>20000	#/100ML	
			7/25/2017	1200	#/100ML	
			8/23/2018	1000	CFU/100ML	
BLMPS081	DRY	PIPE	10/12/2011		#/100ML	NO DATA
			11/3/2011		#/100ML	NO DATA
			11/9/2011		#/100ML	NO DATA
			12/19/2011		#/100ML	NO DATA
			6/28/2017		#/100ML	NO DATA
			10/23/2017		#/100ML	NO DATA
	WET	PIPE	4/11/2011		#/100ML	NO DATA
			4/12/2011		#/100ML	NO DATA
			4/13/2011		#/100ML	NO DATA
			10/13/2011		#/100ML	NO DATA
			7/13/2017		#/100ML	NO DATA
BLMPS082	DRY	ROAD CULVERT	10/23/2017		#/100ML	NO DATA

Appendix III: Relationship of Fecal Coliform to Tide Stage, 2008-2017, All Bellamy River Sites







GB33, 2008-2017
10000
1000
100
10
1
Fecal Coliform MPN/100ml
-400
-300
-200
-100
0
100
200
300
400
500
Minutes Before/After Time of Low Tide

Appendix IV: Conditional Area Management Plan for the Bellamy River (2017-2018)

Description of Conditionally Approved Area

The lower section of the Bellamy River growing area is classified as Conditionally Approved. This area includes the river south of Clements Point to the mouth of the river at the Route 4/Scammel Bridge.

Factors Indicating Suitability of a Portion of the Bellamy River as Conditionally Approved

1. The major pollution source(s) with the potential to adversely affect water quality in the Bellamy River are point source in origin, namely, the wastewater treatment facilities in Dover, Durham, and Portsmouth. The Conditionally Approved area is separated spatially from each wastewater treatment facility outfall by a Prohibited/Safety Zone. National Pollutant Discharge Elimination System (NPDES) permit requirements for the facilities require the plant operators to immediately notify NHDES when discharges of improperly treated sewage occur, and experience to date has shown the plant operators do provide timely notification to NHDES. There are no other significant point sources in the Conditionally Approved area.
2. The waters of the Bellamy River can be affected by nonpoint sources of pollution following rainfall events of one inch or more per 24 hours. Weather information is available in real-time from the Pease airport weather tower in Portsmouth, which is staffed 24 hours a day.
3. The waters of the Bellamy River have historically exhibited intermittently high bacteria levels in the months of June, July and August.
4. The Bellamy River can be adversely affected very quickly by a discharge of improperly disinfected effluent from the Portsmouth WWTF. Therefore, there must be very tight control over when shellfish harvesting can occur.
5. The Bellamy River exhibits a tidal range that indicates substantial exchange with coastal ocean waters.

Pollution Events that may Trigger Conditional Area Closure

Durham Wastewater Treatment Facility (100 Stone Quarry Drive, Durham, New Hampshire 03824. Max Driscoll, Operator, 868-2274).

The following performance standards may be used to trigger a closure of the Conditionally Approved areas in the Bellamy River. Exceedance of any of the following shall trigger immediate notification of the NHDES Shellfish Program by the Town of Durham:

- Effluent flow: total daily flow shall not exceed 2 mgd.
- Bacteriological quality of the effluent: shall not exceed 43 fecal coliform/100ml after disinfection. Notification of results over 43/100ml shall occur as soon as the laboratory test results are completed.
- Bypasses: any discharge of raw sewage or partially treated sewage from the WWTF or from any part of the sewage collection system. For the purposes of this performance standard, “partially treated sewage” means sewage/effluent that has been released to the environment before undergoing all aspects of treatment required by the most recent NPDES permit.
- Failure of the WWTF to complete its required effluent monitoring, such that the biological, physical, and/or chemical quality of the effluent is unknown.

Dover Wastewater Treatment Facility (484 Middle Road, Dover, New Hampshire 03820. Raymond Vermette, Operator, 516-6475).

The following performance standards may be used to trigger a closure of the Conditionally Approved areas in the Bellamy River. Exceedance of any of the following shall trigger immediate notification of the NHDES Shellfish Program by the City of Dover:

- Effluent flow: total daily flow shall not exceed 4.02 mgd.
- Bacteriological quality of the effluent: shall not exceed 43 fecal coliform/100ml after disinfection. Notification of results over 43/100ml shall occur as soon as the laboratory test results are completed.
- Bypasses: any discharge of raw sewage or partially treated sewage from the WWTF or from any part of the sewage collection system. For the purposes of this performance standard, “partially treated sewage” means sewage/effluent that has been released to the environment before undergoing all aspects of treatment required by the most recent NPDES permit.
- Failure of the WWTF to complete its required effluent monitoring, such that the biological, physical, and/or chemical quality of the effluent is unknown.

Portsmouth Wastewater Treatment Facility (Peirce Island, Portsmouth, New Hampshire 03801. Timothy Babkirk, Operator, 603-957-8780).

The following performance standards may be used to trigger a closure of the Conditionally Approved areas in the Bellamy River. Exceedance of any of the following shall trigger immediate notification of the NHDES Shellfish Program by the City of Portsmouth:

- Effluent flow: total daily flow shall not exceed 4.8 mgd.
- Bacteriological quality of the effluent: shall not exceed 43 fecal coliform/100ml after disinfection. Notification of results over 43/100ml shall occur as soon as the laboratory test results are completed.
- Bypasses: any discharge of raw sewage or partially treated sewage from the WWTF or from any part of the sewage collection system. For the purposes of this performance standard, “partially treated sewage” means sewage/effluent that has been released to the environment before undergoing all aspects of treatment required by the most recent NPDES permit.

- Failure of the WWTF to complete its required effluent monitoring, such that the biological, physical, and/or chemical quality of the effluent is unknown.

Meteorological or Hydrological Events

Rainfall events of more than one-inch total precipitation shall trigger a closure of the Conditionally Approved areas in the Bellamy River. The one-inch criterion is intended to generally apply to a 24-hour period; however, rainfall events that occur over a longer period of time may also warrant closure. Analysis of precipitation records from Portsmouth, New Hampshire suggests that, on average, such events will occur approximately 10-15 times per year. Analyses of the relationship between rainfall and bacteria levels are presented in the sanitary survey report.

For the purpose of this performance standard, rainfall data will be obtained from the meteorological observation station at the Pease International Tradeport Airport in Portsmouth, New Hampshire. Real-time checks of rainfall data are made via phone calls to the weather observation station at the airport tower. Data from other coastal New Hampshire weather stations (e.g., Seabrook) may also be used to institute a closure.

Closures will be instituted for precipitation events that fall primarily as rainfall. Precipitation that falls primarily as snow and/or ice will generally not trigger a closure, as these events do not produce the runoff that transports bacterial contamination to the growing waters. However, precipitation events that fall as a mix of rain and snow/ice, or snow/ice events that are immediately followed by a significant melting period, may trigger a closure. The potential for growing area contamination by such events will be evaluated by NHDES Shellfish Program staff on a case-by-case basis, and closure decisions will be made accordingly.

Seasonal Events

The Conditionally Approved portions of the Bellamy River will be placed in the closed status for the months of June, July and August. Fecal coliform data from water and shellfish tissue samples collected in late August will be used as the basis for reopening.

Other Events

Recreational shellfish harvest will only be allowed on Saturdays, 9am-sunset. The delayed start time gives NHDES and the Portsmouth WWTF time to communicate any overnight treatment issues to recreational harvesters via the Clam Hotline and the NH Coastal Atlas, and initiate temporary harvest closures as needed. Commercial harvesting (where allowed by NH Fish and Game) is controlled by NHDES through direct communication with each harvester on a harvest-by-harvest basis, so commercial harvesting can be allowed any day of the week, provided that conditions in the Conditional Area Management Plan are being met.

Implementation of a Conditionally Approved Area Closure

Notification of Management Plan Violation

The Durham, Dover and Portsmouth WWTFs are responsible for immediately notifying NHDES in the event of a violation of the aforementioned performance standards. The response time between management plan violation and notification of NHDES can vary, depending on the sewage discharge. However, historical experience with these WWTFs indicates notification can be expected within four-to-six hours of the management plan violation. Notification time is shortened by the availability of a pager maintained by NHDES staff (Chris Nash, Shellfish Program Manager, 222 International Drive, Suite 175, Pease Tradeport, Portsmouth, New Hampshire 03801). The Shellfish Program pager is to be used for notification (603/771-9826). The Shellfish Program also maintains a cell phone (603/568-6741) to be used by WWTF as needed (if direct contact with Shellfish staff is not made via cellphone, a page must be sent).

The Prohibited/no-harvest zone around each outfall is based in part on the time of travel notification time (response time) by each WWTF. WWTF response times will be reviewed annually to determine if a change in the size of the zone is warranted.

The NHDES Shellfish Program staff is responsible for monitoring weather forecasts and conditions, and acquiring real-time rainfall data from the Pease Airport or other sources for the purposes of determining when a rainfall closure is necessary.

Implementation of Closure

Response time between management plan violation notification and legal closure by NHDES is relatively short for all facilities, typically within four to six hours. The short response times are aided by the automated alarm systems at the facilities and the fact that the NHDES Shellfish Program staff are on call (cellphone and pager) every day, 6am-9pm. Rainfall closures are also implemented quickly, as NHDES maintains direct contact with the Pease airport weather observation station. Notification of NHF&G (patrol agency) by NHDES typically occurs immediately following NHDES notification. Implementation of closure by NHF&G is often immediate as well, and typically occurs immediately after notification by NHDES. The following notification protocol is followed for each closure:

> <u>Initiation of Closure</u>: Each week, the NHDES Shellfish Program calls the F&G Law Enforcement Division and sends a "Clam Hotline update" email to F&G Marine Fisheries Division/Durham, F&G Law Enforcement Division/Durham, and F&G Public Affairs Division in Concord. The email makes note of any management plan violations that have occurred, as well as any necessary closures. These emails typically outline the more common types of temporary closures, such as those occurring after rainfall events. For the more rare management plan violations that could involve prolonged closures (e.g., significant discharges of improperly treated waste from a WWTF), an informational email is sent not only to NHF&G Marine Fisheries Division/Durham, NHF&G Law Enforcement Division/Durham, and NHF&G Public Affairs Division in Concord, but also to the DHHS/Bureau of Food Protection, the DHHS Public Health Laboratory in Concord, and the NHDES Public Information Office in Concord.

NHF&G will enforce provisions of Fis 606.02(b) once NHDES has placed the area in the closed status.

Public Dissemination of Closure Information: NHF&G will serve as the lead agency to inform recreational harvesters and the general public of any closures and subsequent reopenings. Procedures to inform the public may include such vehicles as the Clam Hotline, press releases and website updates, and alerting the public during patrol activities. NHDES will assist with informing the general public via updates to the NH Coastal Atlas. DHHS will serve as the lead agency to inform the commercial shellfish industry of any closures and subsequent reopenings.

Enforcement of Closure

The New Hampshire Fish and Game Department is the agency responsible for patrolling waters closed for public health reasons. The frequency of patrols will be at the discretion of the NH Fish and Game Department/Law Enforcement Division staff (Lt. Michael Eastman, Sgt. Jeremy Hawkes, Conservation Officer James Benvenuti, Conservation Officer Graham Courtney), NHF&G Region 3 Office, 225 Main Street, Durham, New Hampshire 03824, 603/868-1095).

Reopening a Conditionally Approved Area After Closure

Wastewater Treatment Plant/Collection System-Related Closures: Following closures triggered by discharges of raw or partially treated sewage from a wastewater treatment facility and/or any part of its sewage collection system, NHDES will be the lead agency for identifying necessary sampling locations and frequency needed to reopen the shellfish beds. At a minimum, water sampling will be conducted at monitoring sites GB2 and GB34. If site access is limited by ice cover or other conditions, alternative shoreline sites will be used. Because access to shellfish tissue sampling sites can vary with tide stage, ice, and daylight considerations, shellfish tissue sampling sites will be determined on a case-by-case basis. NHDES will be the lead agency in collecting water and shellfish tissue samples and will notify the DHHS lab of its intention to sample. All samples will be held on ice and will be delivered to the DHHS Laboratory in Concord by the collecting agency as soon as practical, but always within 24 hours of collection. Upon completion of the laboratory tests, DHHS laboratory personnel will promptly inform the NHDES Shellfish Program of the results. NHDES will then decide whether or not the sample results support a reopening of the area and will notify F&G/Law Enforcement Division of the decision. Sampling will continue until meat samples show a FC MPN of 230/100g or less (or a different baseline value established for a particular site) and confirmatory water samples show FC of 43/100ml or less. When sampling demonstrates that the area was in fact impacted by a significant sewage discharge, the area will remain closed for a period of at least three weeks, per U.S. FDA recommendations relating to the time required for viral pathogens to be purged from shellfish. Reopening may alternatively be driven by sampling of shellfish meats for male-specific coliphage, per NSSP guidelines (<50 pfu/100g tissue, or higher if documented background levels dictate). Reopening after the three-week closure will be done in concert with water and meat samples that show sufficiently low fecal coliform results.

Rainfall-Related Closure Periods: Because water quality impacts can vary among storms of the same size, NHDES may elect to conduct an initial round of sampling, involving water samples only, of the Conditionally Approved area in the day(s) following closures from rainfall events. The purpose of such sampling is to determine if the rainfall event did in fact cause bacterial contamination of the growing area, and therefore to determine if a closure was warranted. At a minimum, water sampling will be conducted at Sites GB2 and GB34. If site access is limited by ice cover or other conditions, alternative shoreline sites near GB2 and GB34 will be used. If these water samples show low fecal coliform levels (i.e., the samples indicate that there was no water quality impact from the storm to begin with), then the closure may be lifted with no additional sampling of waters or shellfish meats. If high FC levels are observed, then the area will remain in the closed status until post-rainfall meat samples show a FC MPN of 230/100g or less (or a different baseline value established for a particular site), and confirmatory water samples show FC of 43/100ml or less, or until 14 consecutives days with no storms >1.50 inches have elapsed and confirmatory water samples show FC of 43/100ml or less, whichever is less.

Seasonal Closure Periods: Water and shellfish tissue sampling from the Conditionally Approved area will be conducted in mid to late August of each year. At a minimum, water sampling will be conducted at Sites GB2 and GB34. If site access is restricted, alternative shoreline sites near GB2 and/or GB34 will be used. Because access to shellfish tissue sampling sites can vary with tide stage, daylight considerations, and other factors, shellfish tissue sampling sites will be determined on a case-by-case basis. If these samples show low fecal coliform levels, then the closure will be lifted with no additional sampling of waters or shellfish meats. If high FC levels are observed, then the area will remain in the closed status until meat samples show a FC MPN of 230/100g or less (or a different baseline value established for a particular site), and confirmatory water samples show FC of 43/100ml or less.

NHDES will be the lead agency in collecting samples from sites in the Conditionally Approved area and will notify the DHHS and/or NHDES laboratory, as well as NHF&G Law Enforcement Division of its intention to sample. All samples will be collected as soon as practical after the rainfall event has ended, will be held on ice, and will be delivered to the DHHS Laboratory in Concord, or an appropriate contracting laboratory, by the collecting agency within 24 hours of collection. Upon completion of the laboratory tests, DHHS will promptly inform the NHDES Shellfish Program of the results. NHDES will then decide whether or not to close the area for harvesting and will notify NHF&G/Law Enforcement Division of the decision.

Notification of Reopening: NHDES will promptly rescind the closure after it is determined that the shellfish growing waters meet NSSP standards. Upon this determination, NHDES will email a reopening notice to the NHF&G Marine Fisheries Division/Durham, NHF&G Law Enforcement Division/Durham, and the NHF&G Public Affairs Division, as well as to the other individuals/organizations that received a closure notice. NHF&G will serve as the lead agency to inform recreational harvesters and the general public of any closures and subsequent reopenings. Procedures to inform the public may include such vehicles as the Clam Hotline and press releases. NHDES will assist with informing the general public via updates to the NH Coastal Atlas. DHHS will serve as the lead agency to inform the commercial shellfish industry of any closures and subsequent reopenings.

Management Plan Evaluation

This plan shall be evaluated once per year as part of the NHDES Shellfish Program's annual report.

Appendix V: Conditional Area Management Plan for the Bellamy River (Oct. 2018-2019)

Description of Conditionally Approved Area

The lower section of the Bellamy River growing area is classified as Conditionally Approved. This area includes the river south of Clements Point to the mouth of the river at the Route 4/Scammel Bridge.

Factors Indicating Suitability of a Portion of the Bellamy River as Conditionally Approved

1. The major pollution source(s) with the potential to adversely affect water quality in the Bellamy River are point source in origin, namely, the wastewater treatment facilities in Dover, Durham, and Portsmouth. The Conditionally Approved area is separated spatially from each wastewater treatment facility outfall by a Prohibited/Safety Zone. National Pollutant Discharge Elimination System (NPDES) permit requirements for the facilities require the plant operators to immediately notify NHDES when discharges of improperly treated sewage occur, and experience to date has shown the plant operators do provide timely notification to NHDES. There are no other significant point sources in the Conditionally Approved area.
2. The waters of the Bellamy River can be affected by nonpoint sources of pollution following rainfall events of one inch or more per 24 hours. Weather information is available in real-time from the Pease airport weather tower in Portsmouth, which is staffed 24 hours a day.
3. The waters of the Bellamy River have historically exhibited intermittently high bacteria levels in the months of June, July, and August.
4. The waters of the Bellamy River can be adversely affected by chronic inputs of viral indicators from Portsmouth WWTF effluent, particularly during the months of October-March.
5. The Bellamy River can be adversely affected very quickly by a discharge of improperly disinfected effluent from the Portsmouth WWTF. Therefore, there must be very tight control over when shellfish harvesting can occur.
6. The Bellamy River exhibits a tidal range that indicates substantial exchange with coastal ocean waters.

Pollution Events that may Trigger Conditional Area Closure

Durham Wastewater Treatment Facility (100 Stone Quarry Drive, Durham, New Hampshire 03824. Max Driscoll, Operator, 868-2274).

The following performance standards may be used to trigger a closure of the Conditionally Approved areas in the Bellamy River. Exceedance of any of the following shall trigger immediate notification of the NHDES Shellfish Program by the Town of Durham:

- Effluent flow: total daily flow shall not exceed 2 mgd.
- Bacteriological quality of the effluent: shall not exceed 43 fecal coliform/100ml after disinfection. Notification of results over 43/100ml shall occur as soon as the laboratory test results are completed.
- Bypasses: any discharge of raw sewage or partially treated sewage from the WWTF or from any part of the sewage collection system. For the purposes of this performance standard, "partially treated sewage" means sewage/effluent that has been released to the environment before undergoing all aspects of treatment required by the most recent NPDES permit.
- Failure of the WWTF to complete its required effluent monitoring, such that the biological, physical, and/or chemical quality of the effluent is unknown.

Dover Wastewater Treatment Facility (484 Middle Road, Dover, New Hampshire 03820. Raymond Vermette, Operator, 516-6475).

The following performance standards may be used to trigger a closure of the Conditionally Approved areas in the Bellamy River. Exceedance of any of the following shall trigger immediate notification of the NHDES Shellfish Program by the City of Dover:

- Effluent flow: total daily flow shall not exceed 4.02 mgd.
- Bacteriological quality of the effluent: shall not exceed 43 fecal coliform/100ml after disinfection. Notification of results over 43/100ml shall occur as soon as the laboratory test results are completed.
- Bypasses: any discharge of raw sewage or partially treated sewage from the WWTF or from any part of the sewage collection system. For the purposes of this performance standard, "partially treated sewage" means sewage/effluent that has been released to the environment before undergoing all aspects of treatment required by the most recent NPDES permit.
- Failure of the WWTF to complete its required effluent monitoring, such that the biological, physical, and/or chemical quality of the effluent is unknown.

Portsmouth Wastewater Treatment Facility (Peirce Island, Portsmouth, New Hampshire 03801. Timothy Babkirk, Operator, 603/957-8780).

The following performance standards may be used to trigger a closure of the Conditionally Approved areas in the Bellamy River. Exceedance of any of the following shall trigger immediate notification of the NHDES Shellfish Program by the City of Portsmouth:

- Effluent flow: total daily flow shall not exceed 4.8 mgd.
- Bacteriological quality of the effluent: shall not exceed 43 fecal coliform/100ml after disinfection. Notification of results over 43/100ml shall occur as soon as the laboratory test results are completed.
- Bypasses: any discharge of raw sewage or partially treated sewage from the WWTF or from any part of the sewage collection system. For the purposes of this performance standard, "partially treated sewage" means sewage/effluent that has been released to

the environment before undergoing all aspects of treatment required by the most recent NPDES permit.

- Failure of the WWTF to complete its required effluent monitoring, such that the biological, physical, and/or chemical quality of the effluent is unknown.

Meteorological or Hydrological Events

Rainfall events of more than one-inch total precipitation shall trigger a closure of the Conditionally Approved areas in the Bellamy River. The one-inch criterion is intended to generally apply to a 24-hour period; however, rainfall events that occur over a longer period of time may also warrant closure. Analysis of precipitation records from Portsmouth, New Hampshire, suggests that, on average, such events will occur approximately 10-15 times per year. Analyses of the relationship between rainfall and bacteria levels are presented in the sanitary survey report.

For the purpose of this performance standard, rainfall data will be obtained from the meteorological observation station at the Pease International Tradeport Airport in Portsmouth, New Hampshire. Real-time checks of rainfall data are made via phone calls to the weather observation station at the airport tower. Data from other coastal New Hampshire weather stations (e.g., Seabrook) may also be used to institute a closure.

Closures will be instituted for precipitation events that fall primarily as rainfall. Precipitation that falls primarily as snow and/or ice will generally not trigger a closure, as these events do not produce the runoff that transports bacterial contamination to the growing waters. However, precipitation events that fall as a mix of rain and snow/ice, or snow/ice events that are immediately followed by a significant melting period, may trigger a closure. The potential for growing area contamination by such events will be evaluated by NHDES Shellfish Program staff on a case-by-case basis, and closure decisions will be made accordingly.

Seasonal Events

The Conditionally Approved portions of the Bellamy River will be placed in the closed status for the months of June, July, and August. Fecal coliform data from water and shellfish tissue samples collected in late August will be used as the basis for reopening.

Viral inputs from the Portsmouth WWTF, a primary treatment facility, are much higher than viral inputs from the other WWTFs in the region, all of which employ secondary or tertiary treatment. Documentation of effluent Male Specific Coliphage (MSC) levels in effluent showeds that Portsmouth effluent typically has MSC concentrations well over 10,000 plaque-forming units per 100ml, and sometimes approaches 1,000,000 pfu/100ml. The 4,600:1 dilution available at the entrance of Little Bay at Dover Point is not sufficient to dilute these concentrations to levels that protect public health, particularly in the colder weather months when MSC persists in the environment. This is particularly problematic in autumn, when shellfish are rapidly pumping seawater and bioaccumulating pollutants in the ambient seawater. This accumulation has consistently been observed to be underway by mid-October.

The combination of high MSC concentration in Portsmouth effluent, insufficient dilution at Dover Point, and unacceptably high MSC concentration in seawater entering Little Bay during the fall and winter months, prompted NHDES to implement a seasonal closure of Lower Little Bay and the Bellamy River in October 2018. The seasonal closure will be lifted on April 1, 2019. A similar closure will be implemented October 2019-March 2020. The Portsmouth WWTF upgrade to secondary treatment, which is expected to dramatically reduce effluent MSC levels, is scheduled for completion in April 2020. The continuation of seasonal cold-weather closures in the Bellamy River will be revisited once MSC levels in effluent from the upgraded facility are confirmed.

Other Events

Recreational shellfish harvest will only be allowed on Saturdays, 9am-sunset. The delayed start time gives NHDES and the Portsmouth WWTF time to communicate any overnight treatment issues to recreational harvesters via the Clam Hotline and the NH Coastal Atlas, and initiate temporary harvest closures as needed. Commercial harvesting (where allowed by NH Fish and Game) is controlled by NHDES through direct communication with each harvester on a harvest-by-harvest basis, so commercial harvesting can be allowed any day of the week, provided that conditions in the Conditional Area Management Plan are being met.

Implementation of a Conditionally Approved Area Closure

Notification of Management Plan Violation

The Durham, Dover, and Portsmouth WWTFs are responsible for immediately notifying NHDES in the event of a violation of the aforementioned performance standards. The response time between management plan violation and notification of NHDES can vary, depending on the sewage discharge. However, historical experience with these WWTFs indicates notification can be expected within four-to-six hours of the management plan violation. Notification time is shortened by the availability of a pager maintained by NHDES staff (Chris Nash, Shellfish Program Manager, 222 International Drive, Suite 175, Pease Tradeport, Portsmouth, New Hampshire 03801). The Shellfish Program pager is to be used for notification (603/771-9826). The Shellfish Program also maintains a cell phone (603/568-6741) to be used by WWTF as needed (if direct contact with Shellfish staff is not made via cellphone, a page must be sent).

The Prohibited/no-harvest zone around each outfall is based in part on the time of travel notification time (response time) by each WWTF. WWTF response times will be reviewed annually to determine if a change in the size of the zone is warranted.

The NHDES Shellfish Program staff is responsible for monitoring weather forecasts and conditions, and acquiring real-time rainfall data from the Pease Airport or other sources for the purposes of determining when a rainfall closure is necessary.

Implementation of Closure

Response time between management plan violation notification andlegal closure by NHDES is relatively short for all facilities, typically within four to six hours. The short response times are aided by the automated alarm systems at the facilities and the fact that the NHDES Shellfish Program staff are on call (cellphone and pager) every day, 6am-9pm. Rainfall closures are also implemented quickly, as NHDES maintains direct contact with the Pease airport weather observation station. Notification of NHF&G (patrol agency) by NHDES typically occurs immediately following NHDES notification. Implementation of closure by NHF&G is often immediate as well, and typically occurs immediately after notification by NHDES. The following notification protocol is followed for each closure:

> <u>Initiation of Closure</u>: Each week, the NHDES Shellfish Program calls the NHF&G Law Enforcement Division and sends a “Clam Hotline update” email to NHF&G Marine Fisheries Division/Durham, NHF&G Law Enforcement Division/Durham, and NHF&G Public Affairs Division in Concord. The email makes note of any management plan violations that have occurred, as well as any necessary closures. These emails typically outline the more common types of temporary closures, such as those occurring after rainfall events. For the more rare management plan violations that could involve prolonged closures (e.g., significant discharges of improperly treated waste from a WWTF), an informational email is sent not only to NHF&G Marine Fisheries Division/Durham, NHF&G Law Enforcement Division/Durham, and NHF&G Public Affairs Division in Concord, but also to the DHHS/Bureau of Food Protection, the DHHS Public Health Laboratory in Concord, and the NHDES Public Information Office in Concord.
>
> NHF&G will enforce provisions of Fis 606.02(b) once NHDES has placed the area in the closed status.
>
> <u>Public Dissemination of Closure Information:</u> NHF&G will serve as the lead agency to inform recreational harvesters and the general public of any closures and subsequent reopenings. Procedures to inform the public may include such vehicles as the Clam Hotline, press releases and website updates, and alerting the public during patrol activities. NHDES will assist with informing the general public via updates to the NH Coastal Atlas. DHHS will serve as the lead agency to inform the commercial shellfish industry of any closures and subsequent reopenings.

Enforcement of Closure

The New Hampshire Fish and Game Department is the agency responsible for patrolling waters closed for public health reasons. The frequency of patrols will be at the discretion of NH Fish and Game/Law Enforcement Division staff (Lt. Michael Eastman, Sgt. Jeremy Hawkes, Conservation Officer James Benvenuti, Conservation Officer Graham Courtney), NHF&G Region 3 Office, 225 Main Street, Durham, New Hampshire 03824, 603/868-1095).

Reopening a Conditionally Approved Area After Closure

Wastewater Treatment Plant/Collection System-Related Closures: Following closures triggered by discharges of raw or partially treated sewage from a wastewater treatment facility and/or any part of its sewage collection system, NHDES will be the lead agency for identifying necessary sampling locations and frequency needed to reopen the shellfish beds. At a minimum, water sampling will be conducted at monitoring sites GB2 and GB34. If site access is limited by ice cover or other conditions, alternative shoreline sites will be used. Because access to shellfish tissue sampling sites can vary with tide stage, ice, and daylight considerations, shellfish tissue sampling sites will be determined on a case-by-case basis. NHDES will be the lead agency in collecting water and shellfish tissue samples and will notify the DHHS lab of its intention to sample. All samples will be held on ice and will be delivered to the DHHS Laboratory in Concord by the collecting agency as soon as practical, but always within 24 hours of collection. Upon completion of the laboratory tests, DHHS laboratory personnel will promptly inform the NHDES Shellfish Program of the results. NHDES will then decide whether or not the sample results support a reopening of the area and will notify NHF&G/Law Enforcement Division of the decision. Sampling will continue until meat samples show a FC MPN of 230/100g or less (or a different baseline value established for a particular site) and confirmatory water samples show FC of 43/100ml or less. When sampling demonstrates that the area was in fact impacted by a significant sewage discharge, the area will remain closed for a period of at least three weeks, per U.S. FDA recommendations relating to the time required for viral pathogens to be purged from shellfish. Reopening may alternatively be driven by sampling of shellfish meats for male-specific coliphage, per NSSP guidelines (<50 pfu/100g tissue, or higher if documented background levels dictate). Reopening after the three-week closure will be done in concert with water and meat samples that show sufficiently low fecal coliform results.

Rainfall-Related Closure Periods: Because water quality impacts can vary among storms of the same size, NHDES may elect to conduct an initial round of sampling, involving water samples only, of the Conditionally Approved area in the day(s) following closures from rainfall events. The purpose of such sampling is to determine if the rainfall event did in fact cause bacterial contamination of the growing area, and therefore to determine if a closure was warranted. At a minimum, water sampling will be conducted at Sites GB2 and GB34. If site access is limited by ice cover or other conditions, alternative shoreline sites near GB2 and GB34 will be used. If these water samples show low fecal coliform levels (i.e., the samples indicate that there was no water quality impact from the storm to begin with), then the closure may be lifted with no additional sampling of waters or shellfish meats. If high FC levels are observed, then the area will remain in the closed status until post-rainfall meat samples show a FC MPN of 230/100g or less (or a different baseline value established for a particular site), and confirmatory water samples show FC of 43/100ml or less, or until fourteen consecutives days with no storms >1.50 inches have elapsed and confirmatory water samples show FC of 43/100ml or less, whichever is less.

Seasonal Closure Periods: Water and shellfish tissue sampling from the Conditionally Approved area will be conducted in mid to late August of each year. At a minimum, water sampling will be conducted at Sites GB2 and GB34. If site access is restricted, alternative shoreline sites near GB2 and/or GB34 will be used. Because access to shellfish tissue sampling sites can vary with tide stage, daylight considerations, and other factors, shellfish tissue sampling sites will be determined on a case-by-case basis. If these samples show low fecal coliform levels, then the closure will be lifted with no additional sampling of waters or shellfish meats. If high FC levels are observed, then the area will remain in the closed status until meat samples show a FC MPN of 230/100g or less (or a different baseline value established for a particular site), and confirmatory water samples show FC of 43/100ml or less.

NHDES will be the lead agency in collecting samples from sites in the Conditionally Approved area and will notify the DHHS and/or NHDES laboratory, as well as the NHF&G Law Enforcement Division of its intention to sample. All samples will be collected as soon as practical after the rainfall event has ended, will be held on ice, and will be delivered to the DHHS Laboratory in Concord, or an appropriate contracting laboratory, by the collecting agency within 24 hours of collection. Upon completion of the laboratory tests, DHHS will promptly inform the NHDES Shellfish Program of the results. NHDES will then decide whether or not to close the area for harvesting and will notify NHF&G/Law Enforcement Division of the decision.

Notification of Reopening: NHDES will promptly rescind the closure after it is determined that the shellfish growing waters meet NSSP standards. Upon this determination, NHDES will email a reopening notice to the NHF&G Marine Fisheries Division/Durham, NHF&G Law Enforcement Division/Durham, and the NHF&G Public Affairs Division, as well as to the other individuals/organizations that received a closure notice. NHF&G will serve as the lead agency to inform recreational harvesters and the general public of any closures and subsequent reopenings. Procedures to inform the public may include such vehicles as the Clam Hotline and press releases. NHDES will assist with informing the general public via updates to the NH Coastal Atlas. DHHS will serve as the lead agency to inform the commercial shellfish industry of any closures and subsequent reopenings.

MANAGEMENT PLAN EVALUATION

This plan shall be evaluated once per year as part of the NHDES Shellfish Program’s annual report.