Sanitary Survey Report
For Hampton/Seabrook Harbor,
New Hampshire

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New Hampshire Department of Environmental Services
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Sanitary Survey Report For Hampton/Seabrook Harbor, New Hampshire

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I. Executive Summary

This report describes the results of a sanitary survey for Hampton/Seabrook Harbor, New Hampshire, conducted in accordance with National Shellfish Sanitation Program (NSSP) guidelines. In December 2006, the NHDES published a sanitary survey of the area. Since that time, annual and triennial updates have been conducted on the growing area. NSSP guidelines state that a new sanitary survey should be conducted on a shellfish growing area every 12 years (ISSC, 2017). This report summarizes data collected through the end of 2018.

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 Hampton/Seabrook growing area was inspected by Shellfish Program staff in 2017 and 2018. 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 sanitary survey indicate that much of Hampton/Seabrook Harbor and its tributaries 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, or following significant discharges of raw or partially treated sewage from the Hampton wastewater treatment facility. Discharges of raw sewage from municipal wastewater infrastructure in Hampton and in Seabrook would also warrant closure, depending on location and volume of discharge. Seasonal closure of the Conditionally Approved area for the months of June through October is also warranted because of unpredictable bacteria levels observed during dry and wet weather conditions. The risk of boat sewage contamination also creates the need for seasonal closure during this time period. All of Mill Creek is classified as Restricted due to recent ambient fecal coliform sampling results in seawater, and pollution source fecal coliform sampling results. All areas upstream of the security perimeter of the NextEra Energy/Seabrook Station Nuclear Facility, including much of the Browns River and nearby tributaries, are classified as Prohibited. This is largely due to the fact that sampling and evaluation of these areas is difficult at best due to the security concerns/restricted access around the facility, and these areas are not available to the public for shellfish harvest. Thus, they are essentially not evaluated in accordance with NSSP protocols, and therefore classified as Prohibited. The waters of the Taylor River upstream of the railroad trestle nears its crossing with U.S. Route 1 are classified as Prohibited. This Prohibited area provides sufficient dilution around the NPDES outfalls for Aquatic Research Organisms, Inc. and for Envirosystems/Enthalpy Inc., both of which exhibit occasionally high fecal coliform concentrations. A Prohibited Safety Zone around the Hampton municipal wastewater treatment facility outfall is established to include all of the Tide Mill Creek, as well as the Hampton River downstream to “The Willows,” and upstream to include portions of the Taylor River and the Hampton Falls River. The eastern side of the Hampton River, from the Willows and extending downstream to the mouth of the Harbor at the Route 1A bridge is classified as Prohibited, due to the presence of multiple pollution sources and the possibility of contamination from poisonous/deleterious substances from the

Hampton River Marina as well as the NH Division of Ports and Harbors Hampton Harbor fueling/fishing offload facility. The area immediately adjacent to the Yankee Fishermans Cooperative in Seabrook is classified as Prohibited/Safety Zone because of the possibility of contamination (boat sewage and/or poisonous and deleterious substances) from the vessels using that location for refueling and/or loading/offloading commercial fishing catch.

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 Hampton/Seabrook produced by NHDES, published December 2006 (Nash and Wood, 2006). The NSSP requires a new sanitary survey every 12 years. This report presents findings for a new sanitary survey for Hampton/Seabrook Harbor and its associated tributaries.

III. Description of Growing Area

The Hampton/Seabrook Harbor Management Area (Figure 1) is located in southeastern New Hampshire, within the town boundaries of Hampton, Hampton Falls and Seabrook. The harbor is a shallow, bar-built estuary that is surrounded by approximately 5,000 acres of salt marsh on its western side, while being developed on the eastern side with dense residential and commercial development along Seabrook Beach and Hampton Beach, which are popular tourist destinations. The harbor itself supports multiple uses, including commercial and recreational fishing, boating and windsurfing, and recreational shellfish harvesting. A nuclear power facility, run by NextEra Energy, is located near the surrounding salt marshes. Low tide channel depths range from less than three feet in the upper tributaries to over 20 feet at the ocean inlet. There are extensive intertidal flats scattered throughout the harbor, which are largely comprised of sand. The unconsolidated nature of the flats makes them subject to erosion and deposition, prompting the need for periodic maintenance dredging in the harbor area.

Hampton/Seabrook Harbor receives relatively small amounts of fresh water from its tributaries, which include Blackwater River, Mill Creek, Hunts Island Creek, Browns River, Hampton Falls River and Taylor River. Land cover in and around the management area shoreline is lightly developed or undeveloped in the salt marshes that rim the harbor to the north, west, and south. Intense development is present along the commercial and residential areas to the east of the harbor. Just over 75% (68 of 90) of the properties surveyed are served by municipal sewer (largely in Seabrook, but some in Hampton), while septic systems/leach fields service the remaining structures. The Hampton municipal wastewater facility discharges directly to the estuarine system via a tributary to Tide Mill Creek. The Seabrook municipal wastewater facility outfall does not discharge to the estuary, but rather is located in the Atlantic Ocean. Hydrographic dye study confirms that effluent from the Seabrook outfall has little to no influence on Hampton/Seabrook harbor water quality. Agricultural uses within the management area are limited. Hampton/Seabrook Harbor includes approximately 1,238 acres of tidal waters, with 195 miles of tidal shoreline.

Land use for the 184 properties within the Hampton/Seabrook Harbor Management Area is summarized in Table 1.

Table 1: Land Use for Properties in the Hampton/Seabrook Management Area

	Commercial Industrial	Marina Mooring	Other/Not Found	Residential	Vacant
Hampton	15	9	7	12	33
Hampton Falls	2	0	0	0	54
Seabrook	3	3	1	10	40
TOTAL	20	12	8	22	127

Perhaps the most significant pollution source with the potential to affect the management area is the Hampton municipal wastewater treatment facility. The Seabrook municipal wastewater treatment facility also can affect harbor water quality, primarily through accidental discharges from sewage collection infrastructure. Two other facilities with National Pollutant Discharge

Elimination System (NPDES) permits also discharge to the estuary. Aquatic Research Organisms and Enthalpy Inc. (formerly known as Envirosystems) each have discharge permits, and share a discharge outfall to the Taylor River. Neither receives nor treats sewage, but each has fecal coliform limts in their NPDES permits. Each of these facilities is described in greater detail in Section IV., C of this report.

Hampton/Seabrook provides recreational softshell clam (*Mya arenaria)* harvesting opportunities in New Hampshire, although the clam resource is substantially less than it once was. The number of adult clams in in the entire estuary was 1.4 million in 2015, less than the average level of 2.2 million for the period of 2009-2011. Historically the clam populations have been cyclical, with populations in peak years reaching numbers in the range of 15-25 million clams (Piscataqua Region Estuaries Partnership, 2018). The mean density of adult softshell clams (>50mm) in the enire estuary remained the same in 2018 as it did in 2017, and overall the densities of adult clams have increased between 2015 and 2018 (NextEra Energy/Seabrook, 2019).

Other shellfish species such as blue mussels (*Mytilus edulis),* razor clams (*Siliqua patula*), and surf clams (*Spisula solidissima*) are also present in scattered locations.

There are two commercial shellfish aquaculture sites in the estuary, both operated by the Swell Oyster Company (Figure 1). One location is a 1.1-acre bottom culture site in the Hampton Falls River. The other site is in the Browns River, and consists of a 2.3-acre bottom culture area and a 1-acre suspended culture area. Both sites are licensed for production of American oysters, softshell clams, and hard clams. Oyster larvae are acquired through a hatchery with an accompanying pathology certification (MSX and Dermo free) and are typically set on the aquaculture sites in the spring. All aquaculturists are required to contact the Shellfish Program prior to harvest to verify the open/closed status of the growing waters.

Figure 2 illustrates the most recent classifications of the area, taken from the 2017 Hampton/Seabrook Harbor Management Area Annual Report (Nash, 2018).

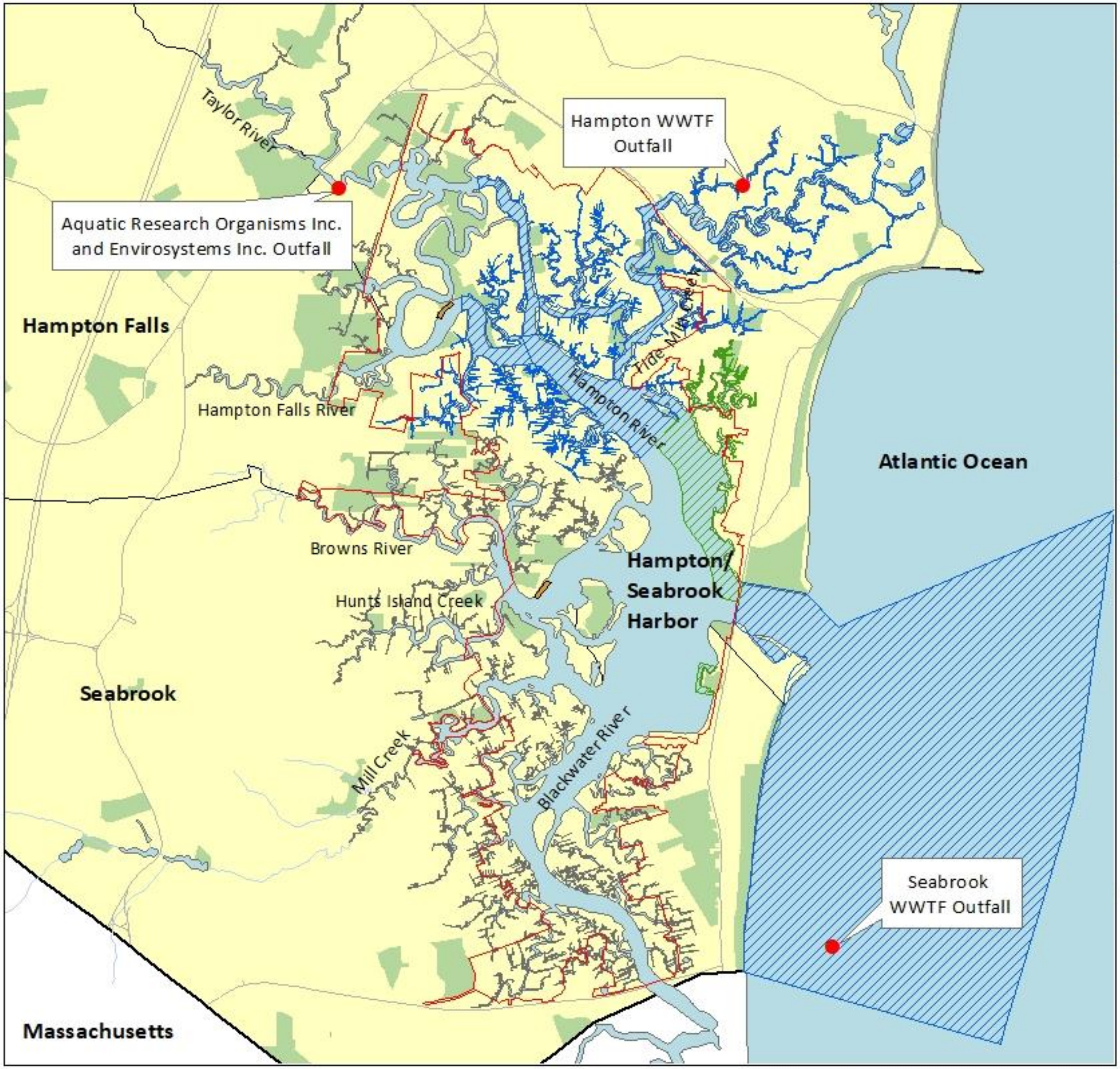


Figure 1: Hampton/Seabrook Harbor Shellfish Management Area

- WWTF Outfall
- Management Area
- Aquaculture Sites
- Vessel Prohibited Area
- WWTF Prohibited Area
- Conservation & Public Land

Vessel Prohibited Areas are designated because of potential sources of pollution, such as bacteria, toxins, fuel, etc. from boats and associated facilities.

N

0 0.25 0.5 0.75 1 Miles

Map Prepared February 2019

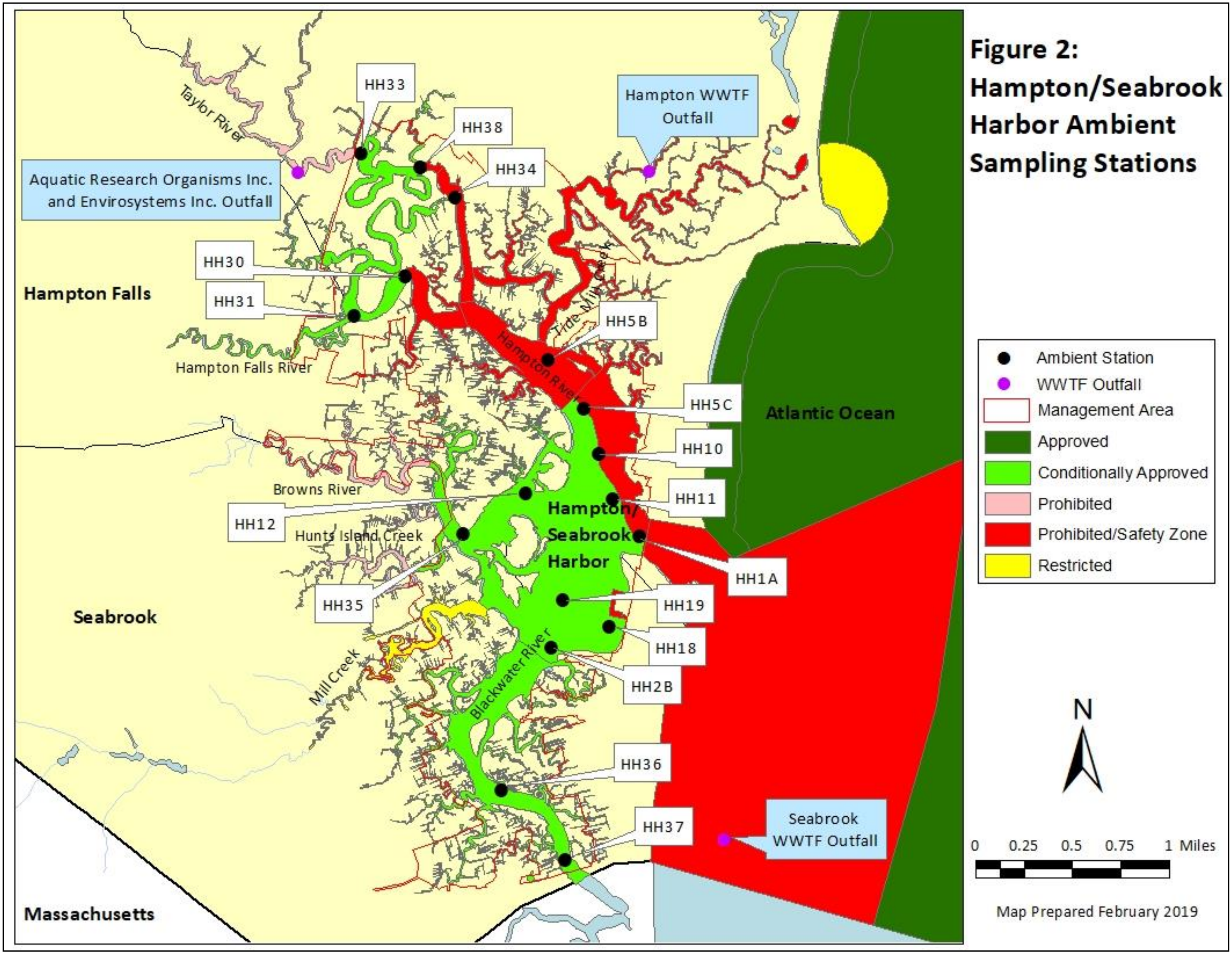


Figure 2:
Hampton/Seabrook
Harbor Ambient
Sampling Stations
Ambient Station
WWTF Outfall
Management Area
Approved
Conditionally Approved
Prohibited
Prohibited/Safety Zone
Restricted
N
0 0.25 0.5 0.75 1 Miles
Map Prepared February 2019
Hampton WWTF Outfall
Aquatic Research Organisms Inc. and Envirosystems Inc. Outfall
Seabrook WWTF Outfall
Taylor River
Hampton Falls
Hampton Falls River
Tide Mill Creek
Hampton River
Browns River
Hunts Island Creek
Mill Creek
Blackwater River
Hampton/ Seabrook Harbor
Atlantic Ocean
Seabrook
Massachusetts
HH33
HH38
HH34
HH30
HH31
HH5B
HH5C
HH10
HH11
HH12
HH1A
HH35
HH19
HH18
HH2B
HH36
HH37

IV. Pollution Source Survey

Survey Area and Methodology

The shoreline survey for the present study was principally done in 2018. The survey focused on tidal shoreline properties. Adjustments to the management area boundary were made in 2012 as a result of discussions with FDA. 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 2018 survey. The management area was revised slightly in 2018 to exclude salt marsh and shoreline properites in and around NextEra (the Seabrook Power Plant) due to restricted access to the area. Digital tax maps for the Towns of Hampton, Hampton Falls and Seabrook were obtained from municipalities and GIS software was used to compile a list of the properties inside the revised management area boundary. 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 Hampton/Seabrook Harbor queries while preserving the historical property and pollution source information in the database.

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. 168 pollution sources were previously identified in this management area in the 2006 sanitary survey, and 72 of those pollution sources have since been inactivated. The 2018 survey resulted in the identification of no additional pollution sources.

Some pollution sources were targeted for sampling under specific weather conditions, based on previous data. Flow measurements were taken where practical and appropriate. Homes bordering the growing area were visually evaluated for malfunctioning septic systems, discharging pipes, outhouses, and other potential sources of pollution. Water samples were collected in sterilized Nalgene bottles, labeled, and kept on ice in coolers until deliver to the Department of Health and Human Services (DHHS) Water Analysis Laboratory in Concord, NH. Once all of the data had been collected and evaluated, previous categorization of each source as actual, potential, investigatory or investigated/clean was reviewed 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 microbiological 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 WWTF 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.

Sampling of identified pollution sources was carried out mainly during the 2018 field season, with additional sampling during the 2019 field season.

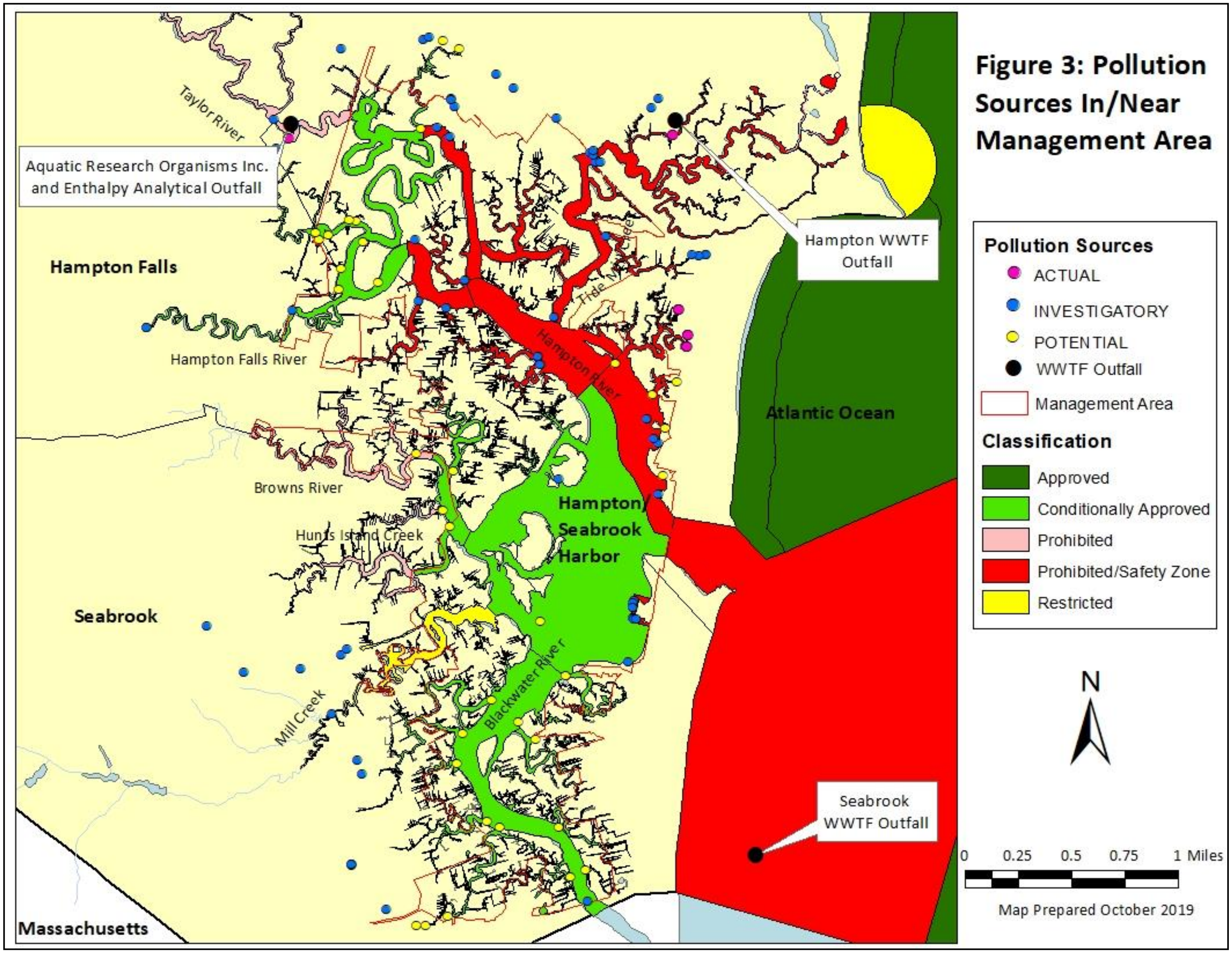


Figure 3: Pollution Sources In/Near Management Area
Pollution Sources
ACTUAL
INVESTIGATORY
POTENTIAL
WWTF Outfall
Management Area
Classification
Approved
Conditionally Approved
Prohibited
Prohibited/Safety Zone
Restricted
N
0 0.25 0.5 0.75 1 Miles
Map Prepared October 2019
Aquatic Research Organisms Inc. and Enthalpy Analytical Outfall
Hampton WWTF Outfall
Seabrook WWTF Outfall
Hampton Falls
Seabrook
Massachusetts
Atlantic Ocean
Hampton/ Seabrook Harbor
Taylor River
Hampton Falls River
Browns River
Hunts Island Creek
Mill Creek
Blackwater River
Hampton River
Tide Mill Creek

B. Summary of Sources and Locations

The property survey involved the on-site inspection of 184 properties. The majority of these properties are vacant salt marsh habitat, with the exception of some commercial and residential lots with municipal sewers or septic/leach fields. Although not directly within the growing area, the Seabrook and Hampton WWTFs were identified as sources of potential pollution that could adversely affect the sanitary quality of the growing waters. Previous shoreline investigations resulted in the detection of 168 pollution sources. The management area was revised in 2012 after a triennial evaluation/meeting with FDA, and 72 investigatory and potential pollution sources were inactivated based on their distance from shellfish growing waters. The management area was revised again in 2018 to exclude NextEra (the Seabrook Power Plant) due to restricted access to the tributaries within a certain radius of the plant. These excluded areas are in Prohibited waters and any pollution sources further downstream in Conditionally Approved waters will continue to be assessed for possible contaminated discharges. Only one additional pollution source had been identified since the previous sanitary suvery. A camper at the end of Cross Beach Road was found to be parked illegally in 2009, but it was confirmed by the NHDES Wetlands Bureau that the trailer was removed in 2016 and the pollution source has since been inactivated in the Environmental Monitoring Database.

A sampling plan was developed for each source to evaluate bacterial loading under dry and/or wet weather conditions. 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 I. 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

Note: Queried for data collected 2006 to 2018

*These sources are located at the Yankee Fisherman Cooperative bulkhead below the water surface. Access to these sources is very limited, but frequent site visits and ambient water samples near the bulkhead demonstrate that these pollution sources pose a minimal public health risk.
**These sources are road culverts on either side of the Brown’s River at the RT. 101 bridge and were sampled in dry weather only.

Station ID	Source Description	Range of Dry Weather FC (#, CFU, or MPN/100mL)	Range of Wet Weather FC (#, CFU, or MPN/100mL)
HHPS001	Tidal River	< 10-190	130-480 (2 samples)
HHPS002	Tidal River	< 9-90	50-173
HHPS003	Stormwater Outfall	no flow	50 (1 sample)
HHPS011	Tidal River	9-130	120 (1 sample)
HHPS014	Road Culvert	no flow	no flow

Station ID	Source Description	Range of Dry Weather FC (#, CFU, or MPN/100mL)	Range of Wet Weather FC (#, CFU, or MPN/100mL)
HHPS015	Intermittent Stream	20-1200	320-600 (2 samples)
HHPS016	Intermittent Stream	150-1600	320-340 (2 samples)
HHPS017	Road Culvert	no flow	460 (1 sample)
HHPS018	Road Culvert	no flow	no flow
HHPS020	Saltmarsh Ditch	10-20 (2 samples)	9-< 10 (2 samples)
HHPS021	Tidal Creek	< 10-20	20-40 (2 samples)
HHPS024	Stormwater Outfall	no flow	no flow
HHPS025	Road Culvert	no flow	no flow
HHPS026	Intermittent Stream	120 (1 sample)	30-400 (2 samples)
HHPS033	Stormwater Outfall	no flow	**Could not locate source 2018**
HHPS035	Road Culvert	no flow	60 (1 sample)
HHPS036	Stormwater Outfall	no flow	< 20 (1 sample)
HHPS037	Tidal Creek	< 10-20	< 10-40
HHPS039	Road Culvert	no flow	4500 (1 sample)
HHPS040	Stormwater Outfall	no flow	**no recent data (2006-2018)***
HHPS041	Stormwater Outfall	no flow	**no recent data (2006-2018)***
HHPS042	Tidal River	9-920	30 (1 sample)
HHPS043	Stormwater Outfall	no flow	**no recent data (2006-2018)***
HHPS044	Stormwater Outfall	no flow	**no recent data (2006-2018)***
HHPS054	Stormwater Outfall	190 (1 sample)	No flow
HHPS055	Tidal Creek	< 10-800 (2 samples)	5500 (1 sample)
HHPS056	Tidal Creek	<10 - 300	5100 (1 sample)
HHPS057	Road Culvert	< 10 (1 sample)	no flow
HHPS058	Stormwater Outfall	no flow	no flow
HHPS061	Stormwater Outfall	< 10-370	260-4500
HHPS062	Stormwater Outfall	< 10-490	30-670
HHPS066	Pipe	< 10-1600	70-11400
HHPS067	Pipe	no flow	no flow
HHPS068	Stormwater Outfall	50-12800	570-8500
HHPS069	Stormwater Outfall	< 2-14,500	50-8500
HHPS070	Stormwater Outfall	< 10-4600	230- >20,000 (2 samples)
HHPS071	Pipe	10-3300	9500 (1 sample)
HHPS086	Road Culvert	no flow	470- >20000
HHPS089	Perennial Stream	no flow	150-520 (2 samples)
HHPS092	Stormwater Outfall	no flow	no flow
HHPS094	Intermittent Stream	no flow	1800 (1 sample)
HHPS095	Tidal Creek	10-920	490 (1 sample)
HHPS106	Intermittent Stream	110-3100 (2 samples)	50-350 (2 samples)
HHPS108	Stormwater Outfall	no flow	40 (1 sample)
HHPS109	Stormwater Outfall	no flow	<10 (1 sample)
HHPS124	Intermittent Stream	40-500 (2 samples)	470-700 (2 samples)

Station ID	Source Description	Range of Dry Weather FC (#, CFU, or MPN/100mL)	Range of Wet Weather FC (#, CFU, or MPN/100mL)
HHPS127	Pipe	no flow	no flow
HHPS132	Intermittent Stream	10-60 (2 samples)	380-1600 (2 samples)
HHPS134	Tidal River	6-46	10-64
HHPS139	Pipe	no flow	**no longer in use**
HHPS140	Pipe	no flow	**no longer in use**
HHPS141	Pipe	no flow	**no recent data (2006-2018)***
HHPS142	Pipe	no flow	**no recent data (2006-2018)***
HHPS143	Pipe	no flow	**no recent data (2006-2018)***
HHPS144	Pipe	no flow	**no recent data (2006-2018)***
HHPS158	Pipe	no flow	no flow
HHPS206	Saltmarsh Ditch	10-40	< 10-40 (2 samples)
HHPS207	Saltmarsh Ditch	10-20	9-<10 (2 samples)
HHPS208	Tidal Creek	< 10-30	9-<10 (2 samples)
HHPS209	Tidal Creek	< 10-60	9-<10 (2 samples)
HHPS210	Tidal Creek	< 10-20	< 10-40 (2 samples)
HHPS211	Marina	< 10-9	20 (1 sample)
HHPS212	Marina	4.5-130	40- >1600
HHPS213	Marina	< 10-540	10-350
HHPS214	Tidal Creek	< 10-10	< 10-70 (2 samples)
HHPS215	Tidal Creek	< 10-40	< 10-150
HHPS216	Tidal Creek	< 10-50	20-430
HHPS217	Tidal Creek	< 10-20	10-470
HHPS218	Tidal Creek	< 10-20	20 (2 samples)
HHPS219	Tidal Creek	< 10 (1 sample)	10-50 (2 samples)
HHPS220	Tidal Creek	< 10-10	9-<10 (2 samples)
HHPS221	Tidal Creek	< 10-10	10-110
HHPS222	Tidal Creek	< 10-50	80 (1 sample)
HHPS223	Tidal Creek	9-60	20-930
HHPS224	Tidal Creek	< 10-390	30 (1 sample)
HHPS225	Tidal Creek	5-850	20 (1 sample)
HHPS226	Tidal Creek	8-30	50-<290 (2 samples)
HHPS227	Tidal Creek	9-40	**no recent data (2006-2018)***
HHPS228	Tidal Creek	< 10-30	8-110 (2 samples)
HHPS229	Tidal Creek	< 10-110	20-60 (2 samples)
HHPS230	Tidal Creek	< 10-30	20 (2 samples)
HHPS231	Tidal Creek	9-110	40 (1 sample)
HHPS232	Saltmarsh Ditch	9-50	20 (1 sample)
HHPS233	Tidal Creek	< 10-40	70 (1 sample)
HHPS234	Saltmarsh Ditch	< 10-150	50 (1 sample)

Station ID	Source Description	Range of Dry Weather FC (#, CFU, or MPN/100mL)	Range of Wet Weather FC (#, CFU, or MPN/100mL)
HHPS235	Saltmarsh Ditch	< 10-130	9 (1 sample)
HHPS236	Tidal Creek	< 10-90	9 (1 sample)
HHPS237	Tidal Creek	< 10-100	90 (1 sample)
HHPS238	Tidal Creek	9-170	50 (1 sample)
HHPS239	Tidal Creek	< 10-40	80 (1 sample)
HHPS240	Tidal Creek	< 10-50	690- >2000 (2 samples)
HHPS241	Tidal Creek	< 10-40	60 (1 sample)
HHPS242	Tidal Creek	< 10-40	50 (1 sample)
HHPS246	Tidal Creek	< 10-70	70 (1 sample)
HHPS248	Marina	7.8-90	40-3500
HHPS249	Marina	9-40	150-1730 (2 samples)

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.

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. The Hampton WWTF discharges to the Tide Mill Creek, and the Seabrook WWTF discharges to the Atlantic Ocean. Two industrial facilities, Aquatic Research Organisms, Inc. and Enthalpy, Inc. share an outfall that discharges to the Taylor River.

Hampton Wastewater Treatment Facility

The Hampton Municipal Wastewater Treatment Facility (NPDES No. NH0100625) provides secondary treatment to wastewater from residents and businesses in the Town of Hampton. The treatment plant is designed for a flow of 3.9 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 a tributary to Tide Mill Creek, and is located above the low tide line.

The most recent NPDES permit for Hampton became effective on September 1, 2007 and expired on August 31, 2012. The town is awaiting issuance of its next permit. The most recent compliance inspection report by the NHDES Wastewater Engineering Bureau (May 2018) 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 (Table 3) shows the facility routinely meets its bacteria permit limits. Plant flows show seasonal characteristics, with highest values in the spring. Summer flows can also be high, due to summer tourists and seasonal residents and businesses.

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.

The facility provides secondary treatment and single-stage nitrification using an activated sludge process. De-nitrification is achieved by the Modified Ludzack-Ettinger (MLE) process. The liquid treatment train consists of the headworks with one mechanical bar screen, one manually-cleaned bar rack (used during maintenance of the mechanical bar screen) and a grit removal system, influent pumping station, two (243,321 gallon) primary clarifiers, one anoxic zone (338,951 gallon), three (338,951 gallon) aeration tanks, three (429,033 gallon) secondary clarifiers, two (67,230 gallon) chlorination tanks. Disinfection is achieved with sodium hypochlorite and sodium bisulfite for dechlorination. The solids treatment train includes two gravity thickeners (6,200 gallon) for concentrating primary sludge, a rotary drum thickener for concentrating secondary sludge, and a rotary drum press for dewatering. Dewatered sludge is hauled to the Turnkey Landfill in Rochester, NH, where the sludge is landfilled.

The plant is staffed Monday-Friday, 8 hours per day, and checked every morning on the weekends and holidays (4 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 dialer, which in turn results in staff notification. Chlorination pump failures/abnormal chlorine residuals are also alarmed.

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

Month	2016 Flow (MGD)		2016 Fecal Coliform (per 100ml)		2017 Flow (MGD)		2017 Fecal Coliform (per 100ml)		2018 Flow (MGD)		2018 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	1.87	2.79	1.3	0	2.14	3.10	2.0	0	1.98	3.79	1.3	0
Feb	1.94	3.05	2.0	0	2.02	3.16	2.0	0	2.33	3.27	1.3	0
Mar	2.36	3.27	1.3	0	2.06	3.11	1.3	0	2.31	5.96	3.0	4 (69, 61, 77, 50)
Apr	2.12	3.35	1.2	0	2.47	5.33	2.6	0	2.36	4.23	1.2	0
May	2.12	2.97	1.7	0	2.68	4.66	2.0	0	2.32	3.08	1.5	0
Jun	2.18	2.95	2.2	0	2.42	3.70	1.9	0	2.36	3.04	1.5	1 (62)
Jul	2.44	2.90	2.7	0	2.50	3.09	1.4	0	2.06	3.02	1.4	0
Aug	2.07	2.69	2.8	1 (95)	2.23	2.72	1.6	0	2.38	3.23	2.4	0
Sep	1.72	2.22	2.1	0	2.00	2.77	1.7	0	2.18	4.16	4.0	2 (56,115)
Oct	1.75	2.83	1.3	0	1.84	2.50	6.6	2 (45, 201)	2.08	2.95	2.4	0
Nov	1.84	2.76	1.7	0	n/d	n/d	n/d	n/d	2.53	5.06	2.3	1 (129)
Dec	1.99	2.62	1.8	0	1.83	2.19	1.1	0	2.34	3.92	1.3	0

In May 1993, Fugro-McClelland, Inc., under contract with the NH Division of Public Health Services, performed a dye release study on the Hampton WWTF (Raiche and Seiferth, 1993). The study involved the injection of dye to the plant near the time of high tide and the tracking of dye position, dilution, and dispersion over the subsequent ebbing tide. At low tide, the majority of the dye was observed still in, but near the mouth of, Tide Mill Creek. A second dye/dilution study of the Hampton wastewater treatment facility effluent's impact on the Hampton River was conducted in October 1999 by NHDES and the U.S. Environmental Protection Agency (EPA). The 1993 study established that at least some dye would enter the Hampton River on the first six hours of a WWTF failure occurring at high tide. The key question for the 1999 project was to determine, during the next six hours (flooding tide), where sufficient dilution would be seen. Just prior to low slack water, a slug of Rhodamine Wt dye was introduced in Tide Mill Creek, approximately 250 feet upstream of the creek mouth (the approximate plume position at low tide during the 1993 study). Most of the plume migrated into the Hampton River and, to a lesser extent, the Hampton Falls and Taylor Rivers. The lower sections of the Hampton Falls and Taylor Rivers were ultimately included in the Prohibited/Safety Zone, as well as the upper portion of the Hampton River and the entire extent of Tide Mill and Blind Creeks (Figure 2). A new hydrographic dye study of the Hampton wastewater treatment facility, designed to incorporate new 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) has not been conducted. Priority for such updated studies has been directed towards wastewater treatment facilities in Little Bay, where most of the commercial shellfish harvest in the state occurs. As time and resources allow, an updated study of the Hampton wastewater treatment facility should be pursued.

Seabrook Wastewater Treatment Facility

The Seabrook Municipal Wastewater Treatment Plant (NPDES No. NH0101303) provides secondary treatment to wastewater from almost all residences and businesses in the Town of Seabrook. The treatment plant is designed for a flow of 1.8 MGD and utilizes grit removal, dual oxidation units, secondary clarifiers, chlorine for effluent disinfection, scum collection, and sludge disposal. The outfall is located approximately 2,100 ft offshore of Seabrook Beach, and approximately 1,000 ft north of the New Hampshire/Massachusetts state line (Figure 6). The diffuser is nearly 85 ft long with 20, 2-inch diameter discharge ports. CORMIX modeling of the diffuser indicates a near-field (within 1.2 meters of the diffuser), low tide dilution factor of 72 under worst-case dilution conditions (Earth Tech, 1999). There is an industrial pre-treatment for the Seabrook WWTF, and businesses in town that discharge to the system have permits for their discharges. Quarterly Whole Effluent Toxicity (WET) testing for LC50, hardness, and ammonia nitrogen is required in the permit.

The most recent NPDES permit for Seabrook (NH0101303) became effective on November 1, 2010, and expired on November 1, 2015. The most recent compliance inspection report by the DES Wastewater Engineering Bureau (February 2018) shows no significant deficiencies regarding effluent bacteria concentrations, plant flow levels, or operation of the disinfection system. The report notes one repeat deficiency relating to staff properly filling out Discharge Monitoring Reports. The deficiency was addressed in March 2018. 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 quarterly using Mysid Shrimp and Inland Silversides. 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 nine positions employees for eight hours per day during the week, and three hours on each weekend day. 3-4 staff members are on-call with an automated dialer/pager system. The plant is staffed Monday-Friday, 7am-3:00 pm. Staff is on-call 24 hrs/day. Issues at the WWTF (any alarm such as high flow, loss of power, chlorination issues, etc.) are detected by the SCADA systems, which notifies the on-call staff.

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

Month	2016 Flow (MGD)		2016 Fecal Coliform (per 100ml)		2017 Flow (MGD)		2017 Fecal Coliform (per 100ml)		2018 Flow (MGD)		2018 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	0.545	0.733	1	0	0.574	0.871	1	0	0.637	0.812	1	0

Feb	0.032	0.952	1	0	0.553	0.932	1	0	0.614	0.907	1	0
Mar	0.578	0.794	1	0	0.578	0.794	1	0	0.63	0.811	1	0
Apr	0.551	0.719	1	0	0.649	1.134	1	0	0.571	0.904	1	0
May	0.441	0.847	1	0	0.526	0.967	1	0	0.458	0.839	1	0
Jun	0.488	0.782	1	0	0.645	0.930	1	0	0.592	0.811	1	0
Jul	0.556	0.863	2	1 (126)	0.694	0.832	1	0	0.53	0.946	1	0
Aug	0.602	0.987	1	0	0.612	0.858	1	0	0.392	0.861	1	0
Sep	0.244	0.86	2	0	0.571	0.764	2	0	0.573	0.881	1	1 (100)
Oct	0.52	0.682	1	0	0.527	0.723	1	0	0.535	0.738	1	0
Nov	0.538	0.674	1	0	n/d	n/d	n/d	n/d	0.53	1.075	1	0
Dec	0.39	0.737	1	0	0.507	0.723	1	0	0.572	0.914	1	0

In August 2001, the NHDES, U.S. Food and Drug Administration, and the Massachusetts Division of Marine Fisheries conducted a joint hydrographic study to investigate dilution and dispersion patterns of Seabrook, NH, municipal wastewater treatment facility effluent in the Atlantic Ocean. The study involved a prolonged injection of Rhodamine dye into the Seabrook WWTF and tracking of the dye in the Atlantic Ocean. Field measurements of dye concentration in the WWTF effluent and in the receiving water were used to calibrate a computer model (CORMIX), which was then used to simulate WWTF discharges with varying flow rates and effluent bacterial concentrations (Carr, 2004). Resulting fields of dilution in the receiving waters were then projected to the Atlantic Ocean from the Hampton Harbor inlet to the New Hampshire/Massachusetts border. Conclusions from the report determined that an area, with approximate dimensions of 2.3 miles long (along the shore) and 1.3 miles wide (offshore), was needed to contain the plume of effluent that would be insufficiently diluted during a prolonged failure of the WWTF chlorination system. The boundaries of the area are defined by recognizable landmarks to enhance compliance and enforcement of the boundary (tip of Hampton Beach jetty, red navigational buoys, and the NH/MA state line). These boundaries were first proposed in the 2001-2003 Triennial Reevaluation, having been reconfigured from the original circular radius defined in the 2000 Sanitary Survey. Data collected during the 2001 dye study suggest that significant effects to the water quality of Hampton/Seabrook Harbor would only occur under extreme/unusual failure conditions. For this reason the Seabrook WWTF was not included in the Hampton and Seabrook Harbor Conditional Area Management Plan. Of greater concern to the water quality of the harbor would be discharges from the Seabrook sewer infrastructure (e.g. pump stations and sewer lines) near the estuary. Discharges from this infrastructure are addressed in the Conditional Area Management Plan.

The NSSP recommends that a Prohibited area around a WWTF outfall, for plants using chlorine disinfection, provide 1000:1 dilution to protect against viral contamination. Data collected during the 2001 hydrographic study demonstrate that 1000:1 dilution would be achieved well within the current Prohibited area, although the reader should note that new procedures for delineating *steady state* 1000:1 dilution area are now available, but have not been performed on the Seabrook WWTF to date. The 2001 study indicated that 15:02 track T11 data point indicates that dilutions as low as 1041:1 – 4777:1 occur approximately 1,500 feet south of the Hampton/Seabrook Harbor entrance (Carr, 2004). This location was derived from information representative of a hypothetical failure at the WWTF. Under normal operating conditions, which the 1000:1 dilution is intended to be used, the area needed to achieve the 1000:1 dilution would be considerably smaller. This further demonstrates that the Seabrook WWTF outfall is of less concern to the harbor than discharges from sewer collection infrastructure (e.g., pump stations).

Aquatic Research Organisms

Aquatic Research Organisms Inc. (NPDES No. NH002985) and Enthalpy (formerly known as Envirosystems Inc.; NPDES No. NH0022055) are individual NPDES permit holders which use the same discharge location, an outfall in the Taylor River just downstream of the Route 1 bridge (Figure 6). This outfall was formerly located on the bank of the Taylor River, but was extended to the bottom of the river in the spring of 2000. Each of these facilities is classified as "Testing Laboratories" under the 1987 Standard Industrial Classification manual (SIC code 8734). Aquatic Research Organisms Inc. raises aquatic fish and invertebrates used in environmental toxicology testing. The facility draws water from the Taylor River, filters and disinfects the incoming water (sand filter and ultraviolet disinfection), and uses the water to raise the testing organisms. Water released from the facility is again disinfected with UV before discharge to the Taylor River. Envirosystems is another testing laboratory that utilizes fish and invertebrates to perform environmental toxicology testing, as well as other types of environmental testing (e.g., bacterial testing of water samples). It also draws water from the Taylor River in a flow through system that brings river water into the plant, uses it for culture and testing purposes, and discharges the water. The ARO NPDES permit notes a flow limitation of 0.007 mgd (average monthly) and 0.0012 mgd (maximum daily). The Envirosystems NPDES permit has flow conditions of "report" for average monthly flow, and 0.0007 mgd for maximum daily flow. Disinfection for both facilities is achieved with ultraviolet radiation, although chlorine can also be used. Each facility has similar NPDES permit effluent limitations for such parameters as TSS, pH, ammonia nitrogen, hydrogen sulfide, fecal coliform bacteria, whole effluent toxicity, and several heavy metals. The permits specify five fecal coliform samples per week.

Effluent monitoring results from Monthly Operations Reports (MORs) are presented in Tables 5 and 6. The MORs indicate that Aquatic Research, Organisms Inc. (ARO) and EnviroSystems, Inc. regularly meet permit limits for bacteria. Recent NPDES compliance inspection reports by the DES Wastewater Engineering Bureau (March 2018) show no significant deficiencies in regards to effluent bacteria concentrations, plant flow levels, or operation. The report for Envirosystems notes one repeat deficiency relating to staff properly filling out Discharge Monitoring Reports. The deficiency was addressed in October 2018.

Table 5: Aquatic Research Organisms, Inc. Facility Flow and Bacterial Monitoring Data (from Monthly Operations Reports)

Month	2016 Flow (MGD)		2016 Fecal Coliform (per 100ml)		2017 Flow (MGD)		2017 Fecal Coliform (per 100ml)		2018 Flow (MGD)		2018 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	0.0005	0.0017	0.10	0	0.0009	0.0023	1.00	0	0.0001	0.0013	1.25	0
Feb	0.0000	0.0028	0.09	0	0.0000	0.0021	1.62	1 (438)	0.0000	0.0017	1.36	1 (68)
Mar	0.0001	0.0015	0.24	0	0.0002	0.0019	1.06	0	0.0004	0.0016	1.00	0
Apr	0.0007	0.0040	0.36	0	0.0003	0.0023	1.00	0	0.0003	0.0021	1.38	1 (52)
May	0.0010	0.0036	1.28	0	0.0006	0.0018	1.05	0	0.0002	0.0020	1.14	0

Jun	0.0011	0.0027	1.14	0	0.0002	0.0019	1.23	0	0.0003	0.0031	1.79	1 (328)
Jul	0.0008	0.0031	1.04	0	0.0004	0.0036	1.16	0	0.0003	0.0021	1.80	0
Aug	0.0007	0.0029	1.05	0	0.0006	0.0030	2.05	3 (78,63, 276)	0.0003	0.0031	1.43	0
Sep	0.0010	0.0036	1.05	0					0.0003	0.0028	1.57	1 (77)
Oct	0.0007	0.0033	1.10	0	0.0003	0.0028	1.19	0	0.0006	0.0019	1.37	0
Nov	0.0007	0.0025	1.43	1 (187)	0.0007	0.0030	1.40	0	0.0007	0.0030	1.32	0
Dec	0.0009	0.0026	1.00	0	0.0002	0.0020	1.00	0	0.0001	0.0015	1.34	1 (112)

Table 6: Enthalpy, Inc. (Envirosystems) Facility Flow and Bacterial Monitoring Data (from Monthly Operations Reports)

Month	2016 Flow (GPD)		2016 Fecal Coliform (per 100ml)		2017 Flow (GPD)		2017 Fecal Coliform (per 100ml)		2018 Flow (GPD)		2018 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	885	4171	7.7	4 (159, 2200, 2500, 120)					975	4283	0.1	0
Feb	509	1410	2.0	1 (1760)	310	2089	0.4	0	171	2668	1.2	0
Mar	392	1680	6.5	4 (2000, 760, 210,64)	278	3119	1.3	0	218	3214	5.6	1 (2000)
Apr	247	3238	2.4	2 (2000, 59)	154	3597	2.7	1 (2000)	1694	4228	1.7	0
May	385	3487	0.6	0	657	2494	1.7	0	267	5600	2.6	0
Jun	51	3004	0.2	0	215	2105	2.4	1 (136)	496	6856	5.7	0
Jul	156	4532	1.2	1 (59)	66	2198	0.5	0	350	3033	5.1	0
Aug	313	4221	1.4	0	185	3230	0.7	0	309	2301	5.1	0
Sep	446	3422	1.6	0					67	3582	1.7	0
Oct	70	3995	2.3	2 (46, 77)	0	3243	0.5	0	0	1817	3.6	0
Nov	226	7565	0.7	1 (680)	843	4479	1.0	0	1	3268	9.1	3 (2000, 2000, 2000)
Dec	1521	10274	0.4	0	592	3685	0.5	0	0	2356	5.6	0

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.

The most significant issue in the management area regarding wastewater infrastructure occurred in 2015 in Hampton. There was a prolonged discharge of raw sewage from a broken force main between the Church Street pumping station and the wastewater treatment facility in late 2015/early 2016. A 14-inch sewer force main buried eight feet under a salt marsh ruptured (Figure 4). NHDES Shellfish Program systematic random sampling in December 2015 revealed widespread high fecal coliform throughout the estuary. Town staff were immediately contacted, and they confirmed that they were unaware of any discharges from WWTF infrastructure. Followup sampling by NHDES again revealed high fecal coliform, and the entire growing area was placed in the closed status until the cause(s) of the high bacteria could be identified. Possible sources of contamination investigated, but later ruled out, included a local marina with live-aboard vessels for the winter, possible illegal dumping of sewage septic haulers, review of pollution sources previously identified during shoreline surveys, and examination of water quality in all of the major tributaries draining to the growing area. The discharge was identified by NHDES and Hampton DPW staff in early February 2016, and the discharge was immediately ceased by the Town of Hampton by diverting the flow into a backup/secondary force main (typically only used to handle high summer flows from the Hampton Beach district). Over the course of the winter and spring of 2016 the town worked with NHDES Wetlands, NHDES Wastewater Engineering, and its environmental consultants to excavate the line and repair the ruptured section. This work was completed in the spring of 2016. The Town began planning for the eventual abandonment of the two lines buried under the marsh, and replacing them with two new lines that would be located along Route 101. In the meantime, NHDES worked with the Town of Hampton to ensure that regular inspection and monitoring of these existing lines occurred so that any future problems would be detected quickly, in order to ensure that the growing area can be closed in a timely fashion as needed. Inspections included monthly pressure tests of the sewer line, quarterly visual inspection of the marsh along the path of the buried line, and seawater sampling for fecal coliform bacteria. Seawater samples were collected and analyzed by town staff twice a week at the Route 101 bridge over Tide Mill Creek. Sampling in 2017 did not indicate any more ruptures, but problems began to reappear in 2018, when the sewer line failed pressure tests in March 2018 and again in June 2018. These incidents are described more fully in the following paragraph of this report. After the June 2018 event, the line was permanently taken out of service. Testing of the actual pipe material showed that the iron ductile pipe had undergone “selective graphitization,” a process whereby iron is selectively leached from the pipe in the corrosive saltwater environment, leaving behind a pipe with sections of brittle graphite. Over time these sections became weaker, and eventually could not withstand the pressure of the sewer force main.

Figure 4: Location of Church Street Sewer Force Main Break

Regarding instances of sewage discharge over the last three years, in 2018 the Town of Hampton reported two instances of sewage overflow. The first occurred on March 20, 2018, when a required pressure test of the Church Street iron ductile force main showed that the force main was not holding pressure, indicating a hole in the line. The line was immediately taken out of service, with flow diverted to the secondary/backup concrete asbestos line. Public Works staff located the issue, and an Emergency Wetland Authorization/Permit from NHDES was issued on April 4, 2018, with repairs made during the week of April 9, 2018. Fecal coliform testing of the nearby tidal creeks did not indicate any discharge to surface waters. The second instance occurred on June 14, 2018, when again the Church Street force main failed a pressure test (the last successful pressure test was June 7, 2018. The line was taken out of service, and the location of the leak was identified on June 15, 2018. The line was taken out of service indefinitely, and the Town of Hampton made arrangements to install a temporary, above-ground force main along Route 101 during the week of June 18, 2018. The Town is working toward the construction of a new permanent force main to be be buried adjacent to Route 101. The Town of Seabrook reported no sewage overflow events in 2018.

In 2017, the Town of Hampton reported no instances of sewage overflow. The Town of Seabrook reported one sewage overflow event in 2017, a discharge of less than 20 gallons from an overflowing manhole in a parking lot from a commercial retail store along Route 1 in Seabrook. There was no discharge to surface waters, and town staff cleared the blocked sewer line and cleaned up the discharge.

In 2016, the Town of Hampton reported one instance of sewage overflow. On February 22, 2016, a resident noticed a manhole overflowing along Route 1. The location was well away from tidal waters. Town crews identified and resolved a blocked sewer line. No discharge to surface waters was evident. The Town of Seabrook reported five sewage overflow events in 2016. Three were relatively minor, involving less than 50 gallons or less of discharge from private systems. None involved discharge to surface waters. One event involved an undetermined volume of discharge from a private trailer, where the sewer line under the trailer had become disconnected and had leaked onto the concrete pad. No discharge to surface waters was evident. The largest discharge involved an estimated 2,000 gallons of sewage discharged from a blocked sewer line in the parking lot of a large commercial retail store. No discharge to surface waters was evident.

Other Domestic Waste Discharges

One domestic waste discharge was identified in a previous shoreline survey. Site HHPS250 was a small 5x10 trailer illegally parked on Cross Beach Road in Seabrook. The trailer was considered a potential pollution source due to its lack of a septic system. It was confirmed by the NHDES Wetlands Bureau that the trailer was removed from the property in 2016 and the source's status in the Environmental Monitoring Database was changed to "inactive" in 2018.

Stormwater Discharges

17 stormwater discharges of varying diameters were identified during the previous and current shoreline surveys. Ten of these stormwater outfalls have exhibited high wet and dry weather fecal coliform concentrations, but most of them are located outside of the management area and/or discharging to Prohibited waters. Site HHPS071 (Figure 10) is a 30-inch stormwater outfall with a concrete headwall that is located just inside of the management area and discharging to a Prohibited

tributary. There is likely minimal public health risk to shellfish growing waters associated with this source, but it should be evaluated for future reports and classifications. Site HHPS070 is a 24-inch stormwater outfall that is outside of the management area and discharging to Prohibited waters, but high dry weater fecal coliform numbers in recent years suggest that this site should continue to be monitored as well.

Road Culverts

Eleven road culverts were identified during the previous and current shoreline surveys, and of those, five have shown high bacteria levels in recent years. HHPS017, HHPS026, HHPS057 and HHPS086 are all located outside of the management area and pose a minimal public health risk to shellfish growing waters. This is based on their recent sampling and evalulation efforts, which are more fully discussed in *Section D, Evaluation of Pollution Sources* of this report. HHPS035 (Figure 10) is a broken pipe that is just inside the management area but does not have any direct discharge to growing waters. The source was visited twice in the fall of 2018 (during a dry and wet weather event) and could not be located on both occasions. Therefore, this source may require further investigation and evaluation in the future.

Pipes

Twelve pipes of varying diameters were identified during the previous and current shoreline surveys. Six of these pipes (HHPS139, 140, 141, 142, 143 and 144) are located at the Yankee Fisherman's Cooperative and are used for various boat maintaineance operations. Two of the pipes are no longer in use, per Jerry Rowe of the Cooperative, and the remaining pipes are visually assessed by NHDES Shellfish staff during routine monthly ambient sampling. The source HHPS066 (Figure 10), is a 36-inch concrete pipe with a headwall and duckbill. This source is located outside of the management area and discharging to Prohibited waters, but past and present shoreline suveys suggest very high fecal coliform loads that should continue to be evaluated.

Tidal Creeks, Rivers, and Intermittent Streams

Fifty-three tidal creeks, rivers and intermittent streams were identified during the course of shoreline surverys, and bacteriological samples were taken at a majority of these sites in the year 2018.

Eight of these pollution sources are sites located at headwater streams/tributaries flowing into the major rivers of the Hampton/Seabrook Harbor (see Figure 5). All but one site (HHPS134) show high bacteria levels in the past and present. Sites HHPS015 and HHPS016 in particular show high wet and dry weather fecal levels, but both of these sources are located outside the management area. All of these sources will continue to be carefully monitored based on their high bacteria levels and input into major waterways.

A majority of the tidal creeks and rivers are sources located in Hampton/Seabrook Harbor's northern and southern main tributaries; Tides Mill Creek, Hampton River, Hampton Falls River, Browns River, Cains Brook/Mill Creek and Blackwater River (Figure 5). Each of these sites was sampled by boat in the summer and/or fall of the present study. The southern Searbrook sites generally show low fecal coliform concentrations, but northern Hampton sites HHPS225, HHPS229, HHPS231, HHPS234, HHPS235, HHPS236, HHPS237 and HHPS238 exhibited high fecal coliform during the present study. All of these sites are located in a Prohibited/Safety zone of the harbor. There are eight other tidal creeks and streams that have high levels of fecal coliform bacteria in the present survey and all of these sources are outside of the management area. All but two sources are not discharging directly to any tidal waters or are discharging to Prohibited areas of the harbor. HHPS124 and HHPS132 (Figure 10) are both tidally influenced intermittent streams that discharge into a tributary of the Conditionally Approved Blackwater River. Even though they are both located just outside of the management area, these sources may require further scrutiny.

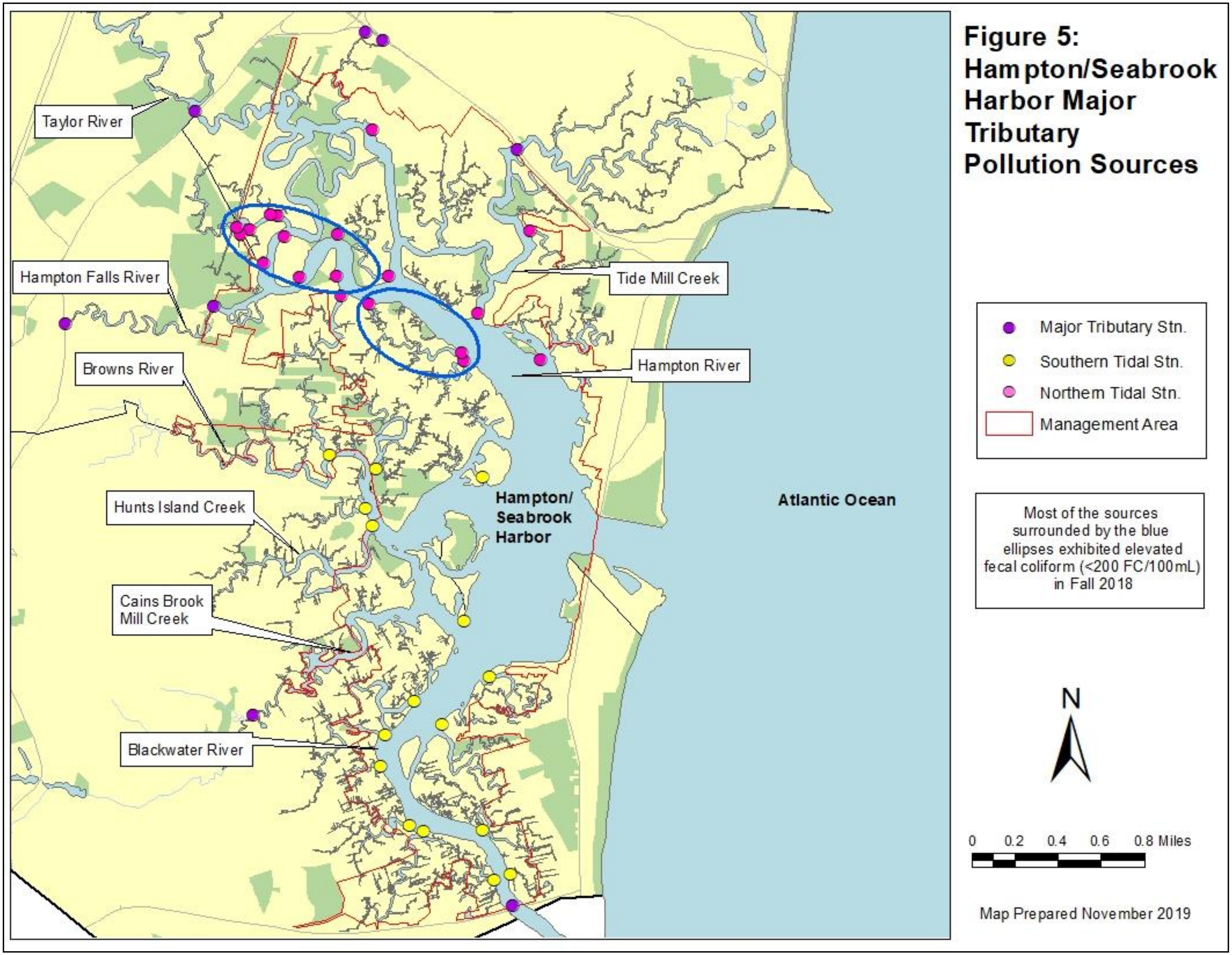


Figure 5:
Hampton/Seabrook Harbor Major Tributary Pollution Sources
Taylor River
Hampton Falls River
Browns River
Hunts Island Creek
Cains Brook
Mill Creek
Blackwater River
Tide Mill Creek
Hampton River
Hampton/
Seabrook
Harbor
Atlantic Ocean
Major Tributary Stn.
Southern Tidal Stn.
Northern Tidal Stn.
Management Area
Most of the sources surrounded by the blue ellipses exhibited elevated fecal coliform (<200 FC/100mL) in Fall 2018
N
0 0.2 0.4 0.6 0.8 Miles
Map Prepared November 2019

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 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, and this process is typically complete by mid/late October. For the period of June through September/October each year, the discharge of sewage from these boats is considered to be a potential direct pollution source.

There are currently seven mooring fields and four marinas in the Hampton/Seabrook Harbor Shellfish Management Area. Note that a fourth "marina," the Hampton River Boat Club, is not really a marina in the traditional sense as it does not provide fuel or maintenance services. It is a private club that provides water access to its members, and is identified as a potential pollution source because of the concentrated number of vessels that may have marine sanitation devices. Location and maximum occupancy figures for these areas are summarized in Table 7 and Figure 6.

Monitoring and evaluation activities for the marinas and mooring fields have included periodic weekday inspections/boat counts during the boating season, with occasional weekend surveys to develop occupancy rate information. At the beginning and end of the boating season each year (April/May and October, respectively), these weekday counts are done each week at the Hampton River Marina, in order to detect when boat sewage risk may warrant harvest closures under the terms of the Conditional Area Management Plan. The Late August/early September weekday surveys of all mooring fields 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. A second source of information to determine if mooring areas are expanding is the annual list of active moorings published online by the NH Division of Ports and Harbors (table 8). There has been a five percent increase in the total number of moorings in the harbor since 2013. Much of that growth has occurred in the "Hampton 3" area (Figure 7), which is located in a Prohibited area.

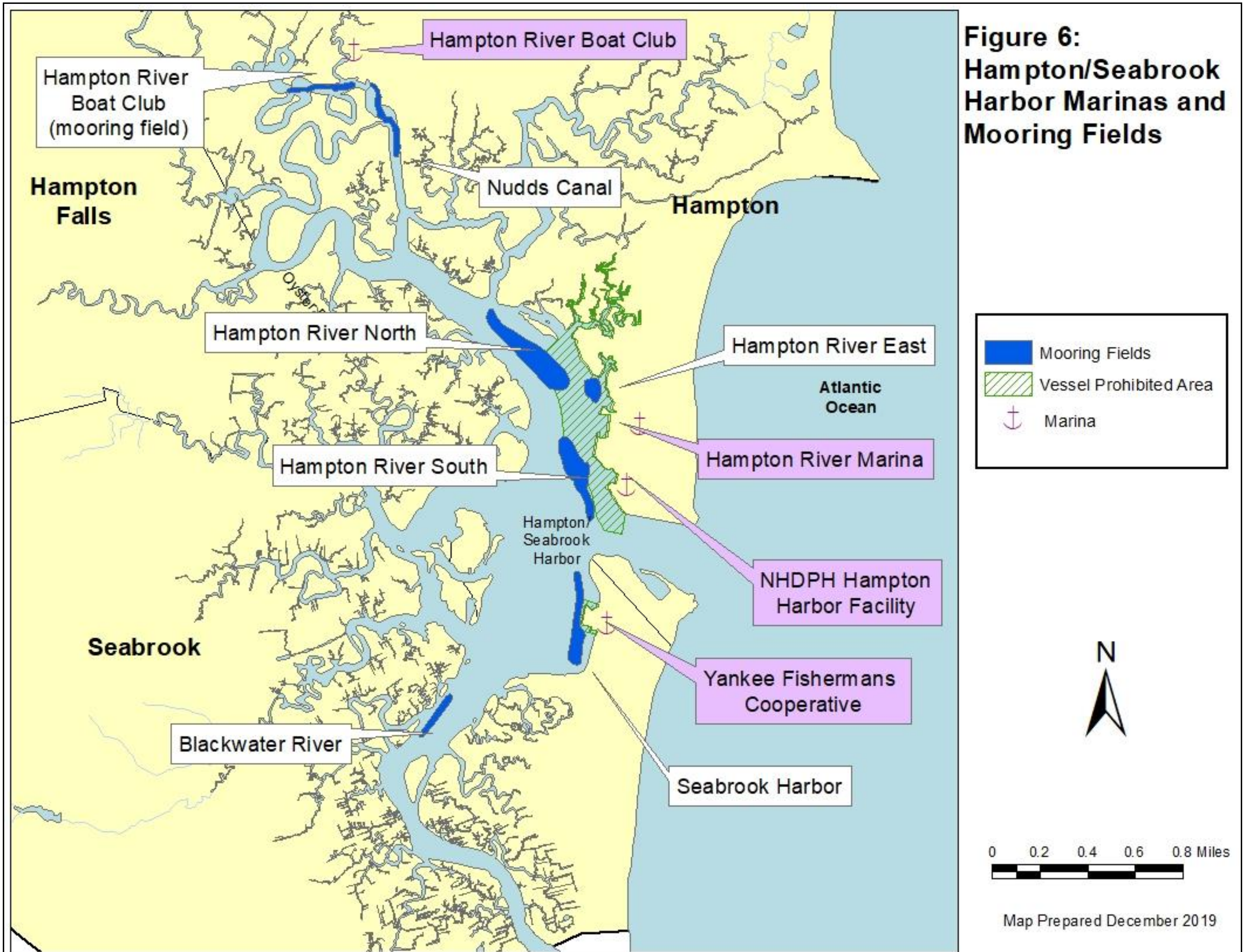


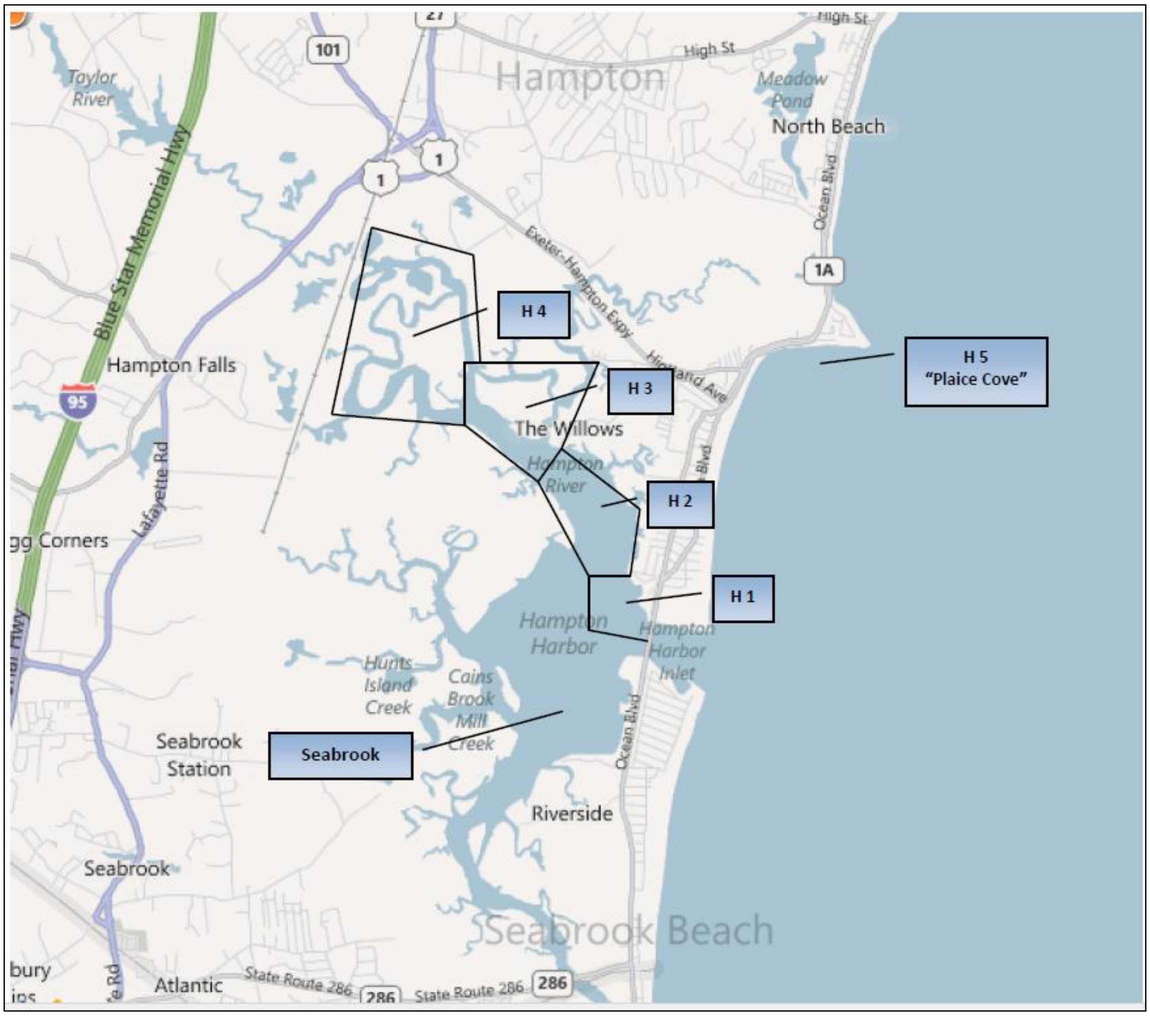
Figure 6: Hampton/Seabrook Harbor Marinas and Mooring Fields

Table 7: List of Marinas and Mooring Fields in Hampton/Seabrook Harbor

Area	Adjacent Avg. Mid-Tide Water Depth (ft)	Maximum Number of Slips or Moorings	Maximum Number of Boats Observed in 2014-2018	Maximum Number of Estimated Boats with Facilities 2014-2018	Estimated Number of Boats Discharging (25% for moorings, 35% for marinas)	Comments
Hampton River Boat Club	8	25	15	2	0.7	Mostly small (<24 ft.) open cabin recreational vessels.
Hampton River Marina	13	143	161	112	39.2	>10 boats with marine sanitation devices estimated.
Yankee Fisherman's Cooperative	13	0	0	0	0	Vessels only use facility to (un)load and to fuel up. Vessels are stored in surrounding mooring fields and marinas.
NHDPH Hampton Harbor Facility	15	0	0	0	0	Vessels only use facility to (un)load and to fuel up. Vessels are stored in surrounding mooring fields and marinas.
Hampton River Boat Club Mooring Field	11	34	20	15	3.75	>10 boats with marine sanitation devices estimated.
Nudds Canal Mooring Field	10	13	6	5	1.25	<10 boats with marine sanitation devices estimated
Hampton River North Mooring Field	9	58	27	11	2.75	>10 boats with marine sanitation devices estimated.
Hampton River East Mooring Field	10	8	6	4	1	<10 boats with marine sanitation devices estimated
Hampton River South Mooring Field	13	42	28	6	1.5	<10 boats with marine sanitation devices estimated. Predominantly commercial lobster vessels
Seabrook Harbor Mooring Field	13	46	39	8	2	<10 boats with marine sanitation devices estimated. Predominantly commercial lobster vessels
Blackwater River Mooring Field	10	2	1	1	0.25	<10 boats with marine sanitation devices estimated

* Note that the maximum number of moorings at a particular mooring field can change from year to year. The numbers presented above were obtained from the most current surveys and may vary from those presented in past reports.

Figure 7: NH Division of Ports and Harbors Hampton/Seabrook Harbor Mooring Areas



Source: https://peasedev.org/wp-content/uploads/2018/11/Seabrook-and-Hampton-Harbors.pdf

Because of the potential release of poisonous or deleterious substances (e.g., fuel) and sewage from the Hampton River Marina, the NH Division of Ports and Harbors Hampton Harbor Facility, and Yankee Fisherman's Cooperative, Prohibited areas have been delineated around them. The boundaries are drawn to provide the estimated dilution area needed to protect public health and to provide practical boundaries for enforcement (i.e., those with easily visible landmarks for harvesters and for New Hampshire Fish and Game conservation officers). The Prohibited area around the Hampton River Marina provides for sufficient dilution of sewage from 20 vessels with Marine Sanitation Devices (MSDs). In 2009, the Shellfish Program assumed for management purposes that 35% of the vessels present might be discharging at any given time; thus, once the number of vessels with MSDs exceeds 57, the Prohibited area is presumed to no longer be adequately protective of public health. As a result, the entire growing area would be placed in the closed status. Note that the 35% figure was adopted in 2009 following an examination of the standard 50% assumption that had been used up until that time. The 35 percent figure represents the maximum number of boats observed to be actually occupied on a Labor Day weekend in 2007. That Labor Day weekend survey was repeated in 2018, and the percentage occupied was observed to be 20%. The more conservative 35% is used for evaluation of sewage risk in this report. That evaluation is presented in the *Evaluation of Pollution Sources* section of this report.

Table 8: Trends in the Number of Mooring Permits in Hampton/Seabrook Harbor

Mooring Field	2005	2008	2013	2015	2017	2018
H1	40	39	35	34	32	32
H2	44	39	26	23	19	20
H2 - NS			4	4	4	4
H3	18	24	68	71	88	93
H3 - NS			2	3	3	4
H4	47	56	50	55	58	55
H4 - NS			3	2	3	3
H5	7	10	9	9	8	6
Seabrook	63	86	62	60	56	56
TOTAL	**219**	**254**	**259**	**261**	**271**	**273**

Source: Annual Mooring Lists (online), NH Division of Ports and Harbors

Agricultural Sources

No significant sources of agricultural pollution such as animal farms, golf courses or croplands were identified within the Hampton/Seabrook Harbor shellfish management area. A microbial source-tracking study conducted on Cains Brook/Mill Creek identified horses, cows, and chickens as contributing bacteria to the shellfish growing waters (Jones et al, 2005). A number of residents in the Hampton/Seabrook harbor watershed practice the longstanding tradition of caring for livestock, including raising chickens for eggs and boarding horses. Horses are situated in the areas of Railroad Avenue, Causeway Street and Centennial Street in Seabrook (Jones et al, 2005).

In addition to animals housed on residential properties, there is a commercial dairy farm located northwest of the management area. Hurd Farm is located approximately two miles upstream of the railroad crossing on the Taylor River (1.2 miles upstream of the Taylor River Pond dam). The Hurd Farm has been in operation since 1962 and encompasses 150+/- acres in Hampton and Hampton Falls. The farm keeps cows, chickens, and pigs for the commercial sale of beef, chicken, eggs, and port. The farm has 1.25 miles of frontage on the freshwater portion of the Taylor River and employs a number of best management practices to control bacterial and sediment pollution, including a heavy use area protection, fencing to keep the cattle out of the river, and riparian buffers. Manure from the farm is spread on agricultural fields in upland areas; no manure is spread on fields adjacent to the Taylor River. Because Hurd Farm is outside of the management area in a freshwater portion of the Taylor River, it is difficult to determine if it has any direct effect on the shellfish growing waters. Ambient sampling station HH33 is the most northerly station on the Taylor River and is used to evaluate any possible bacterial sources that may be entering the management area from upstream sources.

Wildlife Areas

The salt marshes and mudflats of Hampton/Seabrook Harbor provide valuable habitat to a variety of wildlife. Commonly observed bird species include a variety of gulls, sea and inland ducks, cormorants, geese, great blue herons, and others. Mammals living within the growing area include muskrat, squirrels, chipmunks, rabbits, moles, mice, 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. Large numbers of birds can pose a threat to the growing area water quality, although such occurrences are difficult to document. An MST (microbial source tracking) study conducted on Cains Brook/Mill Creek identified coyote, deer, fox, geese, otter, rabbit, raccoon, gulls, wild turkeys and skunks as contributing bacteria to the shellfish growing waters (Jones et al, 2005).

Industrial Wastes

There are three industrial facilities within the Hampton/Seabrook Harbor shellfish management area: the Hampton Harbor state boat launch and fuel dock in Hampton, the Yankee Fisherman's Cooperative in Seabrook, and the Seabrook Nuclear Power Plant in Seabrook.

The Yankee Fisherman's Cooperative is a group of fishermen working together to provide dock facilities for fishermen to get fuel, ice and unload fish. Currently there are 52 members who belong to the Cooperative. The facility currently contains three half-ton capacity hoists and one two-ton capacity hoist. The half-ton hoists are used to load bait barrels onto the fishing boats and to offload fish. The two-ton hoist is used for maintenance work which includes the removal of the floating docks in the winter. A 10,000-gallon steel diesel fuel above-ground storage tank (AST) is located within a structure located approximately 60 feet north of the northeast corner of the main facility, approximately 180 feet from the water. The AST is situated on a concrete slab with a dike containment system. The AST conveys fuel to two pumps located on the docking area. Oil spill containment booms and spill response equipment are also present at the facility. The AST underwent its last compliance inspection on 7/31/2006.

NextEra Energy Seabrook Station, commonly referred to as Seabrook Station, is a 1,220-megawatt (net) pressurized-water nuclear reactor. Located two miles inland from the New Hampshire coastline, the plant produces about half the electricity generated in New Hampshire which is about 7% of the electricity used in New England. The water used to condense steam in the plant is carried in from the Atlantic Ocean to the plant via a three-mile long underground pipe. This cooling water does not come in contact with the nuclear reactor at any point before it is discharged back to the Atlantic Ocean. Seabrook Station was designed in the 1970s and constructed in the 1980s. The plant began commercial operations in August 1990. The nuclear power plant originally had its own wastewater treatment facility. This was a tertiary treatment facility with a design flow of 0.05 MGD discharging to the Browns River. In March 1994 the discharge was stopped and the plant's effluent diverted to the Town of Seabrook wastewater treatment facility. In addition, all stormwater runoff is now routed to the cooling water discharge pipe in the Atlantic Ocean. Although categorized as an industrial facility, there are no known poisonous or deleterious substances entering the harbor via Seabrook Station. State and Federal law requires routine environmental sampling of the area to demonstrate that there is no impact from the power plant on the surrounding ecosystem. A report compiled by Normandeau Associates for NextEra Energy/Seabrook (NextEra Energy LLC, 2019) discusses preoperational and postoperational characteristics of fisheries, phytoplankton, softshell clams, and others. Radiological testing of the environmental around the facility is conducted each year and involves testing of media in aquatic, atmospheric, and terrestrial environments (NextEra Energy Seabrook LLC and Framatome, Inc., 2019). Results of these tests are summarized in *Section D, Evaluation of Pollution Sources* of this report.

The Hampton Harbor state boat launch provides a docking and fueling facility for fisherman and recreational boaters. The facility currently contains a 10,000-gallon double walled fiberglass diesel Underground Storage Tanks (UST) and a 4,000-gallon double walled fiberglass gasoline UST. Both tanks were installed in 1989 and underwent their last compliance inspection on 11/1/2005. Both tanks are equipped with overflow devices and the gasoline pump is also equipped with a vapor recovery system.

Dredging

Hampton/Seabrook Harbor is home to numerous commercial fishing vessels (groundfishermen, lobster boats, offshore charter fishing vessels, and others). The unconsolidated sediments and high-energy tidal environment create conditions of significant erosion in some areas, and sediment deposition/shoaling in others. Periodic dredging is necessary to maintain safe navigable channels. Among the projects since the last sanitary survey (all data taken from *Pease Development Authority Division of Ports and Harbors Annual Dredge Report, 2018)*:

- 2004/2005 Army Corps “Section 227” Project: Double walls of vinyl sheet pile constructed at the eastern and western ends of the “River Street Cut” in Seabrook. Dredge spoil from Blackwater River dredging was used to fill the area between the double walls. After completion of this project, an additional 110,699 cubic yards was removed from the Harbor and used for beach nourishment on Hampton and Seabrook Beaches.
- November 2012/January 2013 Inner Harbor Dredging: Included work at the state recreational anchorage areas and areas of the inner harbor. A total of 167,947 cubic yards was removed from the Harbor and used for beach nourishment on Hampton and Seabrook Beaches.
- October 2016: US Army Corps of Engineers contractor performed repairs to the seaward arm of the North Jetty (just outside the harbor entrance) to address damages from Hurricane Sandy.
- Fall 2019 (planned): Another major dreding project to address severe shoaling several areas, including the Seabrook Harbor area and the channel connecting Seabrook Harbor to the harbor inlet. Estimated 150,000-170,000 cubic yards of material to be dredges, and used for beach nourishment on Hampton and Seabrook Beaches.

The 2012 project used a hydraulic dredge system whereby material was essentially sucked up in place and pumped into a closed temporary above-ground pipe system. This pipe system carried material to the beach nourishment sites in Hampton/Seabrook. This system minimized creation of turbidity plumes near the activity. A similar system is envisioned for the work planned for 2019. Multiple sampling trips in November and December 2012 indicated dredging platforms were set up, but were not active at the time of sampling. Active dredging was occurring near the mouth of the harbor during a sampling run on 1/9/2013, and no high fecal coliform results were observed in the seawater samples.

Marine Biotoxins

The waters of the Gulf of Maine are prone to "blooms" of microscopic algae that can produce potent neurotoxins, and filter-feeding shellfish can accumulate concentrations of these toxins such that the shellfish themselves become a public health threat to consumers. This phenomenon typically occurs in the waters of the Atlantic and in Hampton/Seabrook, and NHDES maintains a biotoxin monitoring program, focused on Paralytic Shellfish Poisoning (PSP) in blue mussels, these areas. One of the primary shellfish tissue monitoring stations is located in Hampton/Seabrook Harbor, just north of the public boat launch at the Normandeau Associates dock. The second station is located at a Star Island Cooperation mooring ball at the Isle of Shoals in Gosport Harbor. Blue mussel tissue is collected to test for PSP toxicity on a weekly basis from the Hampton/Seabrook Harbor Normandeau dock from the beginning of April through October. Harvest closures are initiated when PSP toxin levels exceed 80 µg toxin/100g tissue. When high PSP toxicity levels are observed in the nearshore Atlantic area and Seabrook/Hampton Harbor, sampling at secondary monitoring stations in Little Bay is initiated.

The 2016 season showed the typical pattern of low toxicity in early spring and rising toxicity in late April and early May, at least in the offshore (Star Island) samples. On April 27 and May 4, 2016, Star Island mussel samples showed toxicity of 49.8 and 59.8 µg/100g, respectively. The following week, the sample collected on May 12, 2016 had toxicity of 204 µg/100g, and offshore waters were closed to harvest on May 13, 2016. Toxicity at Star Island remained over 200 µg/100g for the next two weeks, then dropped to 50.4 µg/100g on June 1, 2016, and continued to fall after that. After three consecutive weekly samples below the closure threshold of 80 µg/100g, the offshore waters were reopened for harvest on June 16, 2016. The nearshore station at Hampton/Seabrook Harbor never rose above 51 µg/100g, so no nearshore Atlantic or Hampton/Seabrook Estuary closures were needed.

The 2017 season showed the typical pattern of low toxicity in early spring and rising toxicity in late spring. Little toxicity was observed through mid-May, but both the nearshore Hampton/Seabrook site and the offshore Star Island/Gosport Harbor site showed toxicity on 5/31/17. Hampton/Seabrook mussels showed toxicity of 93 µg/100g, while Star Island mussel samples collected on the same day showed toxicity of 774 µg/100g. All nearshore and offshore Atlantic waters were closed for the harvest of all species on 6/1/17. Hampton/Seabrook was in the (seasonal) closed status on 6/1/17. The following week, toxicity in Hampton/Seabrook blue mussels had dropped to 62 µg/100g, and toxicity continued declining subsequent weeks. After the third consecutive weekly sample with low toxicity, the nearshore Atlantic harvest closure was lifted on 7/7/17. Offshore, toxicity continued to build. The Star Island blue mussel sample collected on 6/7/17 showed a doubling of toxicity, to 1508 µg/100g . Subsequent weekly samples from Star Island showed results of 1329, 440, and 301 µg/100g. The first Star Island sample to show toxicity below the mandatory closure threshold of 80 µg/100g was collected on 7/5/17 (72 µg/100g). After the next two weekly samples showed declining toxicity, the offshore waters were reopened for harvest on June 16, 2016. No other PSP closures were needed.

The 2018 PSP season showed low abundances of *Alexandrium* and little shellfish toxicity. None of the weekly blue mussel samples exceeded the 80 µg/100g closure threshold, and no harvest closures were needed.

In addition to PSP toxicity monitoring, NHDES and its volunteers conduct weekly sampling of seawater to monitor phytoplankton concentrations, focusing on genus and species that can be harmful to humans consuming shellfish. A major focus of this work is quantifying populations of *Pseudo-nitzschia* spp. (PN), an organism which can produce dangerous levels of domoic acid, the causative agent of Amnesiac

Shellfish Poisoning. When PN populations reach 2,000 cells per liter, NHDES staff conduct an ASP-toxin screening test on the phytoplankton. If that test is positive for the presence of domoic acid, shellfish tissues are collected for further testing.

The weekly phytoplankton sampling is done at four primary locations (two shore-based in New Castle and in the Hampton/Seabrook Estuary, and two done offshore by boat – one in Gosport Harbor, Isles of Shoals, and the other at an open ocean site halfway between Gosport Harbor and the mainland). There were 137 sampling events at these four locations in 2017 (Feburary through December). Of those, 19 had PN levels over 2,000 cells per liter. Most occurred in the fall. Scotia screening tests on all of those were negative for the presence of domoic acid. In 2018 there were 135 sampling events at the primary stations and, of those, 1s samples had total PN levels over 2,000 cells per liter. Most of these high cell counts occurred in the summer and fall months, and scotia screening tests on these samples were negative for the presence of domoic acid (Table 10). The 2017 and 2018 PN abundance data indicates that the open-ocean site, ACB30, has experienced high PN cell counts on more occasions compared with the Isle of Shoals offshore site and the Hampton/Seabrook Harbor near-shore site.

Table 9: History of PSP Harvest Closures in Hampton/Seabrook Harbor

	Dates of Harvest Closures*	# Blue Mussel Samples with PSP Toxin >80 ug/100g
2000	none	0
2001	none	0
2002	none	0
2003	none	0
2004	none	0
2005	5/19/05 - 5/31/05	6
2006	none	0
2007	none**	2
2008	5/7/08 - 5/31/08	7
2009	5/29/09-5/31/09	3
2010	none	0
2011	5/18/11 - 5/31/11	3
2012	none	0
2013	none	0
2014	5/29/14 - 5/31/14	4
2015	none	0
2016	none	0
2017	none**	1
2018	none	0

*Closures listed as ending on May 31 because area goes into seasonal/closed status on June 1 each year.
**samples with PSP toxin >80 ug/100g occurred AFTER the area went into seasonal closure.

Table 10: *Pseudo-nitszchia* Abundances and Scotia Results, 2017 and 2018

Date	Site	PN Cells/Liter	Scotia Result
6/26/2018	ACB30	19342.5	Negative
7/9/2018	ACB30	11700	Negative
7/19/2018	ACB30	3990	Negative
8/1/2018	ACB30	2460	Negative
8/27/2018	ACB30	2972.5	negative
8/16/2018	ACB30	2100	negative
10/15/2018	ACB30	3510	Negative
7/26/2017	ACB30	2482.5	Negative
8/15/2017	ACB30	3690	Negative
9/27/2017	ACB30	8827.5	Negative
10/3/2017	ACB30	9311.25	Negative
11/13/2017	ACB30	3952.5	Negative
11/21/2017	ACB30	3135	Negative
12/19/2017	ACB30	2437.5	Negative
12/7/2017	ACB30	2242.5	Negative
8/14/2017	HHHR2	3435	Negative
10/2/2017	HHHR2	9881.25	Negative
11/28/2017	HHHR2	2700	Negative
12/4/2017	HHHR2	11637.5	Negative
12/11/2017	HHHR2	2025	Negative
12/21/2017	HHHR2	3930	Negative
5/24/2018	HHHR2	20850	Negative
6/28/2018	HHHR2	13620	Negative
8/30/2018	HHHR2	3615	negative
8/15/2017	IOSSI2	4215	Negative
9/27/2017	IOSSI2	2392.5	Negative
10/3/2017	IOSSI2	8047.5	Negative
11/21/2017	IOSSI2	6652.5	Negative
12/19/2017	IOSSI2	5062.5	Negative
7/9/2018	IOSSI2	8310	Negative

D. Evaluation of Pollution Sources

Hampton Wastewater Treatment Facility

In May 1993, Fugro-McClelland, Inc., under contract with the NH Division of Public Health Services, performed a dye release study on the Hampton WWTF (Raiche and Seiferth, 1993). The study involved the injection of dye to the plant near the time of high tide and the tracking of dye position, dilution, and dispersion over the subsequent ebbing tide. At low tide, the majority of the dye was observed still in, but near the mouth of, Tide Mill Creek. A second dye/dilution study of the Hampton wastewater treatment facility effluent's impact on the Hampton River was conducted in October 1999 by NHDES and the U.S. Environmental Protection Agency (EPA). The 1993 study established that at least some dye would enter the Hampton River on the first six hours of a WWTF failure occurring at high tide. The key question for the 1999 project was to determine, during the next six hours (flooding tide), where sufficient dilution would be seen. Just prior to low slack water, a slug of Rhodamine Wt dye was introduced in Tide Mill Creek, approximately 250 feet upstream of the creek mouth (the approximate plume position at low tide during the 1993 study). Most of the plume migrated into the Hampton River and, to a lesser extent, the Hampton Falls and Taylor Rivers. The lower sections of the Hampton Falls and Taylor Rivers were ultimately included in the Prohibited/Safety Zone, as well as the upper portion of the Hampton River and the entire extent of Tide Mill and Blind Creeks.

Both the 1993 and the 1999 studies involved slug releases of dye over relatively short periods of time. They did not follow the newer procedures for extended dye release over one complete ebb tide and one complete flood tide, in order to project steady state dilution conditions, as outlined in NSSP guidance (ISSC, 2017). Such a study, which would help assess the risk of chronic viral contamination should be undertaken in the future, as time and resources permit. In lieu of such a study, NHDES has undertaken sampling of the Hampton WWTF effluent to assess levels of male specific coliphage under a variety of operational conditions. Figure 8 and Table 11 depicts MSC values in Hampton WWTF influent, predisinfection effluent, and final effluent. The samples, collected 2016-2018, show consistent reduction of MSC in effluent, and final effluent is almost always near the test detection limit. Reductions of five orders of magnitude or better is common. Figure 9 plots WWTF flow versus MSC concentration in final effluent. Most observations show low MSC regardless of flow. Three observations were in the range of 19-69 pfu/100ml. More sampling of this nature should be done in concert with an updated dye study to improve the risk assessment of the Hampton WWTF with regard to viral contamination of shellfish resources.

Table 11: Male-Specific Coliphage Concentration in Effluent from the Hampton Municipal Wastewater Treatment Facility

	Max. Daily Flow (mgd)	Total Daily Flow (mgd)	Influent MSC (pfu/100ml)	Pre-Disinfection MSC (pfu/100ml)	Final Effluent MSC (pfu/100ml)
02/23/16	2.38	3.070	1,600,001	400	8.9
03/01/16	3.17	2.410	426,667	3,236	19.0
03/14/16	3.65	2.480	4,186,667	484	8.9
03/22/16	3.41	2.620	773,333	1,685	8.9
03/28/16	3.70	2.670	786,667	703	8.9
3/30/2016	3.84	2.590	160,000	291	9.9
04/11/16	3.53	2.720	432,727	873	8.9
04/25/16	4.07	2.230	543,030	812	69.0
05/11/16	4.04	2.42	375,758	570	8.9
07/12/16	3.66	2.44	1,533,333	3,188	9.0
8/9/2016	3.53	2.39	1,080,000	800	9.0
10/4/2016	3.04	1.8	2,680,000	618	8.9
3/20/2017	3.04	2.06	344,242	48	8.9
4/17/2017	3.78	2.76	139,394	267	37.0
7/11/2017	3.56	2.56	760,000	900	9.9
5/16/2018	4.14	2.6	780,000	2,200	9.9

Figure 8: Male-Specific Coliphage Concentration in Effluent from the Hampton Municipal Wastewater Treatment Facility

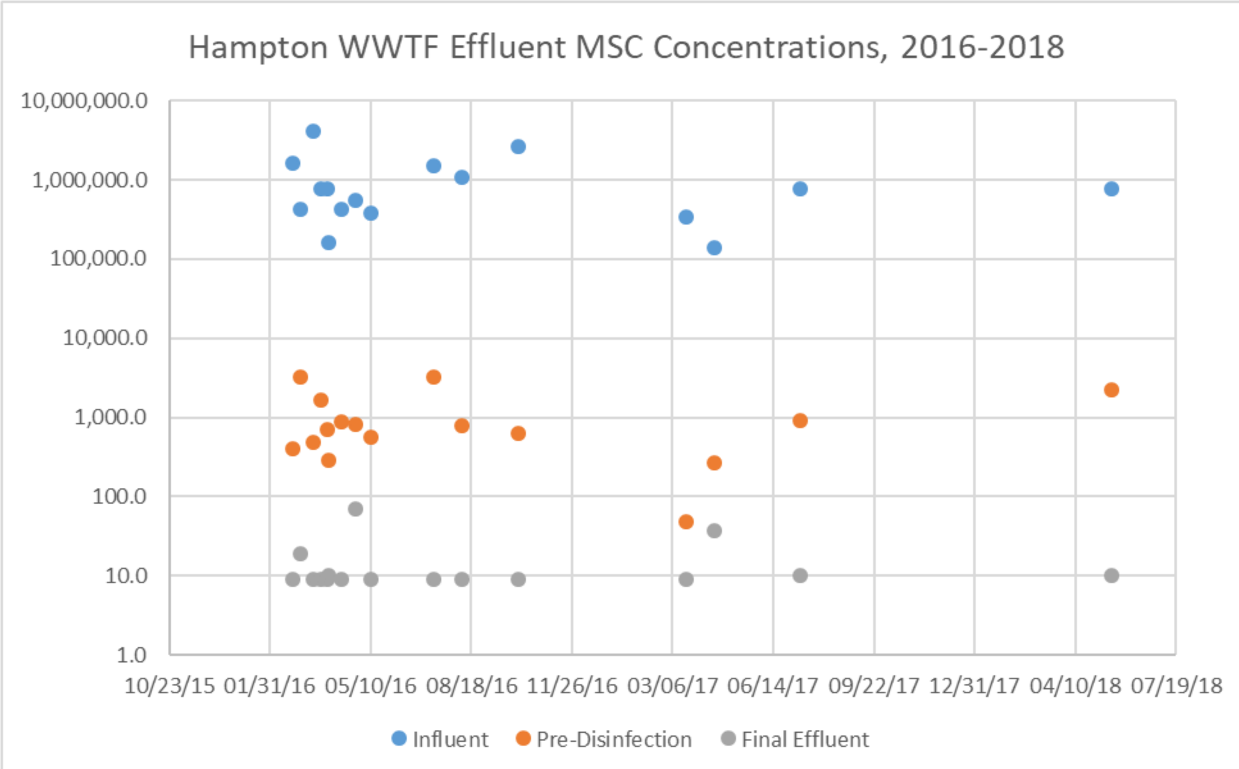
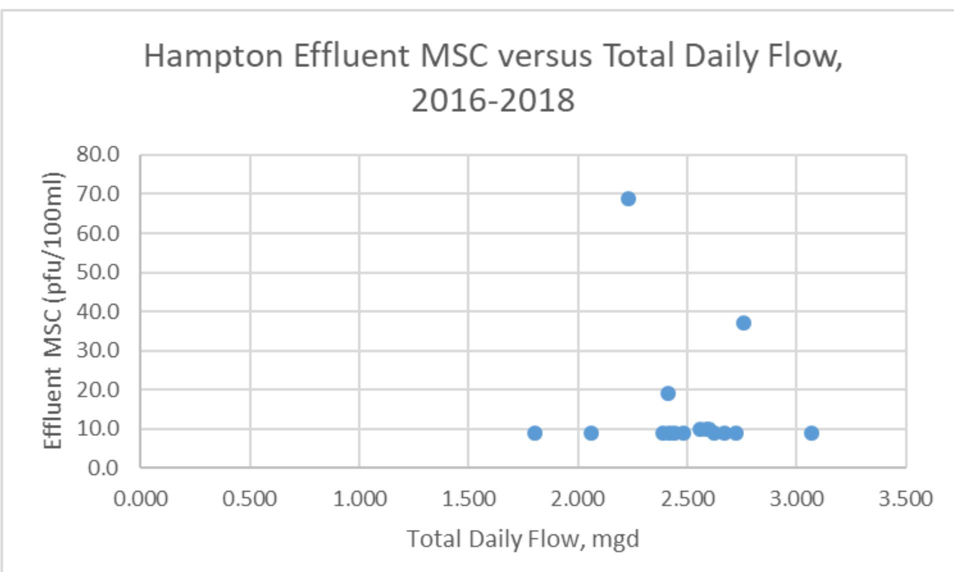


Figure 9: Male-Specific Coliphage Concentration in Hampton WWTF Effluent vs. Flow



The generally efficient removal of virus from Hampton wastewater is generally illustrated by samples of seawater MSC taken from the harbor during cold-weather months, when MSC can be expected to persist in the environment. Most samples show low MSC concentrations (Table 12).

Table 12: 2018 MSC Concentration in Hampton/Seabrook Harbor Seawater

	3/21/2018	4/11/2018	10/8/2018	11/12/2018*
HH34	---	4.9	4.9	---
HH30	4.9	4.9	4.9	10
HH5B	---	4.9	5	---
HH5C	---	4.9	5	10
HH12	---	4.9	4.9	10
HH35	---	4.9	4.9	---
HH19	---	4.9	15	10
HH2B	5	5	4.9	9.9
HH18	4.9	4.9	4.9	9.9
HH1A	5	4.9	4.9	9.9

*due to limited lab resources (available plates) the detection limit for these tests was 10 pfu/100ml, not 5 pfu/100ml

Seabrook Wastewater Treatment Facility

In August 2001, NHDES, the U.S. Food and Drug Administration, and the Massachusetts Division of Marine Fisheries conducted a joint hydrographic study to investigate dilution and dispersion patterns of Seabrook, NH, municipal wastewater treatment facility effluent in the Atlantic Ocean. The study involved a prolonged injection of Rhodamine dye into the Seabrook WWTF and tracking of the dye in the Atlantic Ocean. Field measurements of dye concentration in the WWTF effluent and in the receiving water were used to calibrate a computer model (CORMIX), which was then used to simulate WWTF discharges with varying flow rates and effluent bacterial concentrations (Carr, 2004). Resulting fields of dilution in the receiving waters were then projected to the Atlantic Ocean from the Hampton Harbor inlet to the New Hampshire/Massachusetts border. Conclusions from the report determined that an area, with approximate dimensions of 2.3 miles long (along the shore) and 1.3 miles wide (offshore), was needed to contain the plume of effluent that would be insufficiently diluted during a prolonged failure of the WWTF chlorination system. The boundaries of the area are defined by recognizable landmarks to enhance compliance and enforcement of the boundary (tip of Hampton Beach jetty, red navigational buoys, and the NH/MA state line). These boundaries were first proposed in the 2001-2003 Triennial Reevaluation, having been reconfigured from the original circular radius defined in the 2000 Sanitary Survey. Data collected during the 2001 dye study suggest that significant effects to the water quality of Hampton/Seabrook Harbor would only occur under extreme/unusual failure conditions. For this reason the Seabrook WWTF was not included in the Hampton and Seabrook Harbor Conditional Area Management Plan. Of greater concern to the water quality of the harbor would be discharges from the Seabrook sewer infrastructure (e.g. pump stations and sewer lines) near the estuary.

The U.S. FDA recommends that a Prohibited area around a WWTF outfall, for plants using chlorine disinfection, provide 1000:1 dilution to protect against viral contamination. Data collected during the 2001 hydrographic study demonstrate that 1000:1 dilution would be achieved well within the current Prohibited area, although the reader should note that new procedures for delineating *steady state* 1000:1 dilution area are now available, but have not been performed on the Seabrook WWTF to date. The 2001 study indicated that 15:02 track T11 data point indicates that dilutions as low as 1041:1 – 4777:1 occur approximately 1,500 feet south of the Hampton/Seabrook Harbor entrance (Carr, 2004). This location was derived from information representative of a hypothetical failure at the WWTF. Under normal operating conditions, which the 1000:1 dilution is intended to be used, the area needed to achieve the 1000:1 dilution would be considerably smaller. This further demonstrates that the Seabrook WWTF outfall is of less concern to the harbor than discharges from sewer collection infrastructure (e.g., pump stations).

Male specific coliphage data in Hampton municipal wastewater has been developed. A similar effort should be made on Seabrook municipal wastewater effluent.

NextEra Energy/Seabrook Station

In 2018 NextEra Energy/Seabrook Station analyzed 847 samples collected from 98 different stations within a 10-mile radius of the plant. The samples were analyzed for radiation and radioactivity within aquatic, atmospheric, and terrestrial environments. An estimated 5,086 individual measurements were performed on these samples.

The ingestion exposure pathway examined in the study includes milk, fish, shellfish, terrestrial food products and leafy vegetation samples. The 2018 annual report Executive Summary notes:

> *"The gamma spectroscopy analyses indicated the most prominent positive results were for potassium-40 (K-40) at average environmental levels. Other naturally-occurring radionuclides were also periodically detected. However, past world-wide nuclear events such as atmospheric testing of nuclear weapons and the Fukushima Daiichi nuclear accident did result in detectable fallout of fission related radioactivity (Cs-137) in milk and leafy vegetation. Neither fish or shellfish nor terrestrial food products (strawberries and tomatoes) had any detectable fission product related radioactivity. No radionuclides related to plant effluents were detected in any of these sample media during 2018. For the one fission product (Cs-137) detected in milk and leafy vegetation, the concentration falls within the range of past and pre-operational measurements and can be attributed to past weapons testing fallout."*

In 2018 there were two species of mussels harvested for analysis. *Modiolus modiolus* (horse mussels) were collected by divers from near the discharge outfall (indicator station) and from Ipswich Bay (control). *Mytilus edulis* (blue mussels) were collected from the intertidal areas of Seabrook Harbor (indicator) and Plum Island, MA (control). Eight samples were collected for 2018 and analyzed for radioactivity in the edible portion or meat of the shellfish. The 2018 annual report describes the results as follows:

> *"The only radionuclides detected in edible shellfish body samples in 2018 were naturally-occurring Be-7 (1 out of 8 samples), K-40 (all 8 samples) and nuclides of the Uranium-238 decay chain (Th-230, Ra-226) and the Thorium-232 decay chain (Th-228, Pb-212, and Tl-208). Similar to*

past years, no plant-related gamma emitting radionuclides were detected in any sample. Therefore, no increasing or decreasing trends were observed. Consequently, there is no dose to the public or impact to the environment from this pathway due to plant operations. This is consistent with the pre-operational program and with previous years of plant operations.

Additional analyses were conducted on the May and November shellfish collections from both indicator (MS-06) and control (MS-56) locations. Mussel shells (MS) were analyzed for Strontium 89 and 90 (four samples) to see if there was any indication of strontium uptake into the shell. For 2018, no Sr-89/90 was detected in any sample. No shell analyses are required by the REMP as defined in the ODCM. "

The annual report concludes that results of the 2018 Radiological Environmental Monitoring Program [REMP] demonstrate that there is no significant short term or chronic long-term radiological impact on the environment in the vicinity of Seabrook Station from plant operations and that there is no detectable impact to members of the public associated with the DFS facility.

Marinas and Mooring Fields

To evaluate the risk of sewage discharge from the vessels located at the mooring fields, counts/observations of boats present are made during the boating season. Many of these mooring fields contained more than ten boats during the summer boating season, and some had more than 10 boats with sanitary facilities during the late summer.

Table 13: Hypothetical Fecal Coliform Loading and Dilution for Hampton/Seabrook Marinas and Mooring Fields

	Adjacent Avg. Mid-Tide Water Depth (ft)	Maximum Number of Slips or Moorings	Maximum # Boats Observed, 2014-2018	Maximum # Boats with Sanitary Facilities Observed, 2014-2018	Estimated Number of Boats with Sanitary Facilities Discharging (25% for moorings, 35% for marinas)	Comments	Hypothetical Mooring Field Fecal Coliform Load (per day)	Area of Mooring Field (sq ft)	Hypothetical FC per 100 mL in Mooring Field
Hampton River Boat Club	8	25	15	2	0.7	Mostly small (<24 ft.) open cabin recreational vessels.	2.00E+09	marina/ not applicable	marina/ not applicable
Hampton River Marina	13	143	161	112	39.2	>10 boats with marine sanitation devices estimated.	1.12E+11	marina/not applicable	marina/ not applicable
Yankee Fisherman's Cooperative	13	0	0	0	0	Vessels only use facility to (un)load and to fuel up. Vessels are stored in surrounding mooring fields and marinas.	------	------	------
NHDPH Hampton Harbor Facility	15	0	0	0	0	Vessels only use facility to (un)load and to fuel up. Vessels are stored in surrounding mooring fields and marinas.	------	------	------
Hampton River Boat Club Mooring Field	11	34	20	15	3.75	>10 boats with marine sanitation devices estimated.	1.50E+10	145,027	33.2
Nudds Canal	10	13	6	5	1.25	<10 boats with marine sanitation devices	5.00E+09	200,602	8.8

						estimated			
Hampton River North	9	58	27	11	2.75	>10 boats with marine sanitation devices estimated.	1.10E+10	1,348,698	3.2
Hampton River East	10	8	6	4	1	<10 boats with marine sanitation devices estimated	------	------	------
Hampton River South	13	42	28	6	1.5	<10 boats with marine sanitation devices estimated. Predominantly commercial lobster vessels	6.00E+09	638,048	2.6
Seabrook Harbor	13	46	39	8	2	<10 boats with marine sanitation devices estimated. Predominantly commercial lobster vessels	8.00E+09	456,196	4.8
Blackwater River	10	2	1	1	0.25	<10 boats with marine sanitation devices estimated	------	------	------

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, 2017 and 2018:

1. Over the five 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 five 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% for mooring fields, and 35% for marinas, to more closely reflect actual conditions. Marina surveys on two Labor Day weekends at the Hampton River Marina showed 20% and 35% of the boats occupied, so the more conservative 35% 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 2 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 mid tide water depth. Average mid-tide water depth was determined by accessing data from the NHDES Environmental Monitoring Database (EMD). Mid-tide water depth was used as opposed to the more conservative low-tide water depth because the Hampston/Seabrook Harbor has constantly shifting sands and dredging taking place, therefore, low tide depth changes quite often.

The FC load was then divided by the available dilution water, to yield a hypothetical value of FC/ml. 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 Hampton River Boat Club mooring field and Hampton River North mooring field have more than 10 vessels with sanitary facilities. A few other mooring fields are included in the FC loading analysis because the number of mooring balls historically indicates that's these mooring fields have the potential to have more than 10 vessels. The Hampton River North mooring field (Figure 6, Table 13) has enough water to dilute the hypothetical FC load. But the Hampton River Boat Club mooring field does not have enough water to dilute the hypothetical FC load to <14 MPN/100ml.

Typically, this dilution analysis would call for a Prohibited area around the Hampton River Boat Club mooring field; however, in this case such a delineation is not necessary because the entire Hampton/Seabrook growing area is placed in the closed status by the beginning of June, and it remains in the closed status until November. By that time, all of the boats in the Hampont River Boat Club mooring field are gone for the season (confirmed in multiple years by NHDES Shellfish Program mooring field surveys), and the sewage risk is therefore minimal.

The timing of the seasonal closure has historically been driven by one of the four factors:

- Arrival of June 1. Water quality data show that harbor water quality becomes unpredictable in June. On June 1, the entire growing area is put in the seasonal closed status, regardless of other conditions (rainfall, PSP toxin levels, numbers of boats present, etc).
- A red tide event that begins in May. When a PSP closure becomes necessary in May, there is usually not enough time for the event to subside, and for the required number of low-toxin mussel samples to be collected before the end of May. In such a case, the seasonal closure essentially begins with the red tide event, and when the red tide event is over, the area is simply left in the closed status until November 1.
- Heavy rainfall. Similar to a May PSP event, heavy rain and resulting high fecal coliform sometimes closes the area before the June 1 date arrives.
- Boat Counts at the Hampton River Marina. Most mooring fields in May are sparsely populated with boats, but the April-May time period is when boating activity is at least beginning. Such activity is most notable in the Hampton River Marina, which has the greatest concentration of boats with heads of all the marinas/mooring fields. Dilution analysis from the 2007-2009 Triennial Report (Nash, 2010) indicates that the Hampton River Marina, and the existing Prohibited area adjacent to the marina in the Hampton River, has enough water to dilute the hypotethical sewage coming from 57 boats (assuming 35% discharging). Thus, when more than 57 boats are present, the possible sewage contamination is too great for the available dilution, and the entire area is closed for harvest. The area remains closed until the beginning of November. Boat counts in the marina are done each October to verify that the number of boats with heads is below the 57 mark.

The delineation of Hampton/Seabrook Harbor mooring fields has not been updated since 2014. A future reassessment of mooring ball location and mooring field dilenation should be completed for a more accurate and current representation. This work was contemplated for the present study; however, discussion with the local harbormaster indicated it would be prudent to delay such work. He indicated that recent shoaling in several areas has required periodic relocation of several moorings, and such movements would likely continue. Furthermore, a planned dredging of the area for 2019 will mean that many mooring blocks will need to be pulled and later reset. Therefore, the NHDES Shellfish Program will pursue an update of mooring field delineation after the 2019 dredging project is done.

Shoreline Pollution Sources

For the 2018 survey, all pollution sources in the growing area were reevaluated using sampling data from the last 12 years. 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 14). Note: The dilution radii in Table 14 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 14 and illustrated in Figure 10 indicate that most of the pollution sources have a low potential for high fecal coliform loading into Conditionally Approved waters based on their locations outside of the management area and their dilution radii. Many of these sources are either discharging into Prohibited waters or not discharging directly into any shellfish growing waters at all, therefore, resulting in a minimal public health risk. HHPS035 is located in the management area but does not discharge directly into any tidal waters, and site HHPS071 is also located within the management area but a Prohibited area is providing dilution for any possible fecal load. Site HHPS066 is even less of a concern because it is situated outside of the management area and discharging into a Prohibited zone as well. Sites HHPS124 and sites HHPS132 are only located just outside of the management area, but do have the potential for high fecal contamination, and they discharge directly in Conditinally Approved tributaries of the Blackwater River. Possible wet weather transect pollution source sampling in Hampton/Seabrook Harbor may be completed in the future for a more comprehensive analysis of fecal coliform dilutions.

Table 14: Hypothetical Fecal Coliform Loading and Dilution Radii for Selected Pollution Sources

Station ID	FC per 100ml	Flow (cfs)	Dilution Radius (ft)*
HHPS003	50	0.0002	1
HHPS057	9	0.0022	1.6
HHPS109	10	0.0111	3.7
HHPS108	40	0.0111	7.4
HHPS035	60	0.0223	12.8
HHPS062	970	0.0022	16.2
HHPS094	1800	0.0022	22.1
HHPS054	190	0.0223	22.8
HHPS017	460	0.0111	25
HHPS061	4500	0.0022	34.9
HHPS068	12800	0.0022	58.8
HHPS056	5100	0.0223	118.2
HHPS055	5500	0.0223	122.8
HHPS086	20001	0.0223	234.1
HHPS071	9500	0.0668	279.2
HHPS026	400	1.6133	281.6
HHPS066	11400	0.0600	289.9
HHPS070	20001	0.0668	405.1
HHPS124	700	2.6736	479.5
HHPS089	520	4.0104	506.2
HHPS069	14500	0.1500	516.9
HHPS132	1600	3.3420	810.5
HHPS106	3100	2.0052	873.9
HHPS039	4500	3.5150	1394

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

All of these sources will also undergo continued sampling during the next triennial review period to better understand their influence on the shellfish management area. It should be noted that the hypothetical dilution radii/potential areas of impact presented in in Table 14 are most likely oversized, as they represent a combination of fecal coliform concentration and flow that were not actually observed concurrently.

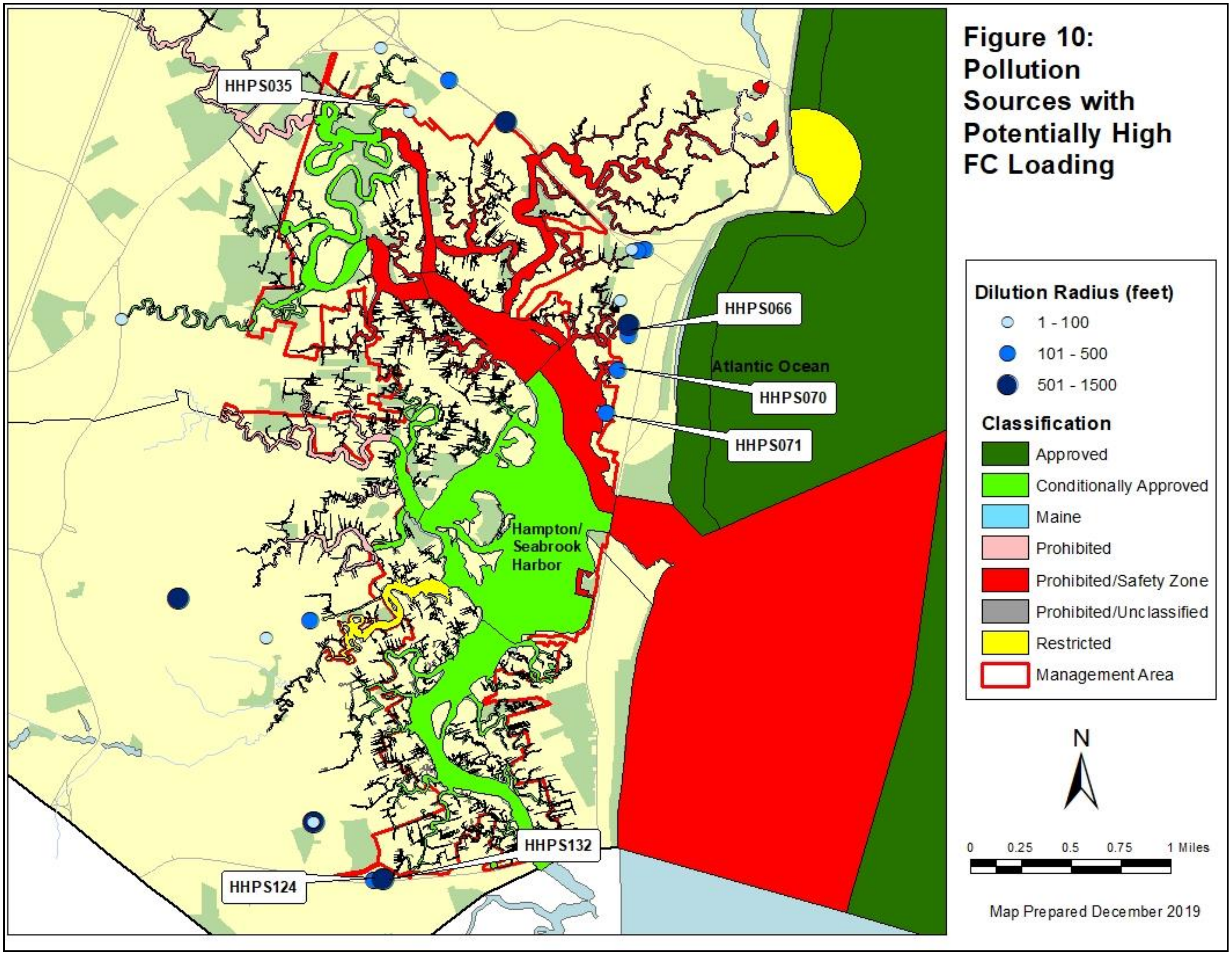


Figure 10: Pollution Sources with Potentially High FC Loading
Dilution Radius (feet)
1 - 100
101 - 500
501 - 1500
Classification
Approved
Conditionally Approved
Maine
Prohibited
Prohibited/Safety Zone
Prohibited/Unclassified
Restricted
Management Area
N
0
0.25
0.5
0.75
1 Miles
Map Prepared December 2019
HHPS035
HHPS066
HHPS070
HHPS071
HHPS132
HHPS124
Atlantic Ocean
Hampton/ Seabrook Harbor

V. Hydrographic and Meteorological Characteristics

The Hampton/Seabrook Harbor growing area is located in southeastern New Hampshire, within the town boundaries of Hampton, Hampton Falls, and Seabrook. The harbor is a shallow, bar-built estuary that is surrounded by approximately 5,000 acres of salt marsh on its western side. Tidal flow enters and exits the estuary through one outlet to the Atlantic Ocean under the Route 1A bridge. Tidal flushing is high, with an estimated 88%of the estuary's volume exchanged on each tide under average wind conditions. The low tide volume of the estuary is 500 million gallons, and while the high tide volume is 4,200 million gallons (NAI, 1977).

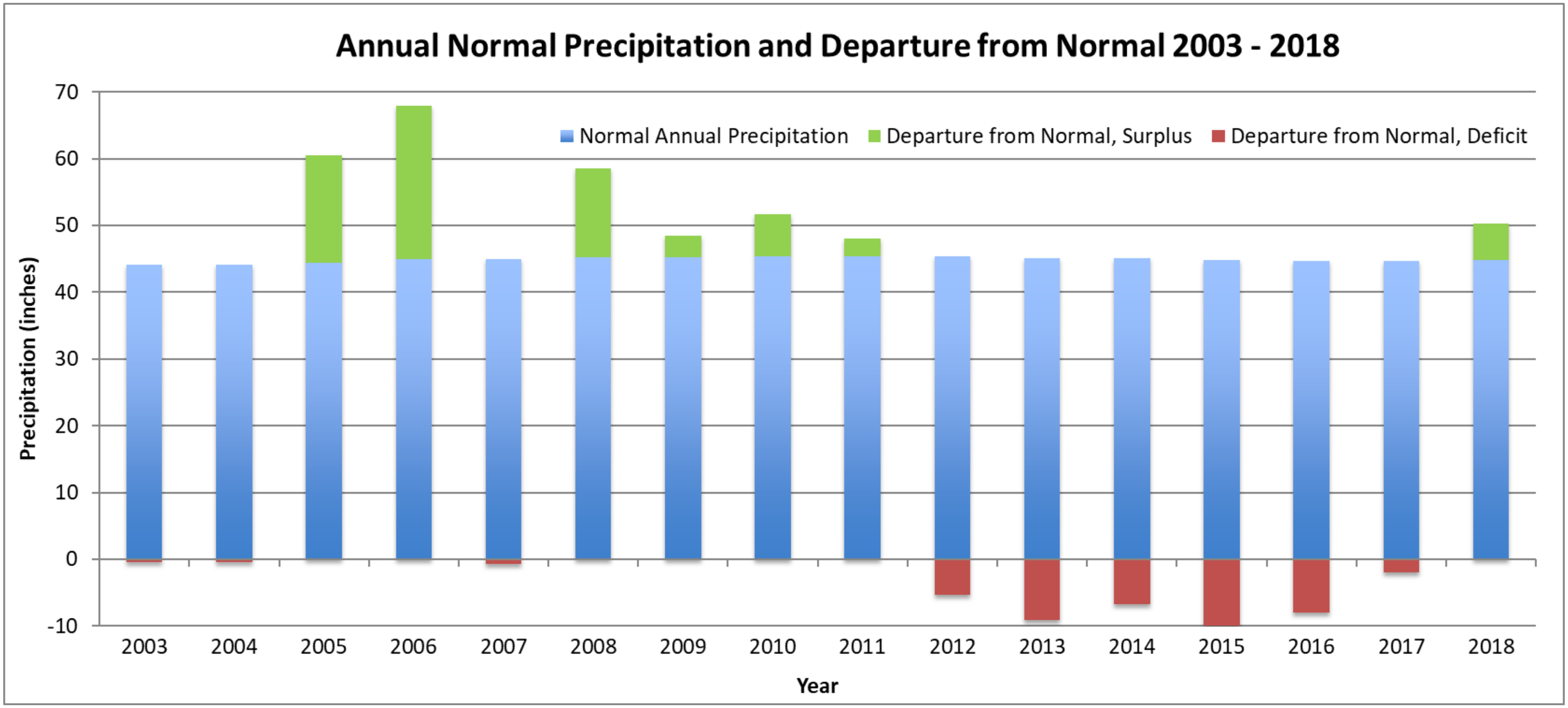
A. Tides

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 in Hampton/Seabrook Harbor indicate a mean tidal range of 8.3 feet, a spring tidal range of 9.5 feet, and a mean tide level of 4.5 above mean lower low water. Currents in the area are predominantly driven by the tides. Tidal flushing is high, with an estimated 88%of the estuary's volume exchanged on each tide under average wind conditions (NAI, 1977).

B. Rainfall

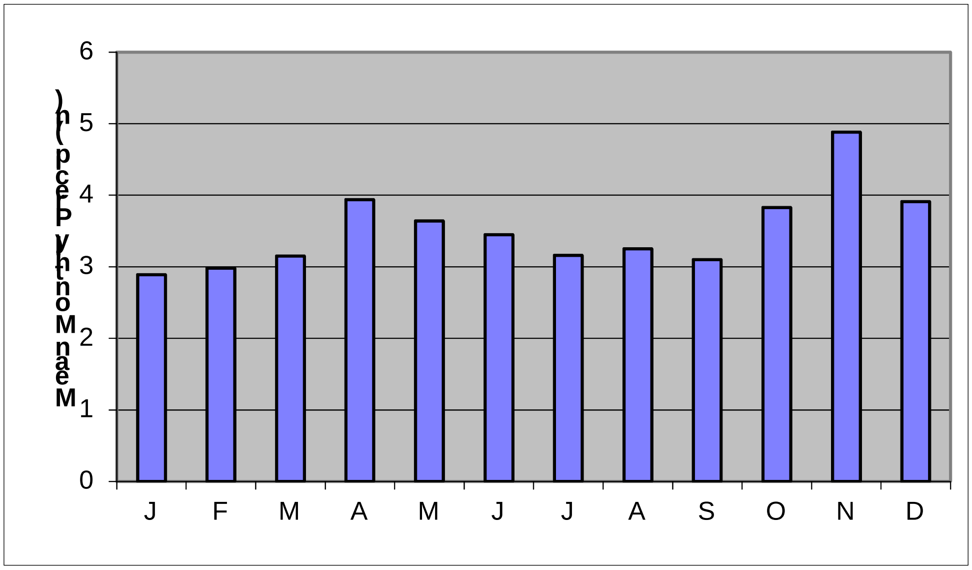
The Portsmouth weather station at the Pease International Tradeport indicates a long-term average annual precipitation value of approximately 45 inches. Total precipitation for each year for the period of 2003 through 2018 is shown in Figure 11. This figure depicts long-term annual mean precipation (blue 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, 2003-2018



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 13a 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. Furthermore, precipitation that fell as rain is not differentiated from precipitation that fell as snow or ice. 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 Hampton/Seabrook Conditional Area Management Plan calls for rainfall closures following storms of over 1 inch of rainfall. Figure 10b shows that storms with more than one inch of precipitation (liquid equivalent) have occurred 96 times over the seven years examined or, on average, 12 times per year. These storms occur, on average, 2.7 times in the winter (some of these would be snow), 2.9 times in the spring, 4.9 times in the summer and 3.2 times in the fall.

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

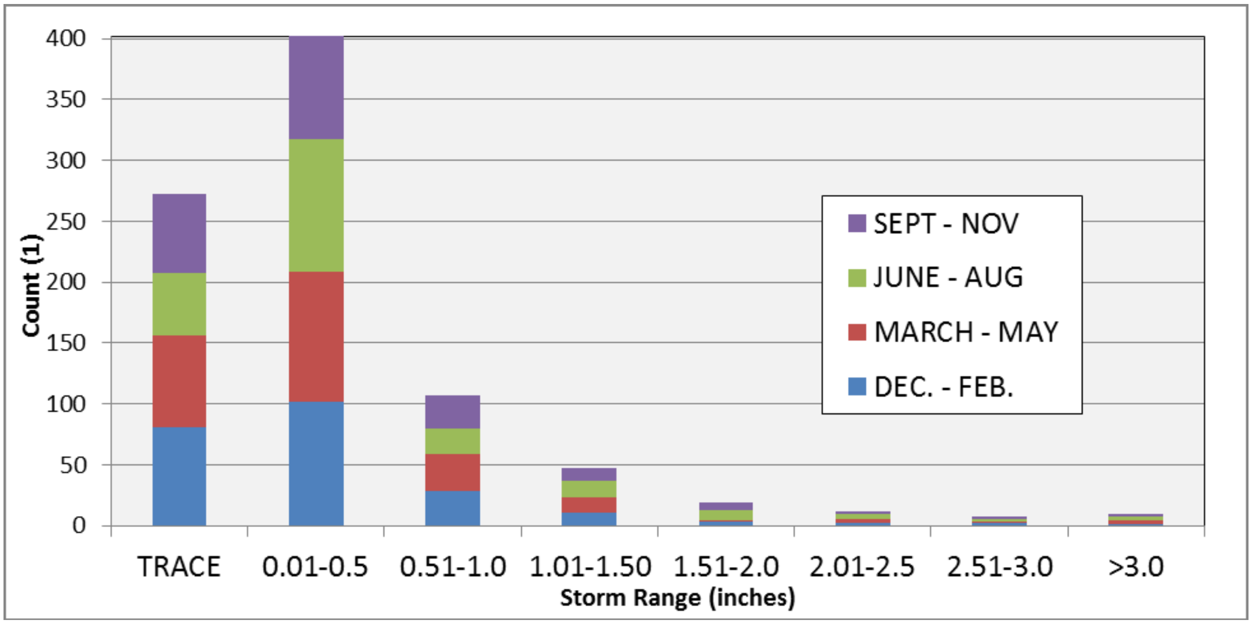
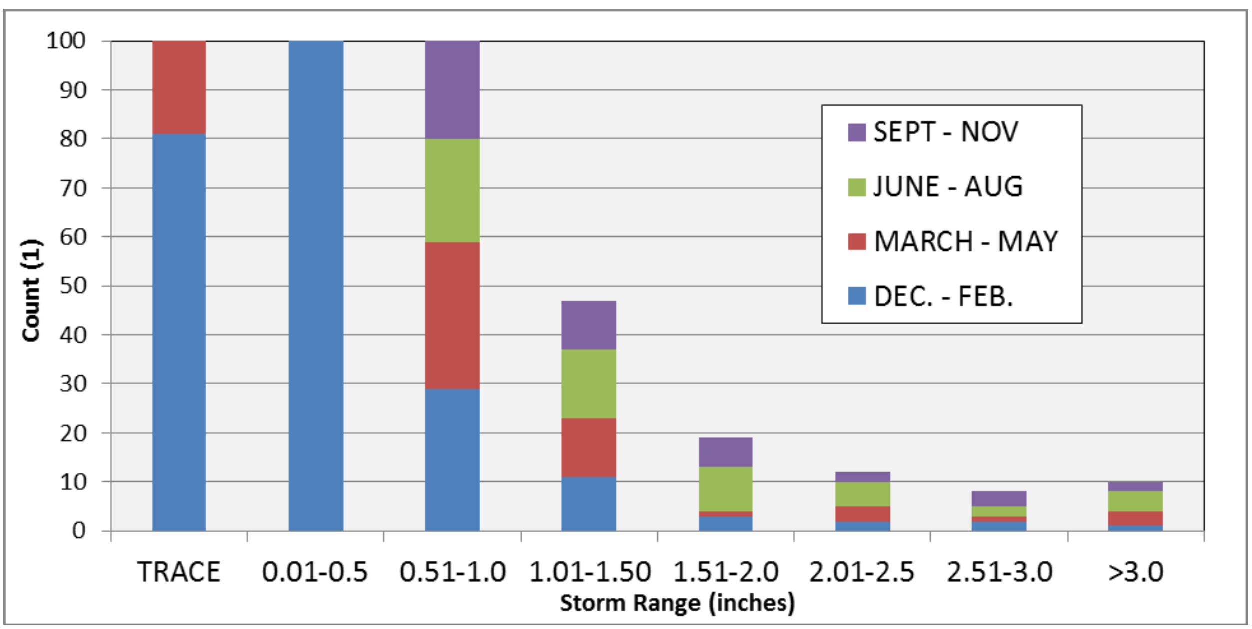


Figure 13b: Scale-Adjusted Distribution of Precipitation Events by Total Precipitation by Season (based on data from Pease/Portsmouth Weather Station, 2008-2014)



C. Winds

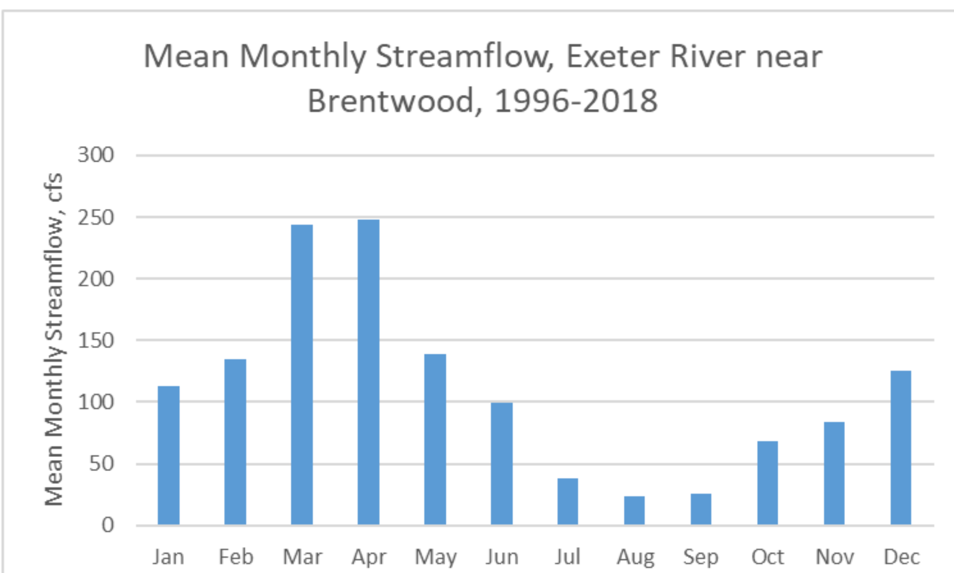
According to Normandeau Associates Inc. (1977), winter winds are typically from the west and northwest. In the spring, predominant winds are from the northwest, but northeast and southeast winds become more important during this season. Winds from these directions, although less frequent, are typically 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. The area is relatively well-protected from significant wind effects on circulation, due to its location in the salt marshes and the convoluted nature of the channels. However, sustained winds have been observed to modify current speed and direction. This is especially true of a sustained wind from the southeast, as such a wind has a rather long fetch up the corridor of the Hampton River.

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). To illustrate the seasonality of streamflow in southeastern New Hampshire, mean monthly flow for the Exeter River at Haigh Road near Brentwood, New Hampshire, gauged by the U.S. Geological Survey, is plotted in Figure 14. Rivers and tributaries that flow into the Hampton/Seabrook Harbor show a similar pattern.

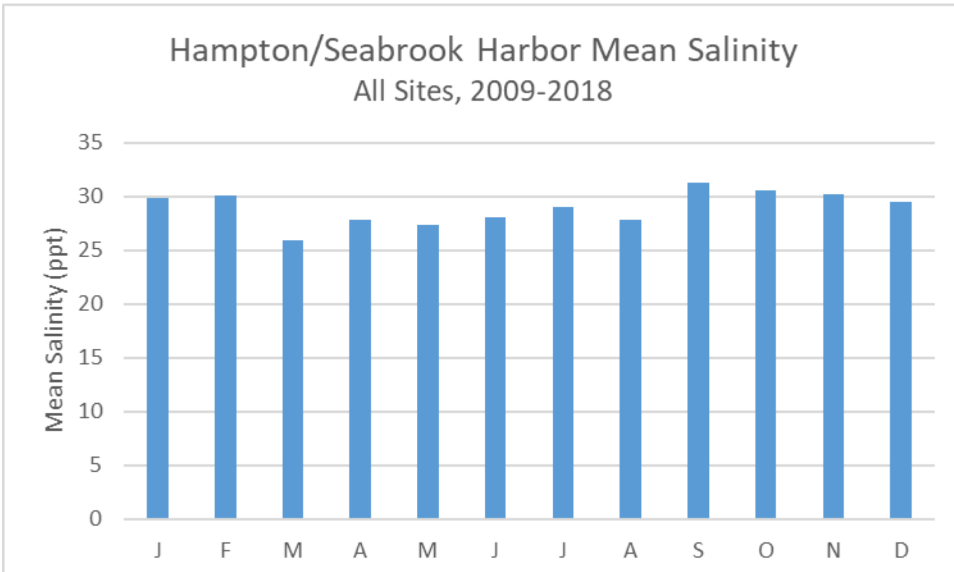
Figure 14: Mean Monthly Flow, Exeter River at Haigh Road (near Brentwood, NH)



Data Source: https://waterdata.usgs.gov/nh, USGS Station 01073587

Salinity data from monitoring sites in Hampton/Seabrook were queried from the NHDES Shellfish monitoring database for the period of 2009-2018 and sorted by month. Only data from the systematic random and open status sampling were used in the query. 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 Hampton/Seabrook Sites, 2009-2018



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

Hampton/Seabrook Harbor and its tributaries are generally well-mixed due to their shallow depths and relatively small freshwater inputs. However, partial salinity stratification can occur during times of heavy rainfall and runoff, which typically occurs in spring, and to a lesser extent in the late fall (NHDPHS, 1994). The stratification is generally short-lived, since the watershed areas that drain into growing area are relatively small. Little temperature stratification has been observed.

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 Hampton/Seabrook Harbor is the pattern of tidal current speed and direction, and how that influences the dispersion of effluent from the Hampton WWTF. This is especially important for the instances when the plant might experience discharges of raw or improperly treated sewage. Perhaps the "worst-case scenario” for such an event would be to have the discharge begin near the time of high tide. As currents around the outfall begin to slow toward high slack tide, improperly disinfected effluent discharged to the river would begin to build a plume of high-bacteria water around the outfall in Tide Mill Creek. As the tide turns and begins to ebb, effluent would be carried down Tide Mill Creek toward the Hampton River. Previous dye studies show that at dead low tide, most of the effluent plume remains in Tide Mill Creek (Raiche and Seiferth, 1994) to be pushed back upstream and diluted on the next flood tide. However, some effluent does exit Tide Mill Creek into the Hampton River, and although this effluent experiences significant dilution upon entry into the Hampton River, it may pose a risk to the lower portions of the Hampton Falls and Taylor rivers before being diluted to acceptable levels on the first flood tide. As the tide continues to ebb and flood, repeated dilution of the high FC water in Tide Mill Creek, along with partial migration of this water into the Hampton River, can be expected. This ongoing, partial migration of effluent to the Hampton River near each low tide may pose an ongoing threat to water quality in the area until all of the effluent is sufficiently diluted, a process that is estimated to take 10 tidal cycles for complete flushing (Raiche and Seiferth, 1994).

The NHDES Shellfish Program maintains a pager for WWTF operator use to facilitate immediate notification regarding discharges of improperly treated sewage. Experience to date has shown that operators have typically notified NHDES staff of problems within four to six hours, although there have been some instances where notification was more on the order of eight to ten hours. The dye studies suggest that for a WWTF failure at the “worst case” of discharge at high tide, insufficiently diluted effluent may migrate into the Hampton River and the lower portions of the Hampton Falls and Taylor Rivers over the next eight hours. These areas are currently included in a permanently closed safety zone for the plant outfall.

Because Shellfish staff are on call from 6am-9pm, problems at the WWTFs occurring after 9 pm may not be responded to until the following morning. Such 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 commercial harvesting in Hampton/Seabrook, aquaculturists must seek approval for each harvest from NHDES, so there is adequate control over harvest practices. Recreational harvesting is generally focused on softshell clams, and to a lesser extent blue mussels, in Hampton/Seabrook. Harvest of both species in Hampton/Seabrook is restricted to Saturdays only, and recreational harvesters calling the Clam Flat hotline typically call on Fridays for updated information. The hotline message advises them to check back frequently for unscheduled updates.

Several tidal creeks, road culverts, stormwater outfalls and intermittent streams were evaluated during the shoreline survey. Most show levels of fecal coliform loading that pose minimal water quality issues. Some sources exhibit very high bacterial loading in dry and wet weather, but they are all located outside of the management area and/or are discharging to prohibited tidal waters. Site HHPS071 is a large storm drain within the management area that has showed high fecal coliform loading, but is discharging into prohibited waters. This site should continue to be evaluated under various weather condtions to further ensure that bacterial loading is staying within the prohibited areas of the harbor.

Some sources show high bacterial loading levels after heavy rain events and these are all located outside of the management area, therefore, they pose a minimal public health risk. Two sources (HHPS086 and HHPS106) have exhibited high fecal coliform levels in dry weather during recent years, but they are located far outside of the management area.

VI. Water Quality Studies

A. Sampling Stations

Seventeen stations in the growing area were used for classification (Table 15 and Figure 2). Most of these sites have been in existence since the mid 1990s or before, while others were created more recently to address specific classification issues. Sites HH30, HH31, HH33, and HH34 were established in 2000 (a fifth site, HH32, was created in 2000 but discontinued after 2004 when statistical analyses confirmed that data from HH33 were statistically similar to HH32, and that sampling resources would be best directed to other sites). Site HH35 was created in 2002 to monitor water quality conditions on a boundary of the Conditionally Approved section of the Browns River, while HH36 and HH37 were established in 2003 to evaluate water quality conditions in the Blackwater River. Station HH38 was added in 2006 to provide long-term evaluation of conditions on a Prohibited/Conditionally Approved boundary on the Taylor River, just upstream of the Hampton River Boat Club.

Table 15: Hampton/Seabrook Harbor Ambient Sampling Stations

Site	Latitude	Longitude	General Description	Rationale for Selection
HH1A	42°53'46"N	70°49'02"W	In Hampton/Seabrook Harbor, at inlet by the Rt. 1A bridge.	Document general water quality; boundary site.
HH2B	42°53'17"N	70°49'35"W	In channel of Blackwater River, adjacent to River Street.	Document general water quality.
HH5B	42°54'34"N	70°49'35"W	In Hampton River, downstream of Tide Mill Creek.	Document general water quality; boundary site.
HH5C	42°54'21"N	70°49'22"W	In Hampton River, downstream of Eagle Creek.	Document general water quality; boundary site.
HH10	42°54'08"N	70°49'16"W	In Hampton River, adjacent to Hampton River Marina.	Document general water quality.
HH11	42°53'56"N	70°49'12"W	In Hampton River, at confluence with Browns River.	Document general water quality.
HH12	42°53'58"N	70°49'44"W	In channel of Browns River, near Common Island flat.	Document general water quality.
HH18	42°53'22"N	70°49'14"W	In Seabrook Harbor, south of the Yankee Fisherman's Cooperative.	Document general water quality.
HH19	42°53'29"N	70°49'30"W	In channel of Blackwater River, downstream of Mill Creek.	Document general water quality.
HH30	42°54'56"N	70°50'26"W	At powerline crossing, mid channel of Hampton Falls River.	Document general water quality; boundary site.
HH31	42°54'46"N	70°50'45"W	In channel of Hampton Falls River.	Document general water quality.
HH33	42°55'29"N	70°50'42"W	Downstream of RR bridge on Taylor River.	Document general water quality; boundary site.
HH34	42°55'17"N	70°50'08"W	Downstream of boat club on Taylor River, near start of	Document general water quality.

Site	Latitude	Longitude	General Description	Rationale for Selection
			Nudds Canal.	
HH35	42°53'47"N	70°50'06"W	In channel of Browns River, adjacent to Halftide Rock.	Document general water quality; boundary site.
HH36	42°52'39"N	70°49'53"W	In channel of Blackwater River.	Document general water quality.
HH37	42°52'20"N	70°49'30"W	In channel of Blackwater River, downstream of RT286 bridge.	Document general water quality.
HH38	42°55'26"N	70°50'21"W	At the boundary between the Conditionally Approved and Prohibited areas west of the Hampton River Boat Club on the Taylor River.	Document general water quality.

B. Sampling Plan and Justification

Hampton/Seabrook Harbor 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 7 am and 10 am 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 Hampton/Seabrook 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 2015 through 2018 are presented in Table 10. All sites meet NSSP fecal coliform criteria for Approved waters (geometric mean $\leq$

14/100ml and the estimated 90th percentile statistic $\leq$ 43/100ml). The reader should note that in early December 2015, some very high fecal coliform values were observed in the Hampton/Seabrook Estuary under open status conditions. By mid-December it was clear that these numbers were persisting, and the area was placed in the closed status until the cause could be determined. In early February a large, buried sewer force main was confirmed to be the cause. Such contamination is not typical of this growing area, so statistical calculations should be done with and without the data in order to 1. Comply with NSSP requirements, and 2. Develop meaningful statistics that reflect the true nature of pollution variability, in order to properly update the growing area's classification. For this reason, statistics that include and exclude the December 2015 data are presented in Table 16. Under both scenarios, not all of the stations meet NSSP fecal coliform criteria for Approved waters (geometric mean < 14/100ml and the estimated 90th percentile < 43/100ml).

Table 16: NSSP Bacterial Data and Statistics for Hampton/Seabrook Harbor Monitoring Stations, 2015-2018

5DAY RAIN	DATE	HH10	HH11	HH12	HH18	HH19	HH1A	HH2B	HH30	HH31	HH33	HH34	HH35	HH36	HH37	HH38	HH5B	HH5C
0.33	1/22/2015	11	17	7.8	2	2			13	7.8	2	2	2			4.5	4.5	7.8
1.76	3/17/2015	4.5	2	2	2	2	2	2	2	7.8	22	2	4.5			2	2	2
0	3/25/2015	2	2	2	2	2	2	2	2		2	2	2	7.8	23	2	2	2
1.93	4/21/2015	2	4	23	23	79	4	17	49	49	170	170	49	33	49	130	21	79
0	5/5/2015	2	2	2	7.8	4.5	2	11	4.5	2		7.8	7.8	7.8	7.8		2	4.5
0.14	5/14/2015	2	2	2	4.5	2	2	2					2	2	2		2	2
0.86	7/28/2015	2	27	2	17	2	7.8	2	23	130	79	170	13	23	13	130	7.8	13
0.07	10/6/2015	70	17	79	14	11	6.8	49	7.8	33	70	13	33	49	33	33	4.5	33
1.52	11/2/2015	110	240	110	46	240	130	33	33	13	130	110	33	7.8	13	79	70	240
	11/4/2015*	7.8	13	4	6.8	2	1.8	11	2	1.8	7.8	4	6.8	2	2	7.8	13	14
0.36	12/1/2015	920	170	79	79	79	49	33	130			130	130	23	9.2	49	920	350
	12/9/2015	13	7.8	2	49	4.5	7.8	2	33	13	130	6.8	23	46	23	23	2	7.8
	12/14/2015	79	33	49	11	33	110	17	79	240	49	540	49	4.5	6.8	240	240	49
0	2/1/16	11	4.5	4.5	2	4.5	2	2	11	11	7.8	9.3	2	2	2	7.8	46	27
0	2/22/16	4.5	2	7.8	23	2	4.5	7.8	7.8	2	4.5	2	2	2	4.5	4.5	2	2
0.19	3/22/16	2	2	2	1.8	4.5	2	2	2	2	2	2	2	2	2	2	2	2
0	4/19/16	2	2	2	2	2	2	2	2	2	2	2	2	4	4	2	2	2
0.45	5/3/16	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
1.48	6/7/16	11	13	33	33	70	33	31	23	110	170	70	70	240	240	49	49	23
0.36	9/27/16	2	23	2	11	7.8	4	14	2	4.5	4.5	6.1	4	4.5	33	2	13	4
1.2	10/24/16	7.8	7.8	27	23	13	7.8	350	540	540	920	540	23	110	130	350	280	70
0.16	11/7/16	23	6.8	31	33	22	17	110	6.8	2	2	4.5	17	49	17	2	11	17
0	11/15/16	1.8	2	4	2	4.5	7.8	2	2	4	4.5	1.8	2	79	22	4.5	2	2
1.16	12/6/2016*	4	7.8	7.8	4.5	4	4.5	6.8	1.8	4.5	7.8	4.5	4	13	17	17	4.5	4
0.57	1/17/17	2	2	4	4.5	4.5	7.8	4.5	2	4	6.8	2	2	7.8	2	2	4.5	2
0.00	2/22/17	2	2	2	2	2	2	2	13	2	4	2	2	2	2	11	2	2
0.11	3/21/17	2	4.5	2	2	4.5	4.5	2	2	2	2	2	2	2	2	2	2	4.5
0.14	4/20/17	2	2	2	7.8	2	2	2	2	2	2	2	2	4	2	4.5	2	2
1.90	5/16/17	49	33	17	13	31	49	17	130	220	350	540	27	110	95	540	95	49
0.24	5/25/17	7.8	7.8	23	49	49	4.5	33	33	33	79	79	23	49	49	130	4.5	4.5
1.86	6/19/17	4.5	6.8	11	2	13	7.8	2	130	110	130	49	13	33	46	130	11	11
0.02	9/13/17	13	13	31	23	140	49	13					33	14	23		7.8	33

0.08	11/9/17	**79**	**79**	23	23	33	23	**79**	13	14	**49**	13	**49**	17	33	22	23	33
0.08	12/5/17	2	2	2	7.8	2	2	4.5	7.8	13	4.5	2	6.8	17	6.1	7.8	2	2
	1/22/18	7.8	7.8	2	2	11	4.5	1.8	21	**49**		6.8	4.5			13	11	4.5
	2/12/18	2	2	2	2	2	2	2	33	**79**	17	22	2	2	2	17	2	4.5
	3/21/18	7.8	4.5	2	7.8	7.8	23	4.5	2			2	2			2	7.8	17
	4/11/18	2	2	2	2	2	2	2	2	2	2	1.8	2	2	2	4	2	2
	5/1/18	2	4.5	4.5	**49**	7.8	2	**110**	3.6	11	6.8	4.5	17	7.8	13	4.5	4.5	2
	5/15/18	2	2	7.8	7.8	2	2	4	17	4.5	33	17	7.8	**79**	**49**	22	11	2
	7/24/18	4.5	2	2	7.8	2	2	7.8	9.3	6.8	17	2	6.8	7.8	7.8	4.5	4.5	2
	9/10/18	**70**	33	4.5	**49**	**79**	13	22	**49**	**46**	**46**	**79**	6.8	**64**	23	**170**	11	**49**
	10/8/18	4.5	1.8	13	**49**	17	2	7.8	33	23	23	2	17	**79**	**79**	4.5	2	2
	11/12/18	11	13	**49**	23	**79**	2	**49**	**46**	**130**	**95**	**49**	**79**	**540**	**110**	**70**	**49**	14
	12/10/18	2	4	2	4.5	2	2	2	4	2	1.8	2	2	2	2	2	2	1.8

STATISTICS WITH THE DECEMBER 2015 DATA

	HH10	HH11	HH12	HH18	HH19	HH1A	HH2B	HH30	HH31	HH33	HH34	HH35	HH36	HH37	HH38	HH5B	HH5C
Count	45	45	45	45	45	44	44	43	40	39	43	45	41	41	42	45	45
Geomean	6.4	6.3	6.3	8.5	7.8	5.5	7.6	10.4	11.9	**15.3**	9.9	7.6	12.6	11.5	13.0	7.5	7.6
Est 90th	37.3	28.8	29.3	46.9	41.5	27.5	**52.3**	**75.3**	**126.9**	**144.3**	**81.9**	36.8	**93.1**	**96.3**	**105.3**	**64.4**	**49.2**
Water Quality	A	A	A	R	A	A	R	R	R	R	R	A	R	R	R	R	R
Classification	P	P	CA	CA	CA	P	CA	P	CA	P	CA	P	CA	CA	P	P	P

STATISTICS WITHOUT THE DECEMBER 2015 DATA

	HH10	HH11	HH12	HH18	HH19	HH1A	HH2B	HH30	HH31	HH33	HH34	HH35	HH36	HH37	HH38	HH5B	HH5C
Count	42	42	42	42	42	41	41	40	38	37	40	42	38	38	39	42	42
Geomean	5.3	5.6	5.8	7.7	7.2	4.8	7.4	9.0	11.0	14.0	8.5	6.6	12.3	11.5	11.5	6.4	6.6
Est 90th	27.5	24.0	24.3	40.6	38.2	21.9	**47.5**	**68.8**	**115.0**	**121.7**	**59.9**	32.4	**97.9**	**98.3**	**69.9**	**45.6**	37.4
Water Quality	A	A	A	A	A	A	R	R	R	R	R	A	R	R	R	R	R
Classification	P	P	CA	CA	CA	P	CA	P	CA	P	CA	P	CA	CA	P	P	P

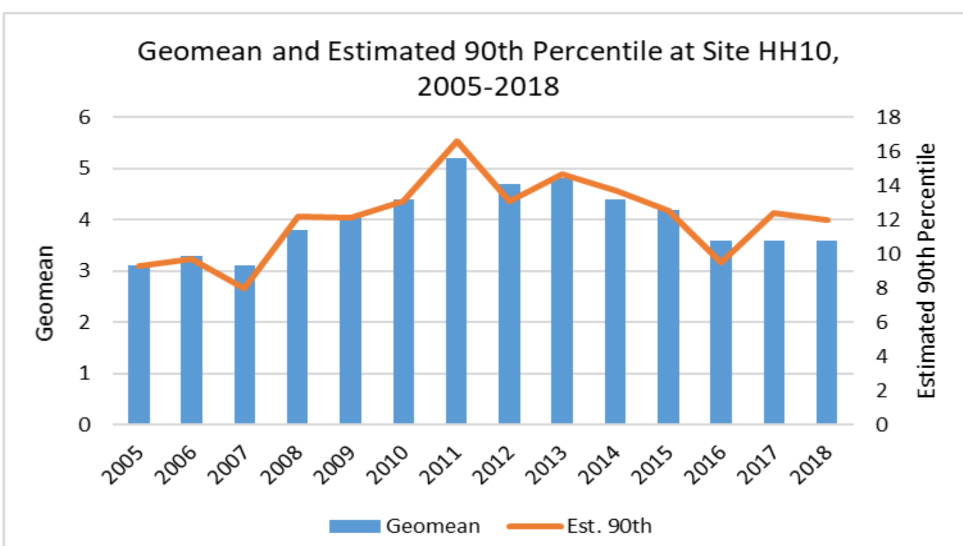
When the conditions specified in the Conditional Area Management Plan are applied to the data (i.e., exclusion of samples collected during times when the area was in the closed status), the routine monitoring stations meet NSSP criteria for Approved waters (Table 17). This is discussed in greater detail in the “Conditional Area Data Review” section of this report. 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 10), all stations meet NSSP criteria for Approved waters.

Table 17: **NSSP Bacterial Data and Statistics for Hampton/Seabrook Harbor Monitoring Stations, 2015-2018 (OPEN STATUS ONLY)**

OPEN STATUS STATISTICS WITH DECEMBER 2015 DATA																	
	HH10	**HH11**	**HH12**	**HH18**	**HH19**	**HH1A**	**HH2B**	**HH30**	**HH31**	**HH33**	**HH34**	**HH35**	**HH36**	**HH37**	**HH38**	**HH5B**	**HH5C**
Count	24	24	24	24	24	23	23	23	20	19	23	24	20	20	22	24	24
Geomean	5.4	5.1	4.2	5.8	4.7	4.6	4.6	7.1	7.3	8.6	5.9	5.2	8.1	6.6	9.0	5.3	5.1
Est 90th	39.7	26.1	17.9	24.4	20.5	20.8	19.3	40.9	**44.4**	**52.8**	**44.8**	26.0	**44.2**	32.1	**52.6**	40.1	27.4
OPEN STATUS STATISTICS WITHOUT DECEMBER 2015 DATA																	
	HH10	**HH11**	**HH12**	**HH18**	**HH19**	**HH1A**	**HH2B**	**HH30**	**HH31**	**HH33**	**HH34**	**HH35**	**HH36**	**HH37**	**HH38**	**HH5B**	**HH5C**
Count	21	21	21	21	21	20	20	20	18	17	20	21	17	17	19	21	21
Geomean	3.6	3.9	3.4	4.5	3.7	3.4	4.1	5.0	5.8	6.6	4.0	3.7	7.1	6.0	6.6	3.6	3.7
Est 90th	12.0	13.8	9.5	14.0	12.5	9.7	15.7	20.1	27.0	32.3	16.0	11.9	39.4	31.8	28.6	9.9	10.8

Figure 16 depicts the trends in NSSP statistics (geometric mean and 90th percentile) at site HH10 from 2005 to 2018. The graph indicates that the statistics are consistently below the NSSP fecal coliform criteria for Approved waters (geometric mean < 14/100ml and the estimated 90th percentile statistic < 43/100ml). Both geomean and estimated 90th percentile follow a similar pattern of increasing from 2005 to 2011, followed by a decrease from 2012 to the present.

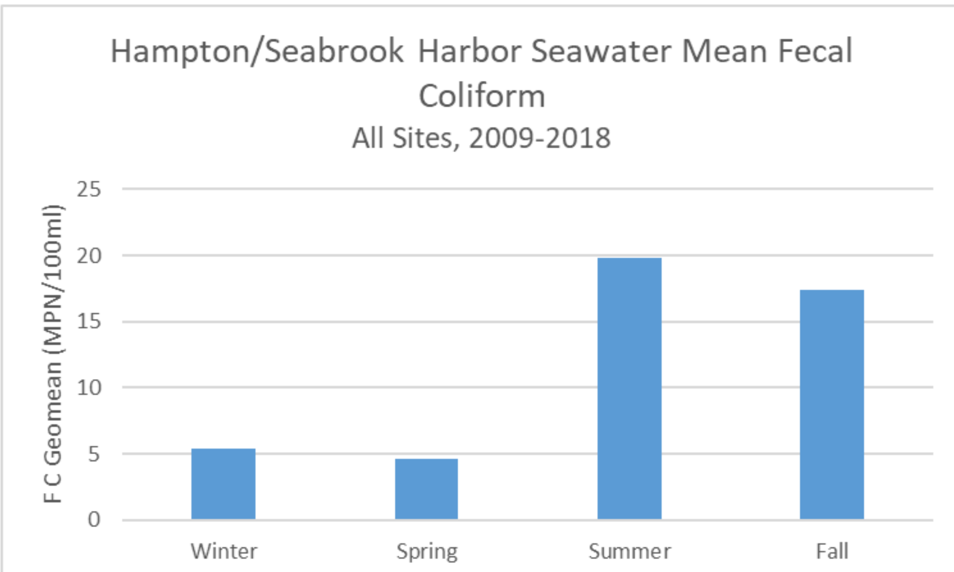
Figure 16: Geometric Mean and Estimated 90th Percentile Statistics at Site HH10 in Hampton/Seabrook Harbor, 2005-2018



Seasonal Effects on Fecal Coliform Concentrations

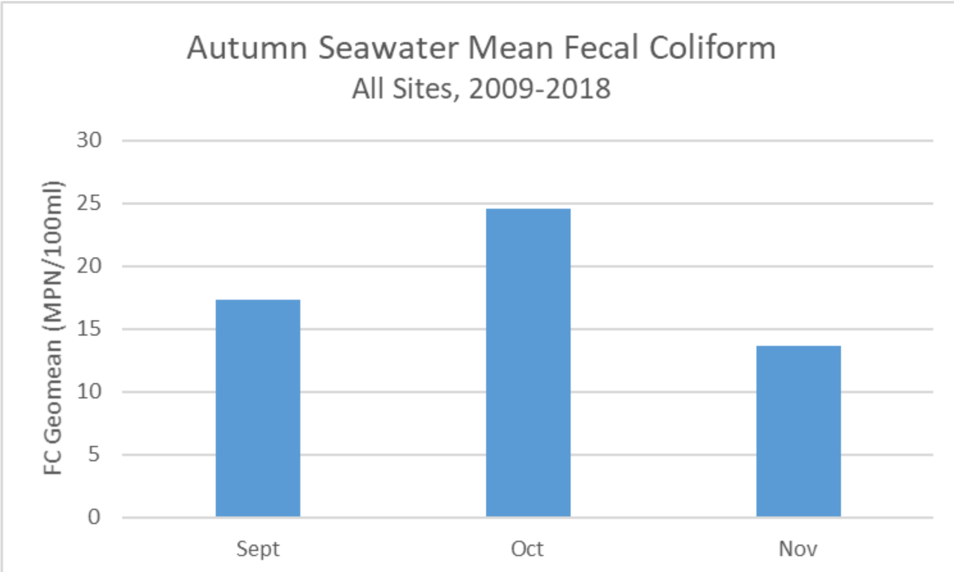
To examine how FC levels may vary with the seasons, the historical FC data from the systematic random and Open status sampling programs (2009-2018) were categorized by season (Figure 17). Summer and fall have higher geometric means than other seasons. This is presumably due to the presence of many types of seasonal pollution sources associated with the summer tourist season (more people, more seasonal septic and sewer use, more boating traffic, more trash in storm drains). Many of these sources are not present in the winter and spring. Furthermore, runoff from rainstorms is not a common in the colder months, which further reduces fecal coliform inputs to the estuary.

Figure 17: Mean Fecal Coliform Concentration by Season, All HH Sites Combined, 2009-2018



The prevalence of high fecal coliform in fall is particularly troublesome for softshell clam harvesters, because although the official clamming season in New Hampshire begins the first Saturday after Labor Day, it is delayed in Hampton/Seabrook until November. A closer look at fecal coliform data in the fall is warranted. Figure 18 illustrates FC geometric mean by month.

Figure 18: Mean Fecal Coliform Concentration in Fall Months, All HH Sites Combined, 2009-2018



October has the highest mean. This may be due to the fact that the October dataset had more wet weather samples than the September and November datasets (19% of October data points had 5-day rainfall of 0.50 or higher, while September and November had only 10%).

But wet weather does not fully account for the high fecal coliform in summer and fall. Figure 19 shows monthly geometic means for wet and dry weather data, while Figure 20 shows the same information for data collected for dry weather data only (no rain within five days of sample collection)

Figure 19: Monthly Wet and Dry Weather Fecal Coliform Data, 2009-2018

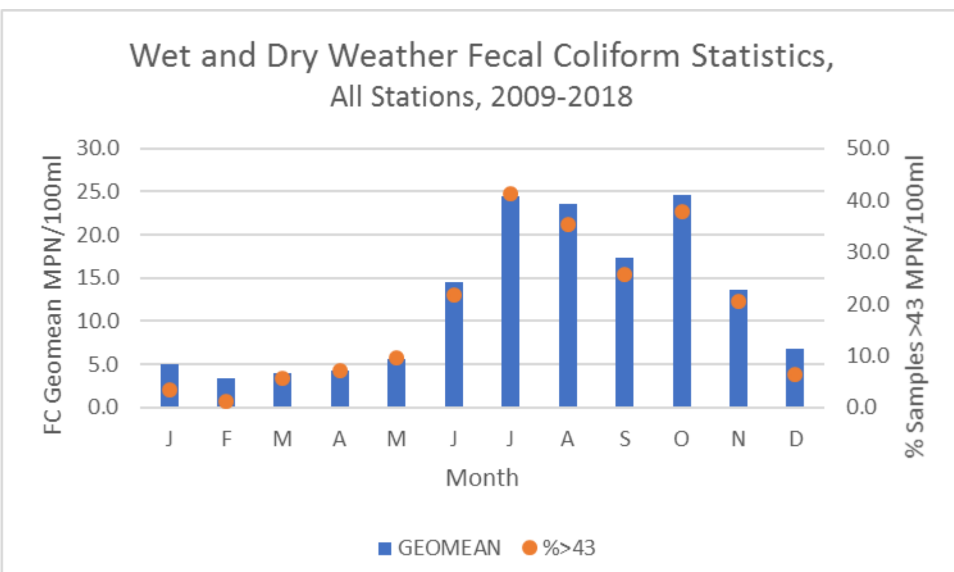
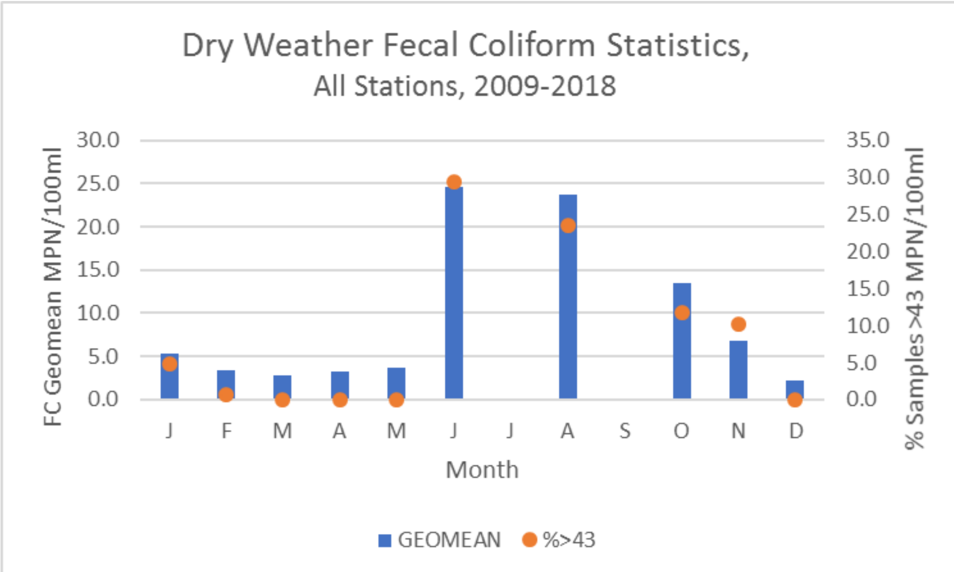


Figure 20: Monthly Dry Weather Fecal Coliform Data, 2009-2018



Note that during the 10-year period of 2009-2018, there were no samples collected in July or September when 5-day cumulative rainfall was zero (all samples were collected after some amount of precipitation).

Figure 20 clearly demonstrates the unpredictable nature of fecal coliform in the harbor during the summer and early/mid fall months. This graph illustrates why harvest in the harbor has historically been delayed until November, and why that practice should continue in the future.

Rainfall Effects on Fecal Coliform Concentrations

To examine the effects of rainfall and runoff on FC levels in the growing area, three separate queries were generated for bacterial data at the Hampton/Seabrook Harbor monitoring stations (Tables 18, 19, and 20) 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 five 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 five days prior to sample collection. Data from the the NextEra Seabrook Power Plant 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 first query generated observes bacterial data at the monitoring stations year-round for a 12-year period (2006-2018). This data set suggests that rainfall does have an adverse effect on fecal coliform concentration, as can be see by the gradual increase in percentage of samples with high FC corresponding with heavier rain events prior to collection (Table 18).

Table 18: 2006-2018 Hampton/Seabrook Harbor 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	% Samples with FC > 43/100ml
0.00”	782	39	4.9
0.01-0.50"	979	112	11.4
0.51-1.00"	424	56	13.2
1.01-1.5"	289	88	30.4
1.51-2.00"	286	78	27.2
2.01-2.5"	90	21	23.2
Over 2.5”	125	45	36

The second query generated presents bacterial data at the monitoring stations from 2015-2018 and excludes data from the summer and fall months (Table 19). The months of June through October are excluded from this analysis because Hampton/Seabrook Harbor’s Conditionally Approved areas are closed during this time due to unpredicatable bacteria levels and potential boat sewage contamination. This analysis demonstrates again that fecal coliform concentrations are adversely impacted by rainfall, more specifically there is a sharp increase in the number of samples with high fecal coliform after 1.51-2.00-inch rain events. This appears to indicate that the 1-inch closure threshold for Hampton-Seabrook Harbor should be re-evaluated; however, only a small number of samples were collected for 0.50-1.00 inch and 1.01-1.50-inch rain events in recent years. To expand the dataset to include more storms in the 1.01-1.50 inch range, another query was run. All bacterial data in a 12-year period (2006-2018) and excluding the summer and fall months (June-October) were included in this query (Table 20). This analysis examines a larger data set and suggests that adverse fecal coliform concentrations become more frequent when rainfall exceeds 1.00 inch, and even more so as rainfall exceeds 1.50 inches. The percentage of samples with high fecal coliform doubles when rainfall exceeds 1 inch, and the percentage of samples doubles again when rainfall exceeds 1.5 inches. This suggests that a rainfall closure threshold of 1 inch continues to be an appropriate conservative rainfall closure threshold. Efforts to collect more data, especially for storms in the 0.5-1.5-inch range, should continue so the rainfall closure threshold can be verified for the next triennial report.

Table 19: 2015-2018 Hampton/Seabrook Harbor Fecal Coliform (MPN/100ml) Data for Varying Levels of Rainfall
* excluding summer and fall months (June through October)

Amount of Rain Prior to Sample Collection	Number of Samples	Number of Samples with FC > 43/100ml	% Samples with FC > 43/100ml
0.00”	167	2	1.2
0.01-0.50"	276	29	10.5
0.51-1.00"	48	2	4.2
1.01-1.5"	38	2	5.3
1.51-2.00"	119	45	37.8
2.01-2.5"	7	0	0
Over 2.5”	0	0	0

Table 20: 2006-2018 Hampton/Seabrook Harbor Fecal Coliform (MPN/100ml) Data for Varying Levels of Rainfall (excluding June through October)

Amount of Rain Prior to Sample Collection	Number of Samples	Number of Samples with FC > 43/100ml	% Samples with FC > 43/100ml
0.00”	697	19	2.7
0.01-0.50"	716	56	7.8
0.51-1.00"	287	19	6.6
1.01-1.5"	153	20	13
1.51-2.00"	200	57	28.5
2.01-2.5"	39	1	2.56
Over 2.5”	91	26	28.5

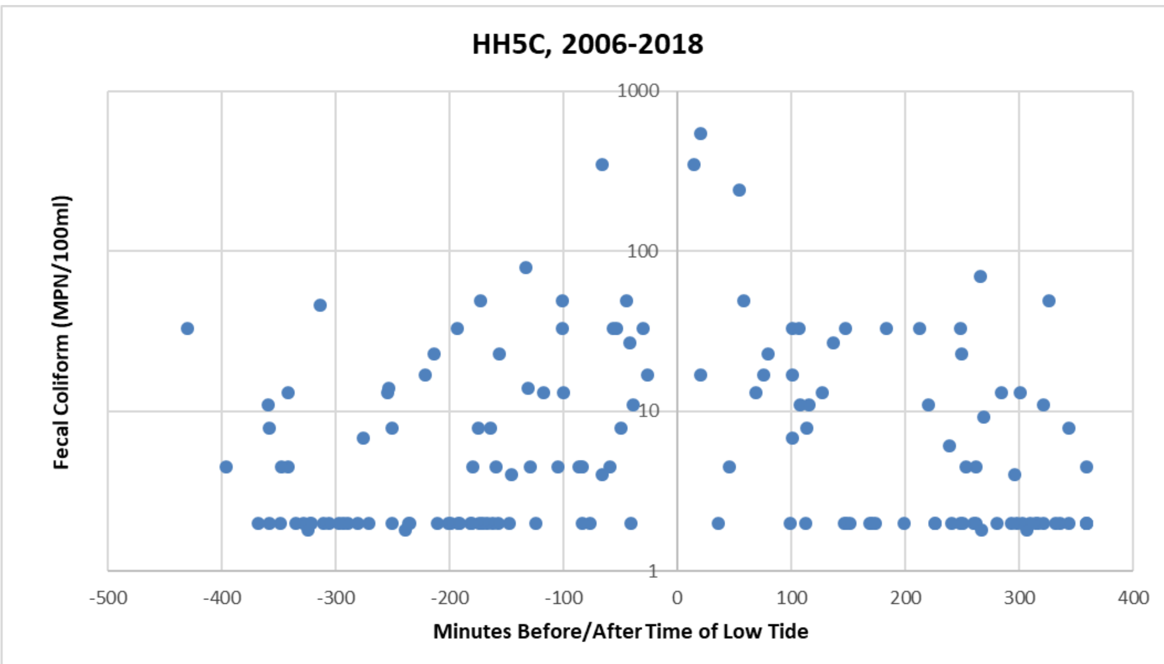
Tidal Effects on Fecal Coliform Concentrations

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 12 years (2006-2018) were queried for all Hampton/Seabrook Harbor monitoring sites. Figure 21 illustrates the relationship between fecal coliform MPN/100ml and the number of minutes before/after low tide the sample was collected at Site HH1A. 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. The highest values may have had more to do with rainfall effects than with tidal effects:

- 7/24/2013 FC= 350/100ml. Ebbing tide sample was collected one day after a 1-inch rain event.
- 7/16/2014 FC= 540/100ml. Flooding tide sample was collected one day after a 0.75-inch rain event.
- 11/2/2015 FC= 240/100ml. Flooding tide sample was collected five days after a 1.5-inch rain event.
- 12/1/2015 FC= 350/100ml. Flooding tide sample collected during sewage contamination from Church Street force main break.

Figure 21: Fecal Coliform Concentration vs. Tide Stage at Site HH5C



Post Rainfall Flushing/Purging of High Fecal Coliform in Seawater and Shellfish

Hampton/Seabrook is subject to temporary harvest closures following rainfall events of one inch or more. Historically, the NHDES Shellfish Program has conducted post-storm sampling of seawater after each storm, to determine if the closure was even warranted, as some storms near the threshold do not result in high seawater bacteria concentrations. When high seawater bacteria was observed, the harvest closure would remain in place, and subsequent seawater and shellfish tissue sampling would be done to determine when the area could be reopened.

Prior to the mid 2000s, the Shellfish Program would base reopening decisions on pre-storm seawater and shellfish tissue results. Over time, resource and staffing constraints made getting the pre-storm samples difficult, and sampling would focus on post storm results to get the area reopened. This type of sampling was not designed to determine exactly how long it would take to get the harbor reopened, but rather focused on getting sufficient data in time to reopen the area for weekend recreational harvesting. Nonetheless, some pre-storm sampling has been done in conjunction with post-storm sampling (Table 21).

Table 21: Observed Seawater and Shellfish Tissue Flushing Times

Rain Date	Rain (inches)	# Days for Water FC to Return Pre-Storm Levels	# Days for Clam Tissue FC to Return Pre-Storm Levels	# Days for Mussel Tissue FC to Return Pre-Storm Levels
12/1/2004	0.83	1-5	1-5	---
12/1/2008	1.04	insufficient data	1-7	---
10/29/2015	1.53	4-6	---	4-6
10/30/2017	1.68	1-7	---	insufficient data
10/15/2005	3.13	2-4	2-4	---
2/25/2010	3.92	insufficient data	---	5-11
4/24/2012	>5	1-7	---	1-7

The limited dataset suggests that in most cases, bacteria levels return to pre-storm numbers by seven days after the storm.

With commercial harvesting now occurring in the harbor, and with the renewed interest the details of how to conduct contaminant reduction studies in discussions at both ISSC and NESSA meetings, the NHDES Shellfish Program is considering resurrecting the pre-storm/post-storm sampling model.

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 Hampton/Seabrook Harbor and its tributaries:

- The waters of Hampton/Seabrook Harbor and its tributaries can be adversely impacted by releases of improperly treated sewage from the Hampton municipal wastewater treatment facility. Although discharge from the Seabrook municipal wastewater treatment facility outfall in the Atlantic Ocean is unlikely to adversely affect Hampton/Seabrook Harbor water quality, discharges from the Seabrook wastewater collection infrastructure (pump stations, gravity sewer lines, sewer force mains, etc.) could adversely impact harbor water quality.
- Hydrographic studies suggest that within 8-9 hours of a release of improperly treated sewage from the Hampton WWTF, the southern portions of the Taylor River and the Hampton Falls River may also be contaminated. These areas are therefore unsuitable for harvest. The remainder of Hampton/Seabrook Harbor and its tributaries can be adversely impacted by releases of improperly treated sewage from the Hampton wastewater treatment facility in Hampton after the 8-9 hour time period.
- Rainfall events of over one inch appear to adversely affect the water quality of Hampton/Seabrook Harbor and its tributaries
- Hampton/Seabrook Harbor and its tributaries exhibit seasonally high bacteria levels for the months of June through October. The high bacteria levels are unpredictable, occurring under wet and dry weather conditions.
- Risk of contamination from pollution from recreational boating, including potential boat sewage exposure as well as poisonous/deleterious substances such as fuel spills, require harvest restrictions. This is particularly true for marinas such as Hampton River Marina, as well as fueling facilities at the Yankee Fishermans Cooperative and the NH Division of Ports and Harbors Hampton Harbor Facility.
- Existing pollution sources and water quality information in Mill Creek preclude an approved or conditionally approved classification for this area.

The aforementioned statements suggest the following classifications are appropriate:

- The Blackwater River from the Route 286 Bridge to the shoreline adjacent to River Street in Seabrook (157.1 acres), as well as its associated tributaries (44.5 acres) and all of Blood Creek (10.1 acres) shall be classified as Conditionally Approved. Mill Creek from its headwaters to its confluence with Hampton/Seabrook Harbor (38.9 acres), as well as its associated tributaries (5.7 acres) shall be classified as Restricted (38.9 acres).
- The Browns River (19.7 acres) and Browns River Tributaries (11.5 acres), as well as Hunts Island Creek (11.5 acres) and Hunts Island Creek Tributaries (6.3 acres) west of the security perimeter signs for the NextEra Energy Seabrook Station shall be classified as Prohibited.
- All of Back Creek (5.3 acres) and Back Creek Tributaries (0.4 acres) shall be classified as Prohibited.
- The remaining downstream sections of the Browns River (17.4 acres) and Browns River Tributaries (1.5 acres), Swains Creek (13.3 acres) and Swains Creek Tributaries (4.7 acres), and Hunts Island Creek (6.9 acres) and Hunts Island Creek Tributaries (0.6 acres), located east of the

security perimeter signs for the NextEra Energy Seabrook Station, shall be classified as Conditionally Approved.

- Waters adjacent to the Yankee Fishermen's Cooperative in Seabrook shall be classified as Prohibited/Safety Zone (3.8 acres) as a precautionary measure because of the potential for long-term contamination from accidental fuel spills or leakage of petroleum or other toxic products from boats using the facility.
- The waters of Tide Mill Creek and adjacent creeks, Blind Creek and associated tributaries, as well as the northern section of the Hampton River to "the Willows," and the southern sections of the Taylor River/Nudds Canal and the southern portion of the Hampton Falls River shall be classified as a Prohibited/Safety Zone, based on the results of two Hampton WWTF effluent dye studies (316.8 acres). It is intended to include all waters expected to exhibit fecal coliform concentrations over 14/100ml within 8-10 hours of a lapse in disinfection at the facility. The size of this zone is also based on the assumption that the highest classification of waters adjacent to the safety zone will be Conditionally Approved, with a condition relating to proper treatment/disinfection of Hampton WWTF effluent, as specified in the most recent NPDES permit.
- All of the Hampton River Boat Club slips/basin, including the river channel directly in front of the facility, shall be classified as Prohibited/Safety Zone (3.0 acres), based on the potential for high FC levels from boat sewage during the boating season, and as a precautionary measure because of the potential for long-term contamination from accidental fuel spills or leakage of petroleum or other toxic products from boats within the basin.
- With the exception of the waters included in the safety zones for the Hampton River Boat Club slips/basin and for the Hampton WWTF, all of Taylor River downstream of the railroad trestle and upstream of the Prohibited/Safety Zone lines shall be classified as Conditionally Approved (51.9 acres). The Taylor River upstream of the railroad trestle shall be classified as Prohibited (34.1 acres). The Hampton Falls River and its tributaries upstream of the Prohibited/Safety Zone line shall be classified as Conditionally Approved (68.9 acres).
- The eastern side of the Hampton River from the Hampton WWTF safety zone southern boundary at the Willows, extending downstream to the center of the Route 1A bridge span, shall be classified as Prohibited/Safety Zone (98.1 acres). This area shall extend westerly to the center channel of the Hampton River. Delineation of the area is based on the potential for high FC levels from boat sewage during the boating season from the Hampton River Marina, the Hampton state docks, and various mooring fields. Delineation of the area is also intended as a precautionary measure because of the potential for long-term contamination from accidental fuel spills or leakage of petroleum or other toxic products from boats within the area.
- All other waters in Hampton/Seabrook Harbor shall be classified as Conditionally Approved (401.3 acres). For all Conditionally Approved waters, conditions that will trigger temporary closure include:
    - operation of the Hampton wastewater facility/treatment of effluent that is not in accordance with the facilities' most recent National Pollutant Discharge Elimination System permit;
    - rainfall events of greater than one inch per 24 hours (note that similar storms occurring over more than 24 hours may also trigger closure);
    - a seasonal harvesting closure beginning June 1 and extending at least through October 31 will also be implemented. The closure can be lifted when seasonal risk of boat sewage contamination is documented to be within criteria specified in the Conditional Area Management Plan.

- Discharges of improperly treated sewage from the Seabrook municipal wastewater treatment facility and sewer collection infrastructure/system may also trigger closure of the Conditionally Approved area, depending on the location, volume, and duration of the discharge (evaluated on a case-by-case basis).

VIII. Conclusions

A. Legal Description

The Blackwater River is classified as Conditionally Approved. For the purposes of this classification, the southern boundary of the Conditionally Approved area is the Massachusetts/New Hampshire border, located approximately 300 feet south of the Route 286 bridge in Seabrook, New Hampshire (42^{0}52’14.1”N, 70^{0}49’26.5”W to 42^{0}52’16.0”N, 70^{0}49’21.0”W). The northern boundary of the Prohibited area is located in the vicinity of River Street in Seabrook, New Hampshire, along a line extending from 42^{0}53’18.8”N, 70^{0}49’46.7”W to 42^{0}53’13.2”N, 70^{0}49’32.1”W.

Mill Creek from its headwaters to its confluence with Hampton/Seabrook Harbor shall be classified as Restricted. For the purposes of this classification, the Restricted area includes all waters west of Mill Creek’s confluence with Hampton/Seabrook Harbor, defined as a line extending from 42^{0}53’29.4”N, 70^{0}50’00.8”W to 42^{0}53’27.1”N, 70^{0}49’57.6”W.

The Browns River from its headwaters to NextEra Energy Seabrook Station security perimeter signage shall be classified as Prohibited. For the purposes of this classification, the Prohibited area includes all waters west of a line extending from 42^{0}54’05.5”N, 70^{0}50’18.6”W to 42^{0}54’07.3”N, 70^{0}50’17.8”W. Waters downstream of the Prohibited area, including Swains Creek and tributaries, as well as the remaining area of the Browns River down to HalfTide Rock, shall be classified as Conditionally Approved. For the purposes of this classification, the downstream extent of this Conditionally Approved area shall be located along a line extending from 42^{0}53’44.6”N, 70^{0}50’08.4”W to 42^{0}53’48.3”N, 70^{0}50’05.9”W.

Back Creek, from its headwaters to NextEra security perimeter signage shall be classified as Prohibited. For the purposes of this classification, the Prohibited area includes all waters west of Back Creek’s confluence with the Browns River, located along a line extending from 42^{0}53’54.4”N, 70^{0}50’15.9”W to 42^{0}53’53.1”N, 70^{0}50’15.1”W.

Hunts Island Creek from its headwaters to NextEra security perimeter signage shall be classified as Prohibited. For the purposes of this classification, the Prohibited area includes all waters west of a line extending from 42^{0}53’38.4”N, 70^{0}50’25.1”W to 42^{0}53’37.2”N, 70^{0}50’24.2”W. Waters downstream (east) of the Prohibited area down to the confluence with the Browns River shall be classified as Conditionally Approved.

Waters adjacent to the Yankee Fishermen’s Cooperative in Seabrook shall be classified as Prohibited/Safety Zone. For the purposes of this classification, the northern boundary of the Prohibited area is located along a line extending from 42^{0}53’31.0”N, 70^{0}49’06.6”W to 42^{0}53’32.2”N, 70^{0}49’12.1”W. The western boundary of the Prohibited area is located along a line in the center of the channel, extending along a line from 42^{0}53’32.2”N, 70^{0}49’12.1”W to 42^{0}53’25.3”N, 70^{0}49’13.2”W. The southern boundary of the Prohibited area is located along a line from 42^{0}53’25.3”N, 70^{0}49’13.2”W to 42^{0}53’24.3”N, 70^{0}49’07.0”W.

Waters around the Hampton wastewater treatment facility outfall, including Tide Mill Creek, Blind Creek, Taylor River/Nudds Canal, Hampton Falls River, and Hampton River are classified as Prohibited/Safety Zone. For the purposes of this classification, the section of the Hampton Falls River extends from the transmission line crossing (42^{o}54’58.7”N, 70^{o}50’26.0”W to 42^{o}54’55.1”N, 70°50'25.8"W) to the mouth of the river, defined as a line from 42°54'49.1"N, 70°50'07.0"W to 42°54'42.8"N, 70°50'03.6"W. The section of the Taylor River/Nudds Canal is defined as the waters between the downstream boundary of the Hampton River Boat Club safety zone (42°55'25.8"N, 70°50'12.0"W to 42°55'24.2"N, 70°50'14.7"W) to the mouth of the river, defined as a line from 42°54'49.6"N, 70°50'06.7"W to 42°54'49.8"N, 70°50'01.4"W. The section of the Hampton River extends from the mouths of the Hampton Falls River and the Taylor River, downstream to the "Willows" on the Hampton River (42°54'20.4"N, 70°49'30.2"W to 42°54'31.4"N, 70°49'15.1"W). All waters north and east of the Hampton River and the Taylor River/Nudds Canal, including Blind Creek, Tide Mill Creek, and all associated tributary creeks, are also included in the Prohibited/Safety Zone.

The waters within the basin/slip area of the Hampton River Boat Club, including that portion of the Taylor River immediately in front of the Hampton River Boat Club, are classified as Prohibited/Safety Zone. For the purposes of this classification, this area is bounded on the northwest side by east bank of the unnamed tributary mouth located just west of the boat club boat launch (42°55'27"N, 70°50'21"W), on the southwest side directly across the channel from the aforementioned tributary (42°55'24"N, 70°50'20"W), on the northeast side by the eastern limit of the boat club basin retaining wall (42°55'26"N, 70°50'12"W), and on the southeast side directly across the channel from the aforementioned retaining wall (42°55'24"N, 70°50'15"W).

The waters of the Taylor River downstream of the railroad trestle to the upstream boundary of the Hampton River Boat Club Prohibited area are classified as Conditionally Approved. For the purposes of this classification, the Conditionally Approved area begins at the railroad trestle (42°55'29.9"N, 70°50'44.5"W) and continues downstream to the Hampton River Boat Club safety zone (42°55'27.0"N, 70°50'20.4"W to 42°55'23.8"N, 70°50'20.3"W). All Taylor River waters and associated tributaries upstream of the railroad trestle are classified as Prohibited.

The upper portion of the Hampton Falls River is classified as Conditionally Approved. For the purposes of this classification, the Conditionally Approved area is defined as all waters upstream of the Hampton WWTF Prohibited/Safety Zone boundary at the transmission line crossing (42°54'58.7"N, 70°50'26.0"W to 42°54'55.1"N, 70°50'25.8"W)

The eastern side of the Hampton River from the Hampton WWTF safety zone southern boundary at the Willows, extending downstream to the center of the Route 1A bridge span, shall be classified as Prohibited/Safety Zone. For the purposes of this classification, the northern boundary fo the Prohibited/Safety Zone shall extend along a line from the Willows shoreline and the upstream side of the Eagle Creek mouth (42°54'31.4"N, 70°49'15.1"W), extending westward to a point in the center of the Hampton River Channel (42°54'23.9"N, 70°49'25.4"W), and then extending southeastward along the center of channel to the midpoint of the Route 1A bridge (42°53'46.4"N, 70°48'59.6"W). The Prohibited/Safety Zone includes all of Eagle Creek and associated tributaries, the entire basin of the Hampton River Marina, and the Hampton state boat launch and docks.

All other waters in Hampton/Seabrook Harbor shall be classified as Conditionally Approved.

For the purposes of this classification, all Conditionally Approved waters are closed for harvesting following rainfall events of over 1.00 inch. These waters will also be closed following discharges of improperly treated sewage from the Hampton WWTF, the Seabrook WWTF sewage collection infrastructure. High fecal coliform discharges from the Envirosystems/Enthalpy facility and/or from the Aquatic Research Organisms facility will be evaluated on a case-by-case basis, but generally these faciltities do not produce fecal coliform concentrations with flow high enough to warrant closure. Furthermore, the Conditionally Approved waters of Hampton/Seabrook Harbor and associated tributaries shall be placed in the closed status for the period of June through October each year.

Appendix VII describes the conditions under which the Conditionally Approved area will be placed in the closed status, and procedures to return those waters to the open status.

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.

B. Recommendations for Sanitary Survey Improvement

1. After the fall 2019/winter 2020 harbor dredging project is done, consider re-delineating all harbor mooring fields.
2. Consider a new dye study of the Hampton municipal wastewater facility, utilizing a long-term injection that begins on the start of an ebbing tide and continues into the next flooding. The study should aim to delineate the 1000:1 dilution area under current operational conditions at the Hampton WWTF.
3. Continue sampling of the Seabrook and Hampton municipal wastewater effluent (raw influent, predisinfection effluent, and final effluent) under varying operational conditions to quantify variability in male specific coliphage concentration and removal efficiency.
4. Continue to document the water quality impacts of rainfall events in the 1-1.5-inch range, as well as storms over 1.5 inches, to maintain updated information to evaluate the 1-inch rainfall closure threshold for Hampton/Seabrook Harbor.
5. Continue with flushing/purging (contaminant reduction) studies in Hampton/Seabrook Harbor, including documentation of pre-storm bacteria levels in seawater and shellfish tissue.
6. Continue with an expanded characterization of summer and autumn fecal coliform concentrations in seawater and shellfish tissue.

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APPENDIX I: Shoreline Pollution Source Sampling Plan

Station ID	2018 Plan	2018 Conclusions	Post 2018 Recommendations	Town	Source Type	Source Description
HHPS001	get a least one sample in summer 2018 possibly a second sample in a autumn dry weather run in 2018	two dry samples, one high FC, one low. Similar to a 2006 high FC dry sample. Several low FC in dry weather too. One wet sample (6/5/18; 0.71 inches), 130 fc. , similar to a high FC in oct 2006	it's a trib site, so we need ongoing sampling. need wet and dry samples every 1-2 years. Need to develop more summer data if commercial relay and depuration becomes a reality,	Hampton Falls	TIDAL RIVER	HAMPTON FALLS RIVER
HHPS002	get a least one sample in summer 2018 possibly a second sample in a autumn dry weather run in 2018	two dry samples: summer sample had slightly high FC; autumn sample had low FC). One summer wet sample with slightly high FC.	get a least one sample in summer 2019 possibly a second sample in a autumn dry weather run in 2019	Hampton Falls	TIDAL RIVER	HAMPTON FALLS RIVER FLOWING THROUGH A CONCRETE BOX CULVERT UNDER THE ROUTE 1 BRIDGE.
HHPS003	keep in the program for now and get wet weather FC and flow data (not much of that in the database). If wet FC load is low, change to inactive.	one summer wet weather sample, site was dry.	keep in program and try to get wet weather FC and flow data; attempt to get sample during a heavy rain event because it may be flashy.	Hampton Falls	STORMWATER OUTFALL	12 IN. STORM WATER OUTFALL, DISCHARGING FROM ONE CATCH BASIN ON THE BRIDGE ON RT 1 TO THE BRIDGE WINGWALL, FLOW INTO HAMPTON FALLS RIVER
HHPS011	get a least one sample in summer 2018, possibly a second sample in a autumn dry weather run in 2018	dry weather sampling run in summer with high FC and a dry weather sampling run in autumn with low FC. A wet weather sampling run in summer with low FC.	it's a trib site, so we need ongoing sampling. need wet and dry samples every 1-2 years. Need to develop more summer data if commercial relay and depuration becomes a reality	Hampton Falls	TIDAL RIVER	TAYLOR RIVER
HHPS014	keep in the program for now and get wet weather FC and flow data (not much of that in the database). If	one wet, one dry in 2018; no flow for either sampling event.	keep in the program for now and get wet weather FC and flow data (not much of that in the database). If wet FC load is low, change to	Hampton	ROAD CULVERT	18 IN. CONCRETE ROAD CULVERT. HELPS WETLAND AREA ACROSS ROAD DRAIN

	wet FC load is low, change to inactive.		inactive.			
HHPS015	get a least one sample in summer 2018 possibly a second sample in a autumn dry weather run in 2018	two dry weather samples with high FC (90 and 1200) and one wet weather with high FC (600)	it's a trib site, so we need ongoing sampling. need wet and dry samples every 1-2 years. Need to develop more summer data if commercial relay and depuration becomes a reality. Recommend more intensive future sampling at this site due to high FC in 2018. possibile referral to WA.	Hampton	INTERMIT TENT STREAM	INTERMITTENT STREAM FLOWING THROUGH A 42 INCH CONCRETE ROAD CULVERT
HHPS016	get a least one sample in summer 2018 possibly a second sample in a autumn dry weather run in 2018	two dry weather samples with high FC (150 and 470). One wet with high FC (340).	it's a trib site, so we need ongoing sampling. need wet and dry samples every 1-2 years. Need to develop more summer data if commercial relay and depuration becomes a reality. Recommend more intensive future sampling at this site due to high FC in 2018. possibile referral to WA.	Hampton	INTERMIT TENT STREAM	INTERMITTENT STREAM FLOWING THROUGH A 60 INCH CONCRETE ROAD CULVERT
HHPS017	CONSIDER keep in the program for now and get wet weather FC and flow data (not much of that in the database). If wet FC load is low, change to inactive. IF # OF THESE "CHECK WET AND THEN DROP" SITES BECOMES TOO LARGE, THIS SITE CAN BE SIMPLY INACTIVATED BASED ON ITS LOCATION.	one wet weather sample in summer 2018 after a ~0.75 inch rain event; no flow.	CONSIDER keep in the program for now and attempt to get more wet weather FC and flow data (not much of that in the database). If wet FC load is low, change to inactive. IF # OF THESE "CHECK WET AND THEN DROP" SITES BECOMES TOO LARGE, THIS SITE CAN BE SIMPLY INACTIVATED BASED ON ITS LOCATION.	Hampton	ROAD CULVERT	24 IN. CONCRETE ROAD CULVERT
HHPS018	CONSIDER keep in the program for now and get wet weather FC and flow data (not much of that in	one wet weather sample in summer 2018 after a ~0.75 inch rain event; no flow.	CONSIDER keep in the program for now and attempt to get more wet weather FC and flow data (not much of that in the database). If	Hampton	ROAD CULVERT	15 IN. CONCRETE ROAD CULVERT

	the database). If wet FC load is low, change to inactive. IF # OF THESE "CHECK WET AND THEN DROP" SITES BECOMES TOO LARGE, THIS SITE CAN BE SIMPLY INACTIVATED BASED ON ITS LOCATION.		wet FC load is low, change to inactive. IF # OF THESE "CHECK WET AND THEN DROP" SITES BECOMES TOO LARGE, THIS SITE CAN BE SIMPLY INACTIVATED BASED ON ITS LOCATION.			
HHPS020	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one May 2018 dry weather sample, low FC	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Seabrook	SALTMAR SH DITCH	TIDAL DITCH DISCHARGING TO BLACKWATER RIVER FROM WEST SIDE
HHPS021	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one May 2018 dry weather sample, low FC	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Seabrook	TIDAL CREEK	TIDAL CREEK DISCHARGING TO BLACKWATER RIVER FROM WEST SIDE
HHPS024	CONSIDER keep in the program for now and get wet weather FC and flow data (not much of that in the database). If wet FC load is low, change to inactive. IF # OF THESE "CHECK WET AND THEN DROP" SITES BECOMES TOO LARGE, THIS SITE CAN BE SIMPLY INACTIVATED BASED ON ITS LOCATION.	could not locate source during a Fall dry sampling visit;	keep in program and try to get wet weather FC and flow data; attempt to get sample during a heavy rain event because source could not be located in dry weather. If cannot locate after continued sampling efforts, considering changing to "site vist only" status.	Hampton	STORMW ATER OUTFALL	12 IN. CONCRETE STORMWATER OUTFALL COMING FROM A SINGLE NEARBY CATCH BASIN ON THE OPPOSITE SIDE OF THE ROAD.
HHPS025	CONSIDER keep in the program for now and get wet weather FC and flow data (not much of that in	could not locate source during a Fall dry and Fall wet sampling visit;	keep in program and try to get wet weather FC and flow data; attempt to get sample during a heavy rain event because source could not be	Hampton	ROAD CULVERT	18 IN. CORRUGATED METAL ROAD CULVERT CONNECTED TO DITCH ON OPPOSITE SIDE OF

	the database). If wet FC load is low, change to inactive. IF # OF THESE "CHECK WET AND THEN DROP" SITES BECOMES TOO LARGE, THIS SITE CAN BE SIMPLY INACTIVATED BASED ON ITS LOCATION.		located in dry weather. If cannot locate after continued sampling efforts, considering changing to "site vist only" status.			LANDING RD. ALLOWS FOR DRAINAGE IN SWALE ALONG ROUTE 101.
HHPS026	CONSIDER keep in the program for now and get wet weather FC and flow data (not much of that in the database). If wet FC load is low, change to inactive. IF # OF THESE "CHECK WET AND THEN DROP" SITES BECOMES TOO LARGE, THIS SITE CAN BE SIMPLY INACTIVATED BASED ON ITS LOCATION.	one Fall dry sampling (source was dry) and one Fall wet sampling (FC=30)	keep in the program for now and get wet weather FC and flow data.	Hampton	INTERMIT TENT STREAM	INTERMITTENT STREAM RUNNING THROUGH A 24 IN. CONCRETE ROAD CULVERT
HHPS033	CONSIDER keep in the program for now and get wet weather FC and flow data (not much of that in the database). If wet FC load is low, change to inactive. IF # OF THESE "CHECK WET AND THEN DROP" SITES BECOMES TOO LARGE, THIS SITE CAN BE SIMPLY INACTIVATED BASED ON ITS LOCATION.	one Fall dry sampling (source was dry)	keep in the program for now and get wet weather FC and flow data.	Hampton	STORMW ATER OUTFALL	12 INCH CORRIGATED PLASTIC STORMWATER OUTFALL. HHPS033 AND HHPS034 WERE COMBINED INTO ONE OUTFALL IN 2007/08 PER KEN SIMON OF ESI.
HHPS035	check in wet weather to see if there have been any changes to the culvert, and to get a flow measurement along with updated FC	Could not locate upon Fall Dry visit	keep in program and try to get wet weather FC and flow data; attempt to get sample during a heavy rain event because source could not be located in dry weather. If cannot locate after continued sampling	Hampton	ROAD CULVERT	6 IN. CLAY ROAD CULVERT

			efforts, considering changing to "site vist only" status.			
HHPS036	check in wet weather to see if there have been any changes to the culvert, and to get a flow measurement along with updated FC	Could not locate upon Fall Dry visit	keep in program and try to get wet weather FC and flow data; attempt to get sample during a heavy rain event because source could not be located in dry weather. If cannot locate after continued sampling efforts, considering changing to "site vist only" status.	Hampton	STORMWATER OUTFALL	6 IN. CMP STORMWATER OUTFALL, COMPLETELY FILLED WITH DEBRIS
HHPS037	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one May 2018 dry weather sample, low FC	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Seabrook	TIDAL CREEK	MOUTH OF BLOOD CREEK AT BLACKWATER RIVER
HHPS039	check in wet weather to see if there have been any changes to the culvert, and to get a flow measurement along with updated FC	one June 2018 dry weather sample, source was dry/no flow	get wet weather FC and flow data	Hampton	ROAD CULVERT	24 IN. CONCRETE ROAD CULVERT FACILITATING STORMWATER AND WETLAND DRAINAGE
HHPS040	sample in dry and/or wet weather to update the database	one summer dry sample, dry/no flow at site.	repeat 2018 plan. Historically no wet or dry data.	Hampton	STORMWATER OUTFALL	15 IN. STORM WATER OUTFALL FROM SINGLE CATCH BASIN ON BRIDGE, ROAD RUNOFF
HHPS041	sample in dry and/or wet weather to update the database	one summer dry sample, dry/no flow at site.	repeat 2018 plan. Historically no wet or dry data.	Hampton	STORMWATER OUTFALL	15 IN. STORM WATER OUTFALL FROM SINGLE CATCH BASIN ON BRIDGE, ROAD RUNOFF
HHPS042	get a least one sample in summer 2018 possibly a second sample in a autumn dry weather run in 2018	two dry weather samples, a high and low FC (90 and 20). One wet weather sample, low FC (30). Hampton sampling this site weekly in 2018,	it's a trib site, so we need ongoing sampling. need wet and dry samples every 1-2 years. Need to develop more summer data if commercial relay and depuration becomes a reality. Hampton	Hampton	TIDAL RIVER	TIDE MILL CREEK

		installing a new force main.	sampling this site weekly in 2018, installing a new force main. Continue intensive sampling post installation.			
HHPS043	sample in dry and/or wet weather to update the database	one summer dry sample, dry/no flow at site.	repeat 2018 plan. Historically no wet or dry data.	Hampton	STORMWATER OUTFALL	15 IN. STORM WATER OUTFALL FROM SINGLE CATCH BASIN ON BRIDGE, ROAD RUNOFF
HHPS044	sample in dry and/or wet weather to update the database	one summer dry sample, dry/no flow at site.	repeat 2018 plan. Historically no wet or dry data.	Hampton	STORMWATER OUTFALL	15 IN. STORM WATER OUTFALL FROM SINGLE CATCH BASIN ON 101 BRIDGE, ROAD RUNOFF
HHPS054	sample in dry and/or wet weather to update the database	Fall dry and summer dry sample; source was dry/no flow.	Repeat 2018 sampling plan. Need both wet and dry samples. High dry weather FC in dry 2016 sampling event (190).	Hampton	STORMWATER OUTFALL	12 IN. METAL STORMWATER OUTFALL, DRAINS STORMWATER FROM RESIDENTIAL PROPERTIES ON OPPOSITE SIDE OF THE STREET
HHPS055	focus on wet weather, but do pre and post storm monitoring if possible	summer dry sample, low FC (<10) and fall dry sample, high FC (800).	Repeat 2018 sampling plan. Need both wet and dry samples.	Hampton	TIDAL CREEK	INTERMITTENT STREAM/TIDAL CREEK RUNNING THROUGH AN 18 INCH CONCRETE ROAD CULVERT
HHPS056	focus on wet weather, but do pre and post storm monitoring if possible	summer dry sample, low FC (<10) and fall dry sample, high FC (300).	Repeat 2018 sampling plan. Need both wet and dry samples.	Hampton	TIDAL CREEK	INTERMITTENT/TIDAL STREAM FLOWING THROUGH A 36 INCH ROAD CULVERT WITH A TIDE GATE
HHPS057	focus on wet weather, but do pre and post storm monitoring if possible	summer dry and fall dry sample; site was dry/no flow	Repeat 2018 sampling plan. Need both wet and dry samples.	Hampton	ROAD CULVERT	18 IN. CONCRETE ROAD CULVERT, END OF PIPE IS BKOKEN, FACILITATES DRAINAGE UNDER ROAD
HHPS058	focus on wet weather, but do pre and post storm monitoring if possible	summer dry and fall dry sampe; site was dry/no flow (site remains covered by metal tide gate).	Continue to monitor to see if metal tide gate remains at outfall. Consider chaninging to "site visit only" if outfall remains covered.	Hampton	STORMWATER OUTFALL	36" STORMWATER OUTFALL WITH METAL TIDE GATE. DRAINS ONTO BEACH NEAR STATE BOAT LAUNCH

HHPS061	update wet weather loading information	summer dry sample, low FC (<10) and a fall dry sample, high FC (370).	repeat 2018 plan (no wet weather data in 2018). Attempt to get a fall and summer wet weather sample. High FC in wet weather within past 10 years	Hampton	STORMW ATER OUTFALL	20 IN. STORMWATER OUTFALL FROM CONCRETE WING WALL
HHPS062	update wet weather loading information	summer dry sample, low FC (<10) and a fall dry sample, high FC (490).	repeat 2018 plan (no wet weather data in 2018). Attempt to get a fall and summer wet weather sample. High FC in wet weather within past 10 years	Hampton	STORMW ATER OUTFALL	10 IN. STORMWATER OUTFALL FROM CONCRETE WING WALL
HHPS066	focus on wet weather, but do pre and post storm monitoring if possible	Fall dry sample, high FC (1600). Very high FC in the past for wet and dry samples	Repeat 2018 plan. Need more recent wet weather data	Hampton	PIPE	36 IN CONCRETE PIPE WITH CONCRETE HEAD WALL
HHPS067	focus on wet weather, but do pre and post storm monitoring if possible	Fall dry sample and Summer dry sample, site was dry/no flow.	Repeat 2018 plan. Need more recent wet weather data	Hampton	PIPE	12 IN. CORRUGATED PLASTIC PIPE
HHPS068	focus on wet weather, but do pre and post storm monitoring if possible	Summer dry sample, high FC (400) and Fall dry sample, high FC (1000)	Repeat 2018 plan. Need more recent wet weather data	Hampton	STORMW ATER OUTFALL	48 IN. CORRUGATED PLASTIC STORMWATER OUTFALL
HHPS069	focus on wet weather, but do pre and post storm monitoring if possible	Summer dry sample, high FC (340) and Fall dry sample, high FC (600). Very high FC in 2016 as well	Repeat 2018 plan	Hampton	STORMW ATER OUTFALL	36 IN. CORRUGATED GREEN PLASTIC STORMWATER OUTFALL
HHPS070	focus on wet weather, but do pre and post storm monitoring if possible	Summer dry sample, low FC (<10) and Fall dry sample, high FC (2200). Very high FC in 2012 and 2016 as well	Repeat 2018 plan	Hampton	STORMW ATER OUTFALL	24 IN. CULVERT WITH CONCRETE HEADWALL, BLOCKED BY REBAR AND A STORMWATER GRATE (2009)
HHPS071	focus on wet weather, but do pre and post storm monitoring if possible	Summer dry sample, low FC (10) and Fall dry sample, high FC (1200). Very high FC in 2012 and 2016 as well	Repeat 2018 plan	Hampton	PIPE	30 IN. CULVERT WITH CONCRETE HEADWALL

HHPS086	get wet weather FC and flow data (not much of that in the database).	Fall wet sample, extremely high FC (>20,000). Over 1 inch of rain on 10/27/2018, two days prior to sampling. Highest the FC has ever been at this site.	repeat 2018 plan. Perhaps site visit/sample once or twice in dry weather to see if site is flowing and/or if there is high FC.	Seabrook	ROAD CULVERT	24 IN. PLASTIC CULVERT UNDER DRIVEWAY TO HOUSE #151. FACILITATING DRAINAGE OF WETLAND AREA AND STORMWATER FROM SEABROOK OUTFALL #9 (HHPS085), DISCHARGES TO MARSH
HHPS089	get wet weather FC and flow data (not much of that in the database).	Fall dry sample, site was dry/no flow. Fall wet sample, high FC (160). Over 1 inch of rain on 10/27/2018, two days prior to sampling.	Repeat 2018 plan	Seabrook	PERENNIA L STREAM	PERENNIAL STREAM FLOWING THROUGH A 32 INCH CONCRETE ROAD CULVERT
HHPS092	get wet weather FC and flow data (not much of that in the database). If wet FC load is low, change to inactive.	Fall dry and Fall wet sample, site was dry/no flow on both ocassions	Repeat 2018 plan	Seabrook	STORMW ATER OUTFALL	15 IN. CONCRETE ROAD CULVERT FACILITATING STORMWATER DRAINAGE UNDER ROAD. TOWN OF SEABROOK OUTFALL #41.
HHPS094	get wet weather FC and flow data (not much of that in the database).	Fall dry sample, site was dry/no flow. Fall wet sample, high Fc (1800). Over 1 inch of rain on 10/27/2018, two days prior to sampling.	Repeat 2018 plan. Visit/sample site on more dry weather ocassions to see if it is flowing.	Seabrook	INTERMIT TENT STREAM	INTERMITTENT STREAM FLOWING THROUGH A 15 IN. CONCRETE ROAD CULVERT. FLOWS SOUTH UNDER ROAD.
HHPS095	get a least one sample in summer 2018 possibly a second sample in a autumn dry weather run in 2018	two dry weather samples (summer and autumn) both high FC. One wet weather sample in summer, high FC	it's a trib site, so we need ongoing sampling. need wet and dry samples every 1-2 years. Need to develop more summer data if commercial relay and depuration becomes a reality.	Seabrook	TIDAL CREEK	40 FT. SPAN, CONC. BRIDGE, HHT2
HHPS106	High wet and dry weather FC in the past (2009 dry- 3100 FC and 2012 wet- 350 FC) get updated FC and flow	Fall dry sample, high FC (110).	Repeat 2018 plan, but focus on wet weather in Fall and Summer.	Seabrook	INTERMIT TENT STREAM	INTERMITTENT STREAM FLOWING THROUGH A 48" CORRUGATED METAL CULVERT

	data (not much of that in the database). If FC load is low, change to inactive.					
HHPS108	Not very high FC in recent past (2012), but need to get updated FC and flow data (not much of that in the database). If FC load is low, change to inactive.	Fall dry sample, site was dry/no flow.	Repeat 2018 plan, but focus on wet weather in Fall and Summer	Seabrook	STORMWATER OUTFALL	18 IN. BL. PLASTIC STORMWATER OUTFALL
HHPS109	High wet weather FC in the past (years 2000 and 2001). get wet weather FC and flow data (not much of that in the database). If wet FC load is low, change to inactive.	Fall dry sample, site was dry/no flow	Repeat 2018 plan, did not get any wet weather samples/data in 2018.	Seabrook	STORMWATER OUTFALL	12 IN. BL. PLASTIC STORMWATER OUTFALL
HHPS124	Multiple high wet and dry weather FC in the past (years 2009 and 2012). Get updated FC and flow data	Fall dry sample, low FC (40)	Repeat 2018 plan, focus on both wet and dry weather.	Seabrook	INTERMITTENT STREAM	INTERMITTENT STREAM RUNNING THROUGH A 48 INCH CORRUGATED PLASTIC ROAD CULVERT. TIDALLY INFLUENCED.
HHPS127	sample in wet or dry to get updated info. Get flow data also.	Fall dry sampling event, but flow was too low to sample from.	Repeat 2018 plan, but focus on wet weather to see if there is enough flow to get sample (and pipe would be easier to locate)	Seabrook	PIPE	4 IN. SQUASHED PLASTIC BLACK PIPE. PIPE STICKS OUT OF BANK AND IS BROKEN IN SECTIONS.
HHPS132	High wet weather FC in the past (1600 FC in 2009, 380 FC in 2012). Get wet weather FC and flow data. If wet FC load is low, change to inactive.	Fall dry sample, low FC (10)	Repeat 2018 plan; did not do any wet weather sampling at this site.	Seabrook	INTERMITTENT STREAM	INTERMITTENT STREAM RUNNING THROUGH A 60 INCH CONCRETE BOX CULVERT WITH CONCRETE WINGWALLS. NORTH DOCK CREEK.
HHPS134	get a least one sample in summer 2018 possibly a second sample in a autumn dry weather run in 2018	sampled dry and wet weather, both had low FC.	it's a trib site, so we need ongoing sampling. need wet and dry samples every 1-2 years. Need to develop more summer data if commercial relay and depuration becomes a reality.	Seabrook	TIDAL RIVER	BRIDGE OVER THE BLACKWATER RIVER, HHT1

HHPS139	re-inspect by boat to see if it is still not in use	no sampling done	Repeat 2018 plan; if no longer in use, consider chaning status to "site visit only"	Seabrook	PIPE	6 IN. WHITE PVC
HHPS140	re-inspect by boat to see if it is still not in use	no sampling done	Repeat 2018 plan; if no longer in use, consider chaning status to "site visit only"	Seabrook	PIPE	6 IN. WHITE PVC
HHPS141	re-inspect by boat to see if it is still not in use	no sampling done	repeat 2018 plan	Seabrook	PIPE	8 IN. WHITE PVC
HHPS142	re-inspect by boat to see if it is still not in use	no sampling done	repeat 2018 plan	Seabrook	PIPE	2(6 IN.) WHITE PVC
HHPS143	re-inspect by boat to see if it is still not in use	no sampling done	repeat 2018 plan	Seabrook	PIPE	8 IN. WHITE PVC
HHPS144	re-inspect by boat to see if it is still not in use	no sampling done	repeat 2018 plan	Seabrook	PIPE	(2) 6 INCH PIPES
HHPS157	no sampling, station made inactive	no work; station made inactive	no work needed; inactive	Seabrook	ICE MACHINE DRAN	4 IN. WHITE PVC ICE MACHINE DRAIN
HHPS158	re-inspect by boat to see if it is still not in use	no sampling done 2018	repeat 2018 plan	Seabrook	PIPE	2 IN. WHITE PVC, FLUSH WITH BOTTOM OF DECK - FRESH WATER LINE
HHPS204	annual sampling	sampled once in May 2018	continue annual sampling	Hampton	NPDES FACILITY	HAMPTON MUNICIPAL WWTF; NPDES NH0100625. SAMPLE COLLECTED JUST PRIOR TO CHLORINATION
HHPS206	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one May 2018 dry weather sample, low FC	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the	Seabrook	SALTMAR SH DITCH	TIDAL DITCH DISCHARGING TO BLACKWATER RIVER FROM WEST SIDE

			other in November (open status). December open status, or even spring open status, would be ok.			
HHPS207	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one May 2018 dry weather sample, low FC	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Seabrook	SALTMAR SH DITCH	TIDAL DITCH DISCHARGING TO BLACKWATER RIVER FROM EAST SIDE
HHPS208	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one May 2018 dry weather sample, low FC	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Seabrook	TIDAL CREEK	TIDAL CREEK DISCHARGING TO BLACKWATER RIVER FROM EAST SIDE
HHPS209	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one May 2018 dry weather sample, low FC	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Seabrook	TIDAL CREEK	TIDAL CREEK DISCHARGING TO BLACKWATER RIVER FROM WEST SIDE
HHPS210	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one May 2018 dry weather sample, low FC	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Seabrook	TIDAL CREEK	TIDAL CREEK DISCHARGING TO BLACKWATER RIVER FROM WEST SIDE
HHPS211	dry weather sampling (for marina)	no sampling done 2018	repeat 2018 plan	Hampton	MARINA	HAMPTON STATE DOCKS

HHPS212	station was reactivated as part of the 2016 Hampton Sewer investigation.	no sampling done 2018	can make station inactive again? Sources are evaluated via HHPS248 and HHPS249	Hampton	MARINA	HAMPTON RIVER MARINA
HHPS213	dry weather sampling (for marina)	4 sampling events: 1/16/2018 high FC (110), 11/05/2018 high FC (79), 11/19/2018 high FC (110), 11/26/2018 high FC (70)	repeat 2018 sampling plan	Hampton	MARINA	HAMPTON RIVER BOAT CLUB
HHPS214	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one May 2018 dry weather sample, low FC	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Seabrook	TIDAL CREEK	MOUTH OF MORRILS CREEK AT BLACKWATER RIVER
HHPS215	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one May 2018 dry weather sample, low FC	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Seabrook	TIDAL CREEK	TIDAL CREEK DISCHARGING TO BLACKWATER RIVER FROM EAST SIDE, JUST SOUTH OF RIVER STREET
HHPS216	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one May 2018 dry weather sample, low FC	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Seabrook	TIDAL CREEK	MOUTH OF MILL CREEK AT BLACKWATER RIVER
HHPS217	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one May 2018 dry weather sample, low FC	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Seabrook	TIDAL CREEK	MOUTH OF HUNTS ISLAND CREEK AT BROWNS RIVER

HHPS218	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one May 2018 dry weather sample, low FC	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Seabrook	TIDAL CREEK	MOUTH OF BACK CREEK AT BROWNS RIVER
HHPS219	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one May 2018 dry weather sample, low FC	CALL SEABROOK STATION AHEAD OF TIME FOR PERMISSION! repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Hampton Falls	TIDAL CREEK	TRIBUTARY TO BROWNS RIVER, EAST SIDE OF ROBBINS POINT
HHPS220	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one May 2018 dry weather sample, low FC	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Hampton Falls	TIDAL CREEK	TRIBUTARY TO BROWNS RIVER, WEST SIDE OF ROBBINS POINT
HHPS221	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one May 2018 dry weather sample, low FC	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Hampton Falls	TIDAL CREEK	TRIBUTARY DISCHARGING TO BROWNS RIVER ALONG EASTMAN SLOUGH
HHPS222	sample in dry and/or wet weather to update the database	no sampling done	repeat 2018 sampling plan	Hampton	TIDAL CREEK	TRIBUTARY DISCHARGING TO HAMPTON RIVER NORTH OF HAMPTON RIVER MARINA

HHPS223	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one 10/4/18 "dry" weather sample (less than 1 inch in Portsmouth, but just over one inch in Seabrook. We did not have seabrook data in real time. This is more of a wet weather event. FC=60	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Hampton	TIDAL CREEK	MOUTH OF EAGLE CREEK, NEAR THE WILLOWS, DISCHARGING TO HAMPTON RIVER
HHPS224	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one 10/4/18 "dry" weather sample (less than 1 inch in Portsmouth, but just over one inch in Seabrook. We did not have seabrook data in real time. This is more of a wet weather event. FC=50	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Hampton Falls	TIDAL CREEK	TIDAL CREEK DISCHARGING TO THE HAMPTON RIVER FROM SOUTHWEST SIDE
HHPS225	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one 10/4/18 "dry" weather sample (less than 1 inch in Portsmouth, but just over one inch in Seabrook. We did not have seabrook data in real time. This is more of a wet weather event. FC=90	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Hampton Falls	TIDAL CREEK	TIDAL CREEK DISCHARGING TO THE HAMPTON RIVER FROM SOUTHWEST SIDE
HHPS226	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one 10/4/18 "dry" weather sample (less than 1 inch in Portsmouth, but just over one inch in Seabrook. We did not have seabrook data in real time. This is more of a wet weather event. FC=30	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Hampton	TIDAL CREEK	MOUTH OF TIDE MILL CREEK, DISCHARGING TO HAMPTON RIVER
HHPS227	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one 10/4/18 "dry" weather sample (less than 1 inch in Portsmouth, but just over one inch in Seabrook. We did not have seabrook data in real time. This is	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even	Hampton	TIDAL CREEK	MOUTH OF TRIBUTARY TO TIDE MILL CREEK, JUST SOUTH OF END OF GLADE PATH ROAD

		more of a wet weather event. FC=10. another sample 5/30/18, FC=40, note over 1 inch rain fell 5/26-5/27 so this might be influenced by rain	spring open status, would be ok.			
HHPS228	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one 10/4/18 "dry" weather sample (less than 1 inch in Portsmouth, but just over one inch in Seabrook. We did not have seabrook data in real time. This is more of a wet weather event. FC=30	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Hampton	TIDAL CREEK	TIDAL CREEK DISCHARGING AT HEAD OF HAMPTON RIVER, BETWEEN TAYLOR AND HAMPTON FALLS RIVERS
HHPS229	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one 10/4/18 "dry" weather sample (less than 1 inch in Portsmouth, but just over one inch in Seabrook. We did not have seabrook data in real time. This is more of a wet weather event. FC=110	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Hampton Falls	TIDAL CREEK	TIDAL CREEK DISCHARGING TO THE SOUTH SIDE OF HAMPTON FALLS RIVER
HHPS230	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one 10/4/18 "dry" weather sample (less than 1 inch in Portsmouth, but just over one inch in Seabrook. We did not have seabrook data in real time. This is more of a wet weather event. FC=10	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Hampton Falls	TIDAL CREEK	TIDAL CREEK DISCHARGING TO THE SOUTH SIDE OF HAMPTON FALLS RIVER
HHPS231	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one 10/4/18 "dry" weather sample (less than 1 inch in Portsmouth, but just over one inch in Seabrook. We did not have seabrook data in real time. This is more of a wet weather event. FC=110	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Hampton	TIDAL CREEK	TIDAL CREEK DISCHARGING TO THE NORTH SIDE OF HAMPTON FALLS RIVER

HHPS232	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one 10/4/18 "dry" weather sample (less than 1 inch in Portsmouth, but just over one inch in Seabrook. We did not have seabrook data in real time. This is more of a wet weather event. FC=50	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Hampton	SALTMAR SH DITCH	TIDAL DITCH DISCHARGING TO THE NORTH SIDE OF HAMPTON FALLS RIVER
HHPS233	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one 10/4/18 "dry" weather sample (less than 1 inch in Portsmouth, but just over one inch in Seabrook. We did not have seabrook data in real time. This is more of a wet weather event. FC=40	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Hampton Falls	TIDAL CREEK	TIDAL CREEK DISCHARGING TO THE WEST SIDE OF TAYLOR RIVER, NEAR CONFLUENCE WITH HAMPTON FALLS RIVER
HHPS234	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one 10/4/18 "dry" weather sample (less than 1 inch in Portsmouth, but just over one inch in Seabrook. We did not have seabrook data in real time. This is more of a wet weather event. FC=150	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Hampton Falls	SALTMAR SH DITCH	TIDAL DITCH DISCHARGING TO WEST SIDE OF TAYLOR RIVER
HHPS235	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one 10/4/18 "dry" weather sample (less than 1 inch in Portsmouth, but just over one inch in Seabrook. We did not have seabrook data in real time. This is more of a wet weather event. FC=130	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Hampton	SALTMAR SH DITCH	TIDAL DITCH DISCHARGING TO WEST SIDE OF TAYLOR RIVER
HHPS236	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one 10/4/18 "dry" weather sample (less than 1 inch in Portsmouth, but just over one inch in Seabrook. We did not have seabrook data in real time. This is	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even	Hampton	TIDAL CREEK	TIDAL CREEK DISCHARGING TO NORTH SIDE OF TRIBUTARY TO TAYLOR RIVER

		more of a wet weather event. FC=90	spring open status, would be ok.			
HHPS237	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one 10/4/18 "dry" weather sample (less than 1 inch in Portsmouth, but just over one inch in Seabrook. We did not have seabrook data in real time. This is more of a wet weather event. FC=100	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Hampton	TIDAL CREEK	TIDAL CREEK DISCHARGING TO NORTH SIDE OF TRIBUTARY TO TAYLOR RIVER
HHPS238	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one 10/4/18 "dry" weather sample (less than 1 inch in Portsmouth, but just over one inch in Seabrook. We did not have seabrook data in real time. This is more of a wet weather event. FC=170	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Hampton	TIDAL CREEK	TIDAL CREEK DISCHARGING TO SOUTH SIDE OF TRIBUTARY TO TAYLOR RIVER
HHPS239	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one 10/4/18 "dry" weather sample (less than 1 inch in Portsmouth, but just over one inch in Seabrook. We did not have seabrook data in real time. This is more of a wet weather event. FC=40	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Hampton	TIDAL CREEK	TIDAL CREEK DISCHARGING TO SOUTH SIDE OF TRIBUTARY TO TAYLOR RIVER, JUST DOWNSTREAM OF SMALL RR TRESTLE ON THE HAMPTON/HAMPTON FALLS TOWN LINE
HHPS240	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one 10/4/18 "dry" weather sample (less than 1 inch in Portsmouth, but just over one inch in Seabrook. We did not have seabrook data in real time. This is more of a wet weather event. FC=20	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Hampton	TIDAL CREEK	UNNAMED TIDAL CREEK DISCHARGING TO THE NORTH SIDE OF THE TAYLOR RIVER, JUST UPSTREAM OF THE HAMPTON RIVER BOAT CLUB

HHPS241	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one 10/4/18 "dry" weather sample (less than 1 inch in Portsmouth, but just over one inch in Seabrook. We did not have seabrook data in real time. This is more of a wet weather event. FC=30	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Hampton	TIDAL CREEK	TIDAL CREEK DISCHARGING TO TRIBUTARY TO TAYLOR RIVER, AT THE SMALL RR TRESTLE ON THE HAMPTON/HAMPTON FALLS TOWN LINE
HHPS242	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one 10/4/18 "dry" weather sample (less than 1 inch in Portsmouth, but just over one inch in Seabrook. We did not have seabrook data in real time. This is more of a wet weather event. FC=30	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Hampton Falls	TIDAL CREEK	TIDAL CREEK DISCHARGING TO THE WEST SIDE OF HAMPTON FALLS RIVER
HHPS245	perform annual evaluation of MORs; no actual sampling needed.		no work needed; inactive	Hampton	NPDES OUTFALL	COMBINED OUTFALL ENVIROSYSTEMS AND APPLIED RESEARCH ORGANISMS-NPDES PERMIT NUMBERS NH0022985, NH0022055 (RESPECTIVELY)
HHPS246	get a least one sample in spring 2018 and/or autumn 2018, preferably dry weather	one 10/4/18 "dry" weather sample (less than 1 inch in Portsmouth, but just over one inch in Seabrook. We did not have seabrook data in real time. This is more of a wet weather event. FC=70	repeat during the next triennial period. Focus on two fall sampling runs in dry weather -- one in Sept or Oct (closed status), and the other in November (open status). December open status, or even spring open status, would be ok.	Hampton	TIDAL CREEK	TIDAL CREEK FROM A SALT MARSH, JUST EAST OF HAMPTON RIVER BOAT CLUB.
HHPS248	Marina station: do dry weather sampling at low tide, preferably after a weekend during the boating season, just to see if high FC exists	no sampling done	repeat 2018 sampling plan	Hampton	MARINA	HAMPTON RIVER MARINA

HHPS249	Marina station: do dry weather sampling at low tide, preferably after a weekend during the boating season, just to see if high FC exists	Fall dry weather sample, low FC (10)	repeat 2018 sampling plan	Hampton	MARINA	HAMPTON RIVER MARINA

Appendix II: Shoreline Pollution Source Sampling Data

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
HHPS001	DRY	TIDAL RIVER	8/23/2000	< 9	#/100ML
			9/11/2000	15	#/100ML
			9/11/2012	< 10	#/100ML
			9/12/2012	< 10	#/100ML
			6/19/2006	120	#/100ML
			7/25/2016	33	MPN/100ML
			5/16/2018	190	CFU/100ML
			9/17/2018	20	CFU/100ML
	SFPOSTWW	TIDAL RIVER	1/25/2016	22	MPN/100ML
			1/27/2016	17	MPN/100ML
			2/2/2016	4.5	MPN/100ML
			3/8/2019	7.8	MPN/100ML
	WET	TIDAL RIVER	9/13/2000	61	#/100ML
			10/12/2006	480	#/100ML
			6/5/2018	130	CFU/100ML
HHPS002	DRY	TIDAL RIVER	8/23/2000	< 9	#/100ML
			9/11/2000	9	#/100ML
			9/11/2012	30	#/100ML
			9/12/2012	80	#/100ML
			6/10/2009	30	#/100ML
			7/25/2016	23	MPN/100ML
			5/16/2018	90	CFU/100ML
			9/17/2018	10	CFU/100ML
	WET	TIDAL RIVER	6/12/2001	50	#/100ML
			9/13/2000	173	#/100ML
			6/5/2018	60	CFU/100ML
HHPS003	DRY	STORMWATER OUTFALL	8/23/2000		
			9/11/2000		
			6/10/2009		#/100ML
			5/16/2018		#/100ML
	WET	STORMWATER OUTFALL	6/12/2001		
			9/13/2000	36	#/100ML
			12/18/2012	50	#/100ML
			6/5/2018		#/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
HHPS011	DRY	TIDAL RIVER	8/23/2000	< 9	#/100ML
			9/11/2000	15	#/100ML
			9/11/2012	9	#/100ML
			9/12/2012	10	#/100ML
			7/25/2016	23	MPN/100ML
			5/16/2018	130	CFU/100ML
			9/17/2018	20	CFU/100ML
	SFPOSTWW	TIDAL RIVER	1/25/2016	280	MPN/100ML
			1/27/2016	33	MPN/100ML
			2/1/2016	2	MPN/100ML
			2/2/2016	2	MPN/100ML
	WET	TIDAL RIVER	9/13/2000	370	#/100ML
			6/5/2018	120	CFU/100ML
HHPS013	DRY	ROAD CULVERT	8/23/2000		
			9/11/2000		
			5/26/2009		#/100ML
	WET	ROAD CULVERT	7/27/2000	> 22800	#/100ML
			9/13/2000	1160	#/100ML
			6/12/2001	660	#/100ML
HHPS014	DRY	ROAD CULVERT	8/23/2000		
			9/11/2000		
			5/26/2009		#/100ML
			5/16/2018		#/100ML
	WET	ROAD CULVERT	7/27/2000		
			9/13/2000	< 200	#/100ML
			6/12/2001	300	#/100ML
			12/18/2012		#/100ML
			6/5/2018		#/100ML
HHPS015	DRY	INTERMITTENT STREAM	8/23/2000	120	#/100ML
			9/11/2000	290	#/100ML
			9/11/2000	225	#/100ML
			9/11/2012	150	#/100ML
			9/12/2012	130	#/100ML
			6/9/2009	20	#/100ML
			7/25/2016	540	MPN/100ML
			5/16/2018	90	CFU/100ML
			9/17/2018	1200	CFU/100ML
			5/26/2009		#/100ML
	HHTMDL	INTERMITTENT	7/23/2002	800	#/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
		STREAM	7/23/2002	1000	#/100ML
			7/23/2002	1600	#/100ML
			7/23/2002	3500	#/100ML
			7/23/2002	700	#/100ML
			10/16/2002	100	#/100ML
			10/16/2002	1700	#/100ML
			10/16/2002	6600	#/100ML
			10/16/2002	2200	#/100ML
			10/16/2002	3500	#/100ML
			10/17/2002	700	#/100ML
	SFPOSTWW	INTERMITTENT STREAM	1/25/2016	49	MPN/100ML
			1/27/2016	49	MPN/100ML
			2/1/2016	4.5	MPN/100ML
			2/2/2016	13	MPN/100ML
	WET	INTERMITTENT STREAM	7/27/2000	3280	#/100ML
			9/13/2000	1845	#/100ML
			6/23/2009	320	#/100ML
			6/5/2018	600	CFU/100ML
HHPS016	DRY	INTERMITTENT STREAM	8/23/2000	880	#/100ML
			9/11/2000	310	#/100ML
			9/11/2000	640	#/100ML
			9/11/2012	250	#/100ML
			9/12/2012	460	#/100ML
			6/9/2009	260	#/100ML
			7/25/2016	1600	MPN/100ML
			5/16/2018	150	CFU/100ML
			9/17/2018	470	CFU/100ML
			5/26/2009		#/100ML
	HHTMDL	INTERMITTENT STREAM	7/23/2002	200	#/100ML
			7/23/2002	700	#/100ML
			7/23/2002	1400	#/100ML
			7/23/2002	4400	#/100ML
			10/16/2002	< 100	#/100ML
			10/16/2002	700	#/100ML
			10/16/2002	5600	#/100ML
			10/16/2002	5300	#/100ML
			10/16/2002	4700	#/100ML
			10/16/2002	8300	#/100ML
			10/16/2002	8500	#/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
			10/17/2002	2000	#/100ML
			7/23/2002		#/100ML
	SFPOSTWW	INTERMITTENT STREAM	1/27/2016	14	MPN/100ML
			2/1/2016	23	MPN/100ML
			2/2/2016	33	MPN/100ML
			1/25/2016		#/100ML
	WET	INTERMITTENT STREAM	7/27/2000	7740	#/100ML
			9/13/2000	4300	#/100ML
			6/23/2009	320	#/100ML
			6/5/2018	340	CFU/100ML
HHPS017	DRY	ROAD CULVERT	8/23/2000	120	#/100ML
			9/11/2000	13	#/100ML
			5/26/2009		#/100ML
	WET	ROAD CULVERT	7/27/2000	560	#/100ML
			9/13/2000	860	#/100ML
			6/12/2001	1720	#/100ML
			12/18/2012	460	#/100ML
			6/5/2018		#/100ML
HHPS018	DRY	ROAD CULVERT	8/23/2000		
			9/11/2000		
			5/26/2009		#/100ML
	WET	ROAD CULVERT	9/13/2000	120	#/100ML
			6/12/2001	675	#/100ML
			12/18/2012		#/100ML
			6/5/2018		#/100ML
HHPS020	DRY	SALTMARSH DITCH	9/12/2012	10	#/100ML
			6/20/2006	20	#/100ML
			10/5/2005	20	#/100ML
			5/23/2018	< 10	CFU/100ML
	WET	SALTMARSH DITCH	7/1/2009	9	#/100ML
			9/27/2016	< 10	#/100ML
HHPS021	DRY	TIDAL CREEK	9/12/2012	20	#/100ML
			6/20/2006	10	#/100ML
			10/5/2005	10	#/100ML
			5/23/2018	< 10	CFU/100ML
	WET	TIDAL CREEK	7/1/2009	40	#/100ML
			9/27/2016	20	#/100ML
HHPS024	DRY	STORMWATER OUTFALL	8/23/2000		
			9/11/2000		

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
			5/26/2009		#/100ML
			10/25/2018		#/100ML
	WET	STORMWATER OUTFALL	7/27/2000	> 40480	#/100ML
			9/13/2000	175200	#/100ML
			6/12/2001	2100	#/100ML
			12/18/2012		#/100ML
HHPS025	DRY	ROAD CULVERT	8/23/2000		
			9/11/2000		
			5/26/2009		#/100ML
			10/25/2018		#/100ML
	WET	ROAD CULVERT	7/27/2000	40	#/100ML
			9/13/2000		
			6/12/2001	1850	#/100ML
			12/18/2012		#/100ML
			10/29/2018		#/100ML
HHPS026	DRY	INTERMITTENT STREAM	8/23/2000	< 20	#/100ML
			9/11/2000	113	#/100ML
			6/9/2009	120	#/100ML
			5/26/2009		#/100ML
			10/25/2018		#/100ML
	WET	INTERMITTENT STREAM	7/27/2000	3640	#/100ML
			9/13/2000	3400	#/100ML
			6/12/2001	70	#/100ML
			12/18/2012	400	#/100ML
			10/29/2018	30	CFU/100ML
			6/25/2009		#/100ML
HHPS033	DRY	STORMWATER OUTFALL	8/23/2000	< 20	#/100ML
			9/11/2000		
			5/26/2009		#/100ML
			10/25/2018		#/100ML
	WET	STORMWATER OUTFALL	7/27/2000	5320	#/100ML
			9/13/2000	1200	#/100ML
			6/12/2001	1100	#/100ML
HHPS034	DRY	PIPE	8/23/2000	< 20	#/100ML
			9/11/2000		
			5/26/2009		#/100ML
	WET	PIPE	7/27/2000	1200	#/100ML
			9/13/2000	700	#/100ML
			6/12/2001	220	#/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
HHPS035	DRY	ROAD CULVERT	8/23/2000		
			9/11/2000		
			5/26/2009		#/100ML
			10/25/2018		#/100ML
	WET	ROAD CULVERT	7/27/2000	5420	#/100ML
			9/13/2000	< 200	#/100ML
			6/12/2001	260	#/100ML
			12/18/2012	60	#/100ML
HHPS036	DRY	STORMWATER OUTFALL	9/11/2000		
			5/26/2009		#/100ML
			10/25/2018		#/100ML
	WET	STORMWATER OUTFALL	9/13/2000		
			6/12/2001	< 20	#/100ML
			12/18/2012		#/100ML
HHPS037	DRY	TIDAL CREEK	9/12/2012	< 10	#/100ML
			6/20/2006	20	#/100ML
			10/5/2005	< 10	#/100ML
			5/23/2018	< 10	CFU/100ML
	WET	TIDAL CREEK	10/12/2006	40	#/100ML
			7/1/2009	20	#/100ML
			9/27/2016	< 10	#/100ML
HHPS039	DRY	ROAD CULVERT	8/23/2000	8	#/100ML
			9/11/2000		
			6/10/2009		#/100ML
			6/11/2018		#/100ML
	WET	ROAD CULVERT	9/13/2000	< 10	#/100ML
			6/12/2001	1180	#/100ML
			12/18/2012	4500	#/100ML
HHPS040	DRY	STORMWATER OUTFALL	8/23/2000		
			9/11/2000		
			6/9/2009		#/100ML
			6/11/2018		#/100ML
	SURVEY	STORMWATER OUTFALL	8/13/1998	20	#/100ML
	WET	STORMWATER OUTFALL	9/13/2000		
			6/12/2001		
HHPS041	DRY	STORMWATER OUTFALL	8/23/2000		
			9/11/2000		
			6/9/2009		#/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
			6/11/2018		#/100ML
	WET	STORMWATER OUTFALL	9/13/2000		
			6/12/2001		
HHPS042	DRY	TIDAL RIVER	8/23/2000	24	#/100ML
			9/11/2000	15	#/100ML
			9/11/2012	9	#/100ML
			9/12/2012	10	#/100ML
			7/25/2016	920	MPN/100ML
			5/16/2018	90	CFU/100ML
			9/17/2018	20	CFU/100ML
			6/10/2009		#/100ML
	SFPOSTRF	TIDAL RIVER	2/29/2016	2	MPN/100ML
	SFPOSTWW	TIDAL RIVER	1/25/2016	110	MPN/100ML
			1/27/2016	> 1600	MPN/100ML
			2/1/2016	> 1600	MPN/100ML
			2/2/2016	3500	MPN/100ML
			2/3/2016		#/100ML
			2/10/2016	11	MPN/100ML
			2/11/2016	17	MPN/100ML
			2/16/2016	2	MPN/100ML
			3/14/2016	4.5	MPN/100ML
			3/22/2016	2	MPN/100ML
			4/11/2016	460	MPN/100ML
			4/13/2016	4.5	MPN/100ML
			4/19/2016	< 2	MPN/100ML
			4/25/2016	33	MPN/100ML
	WET	TIDAL RIVER	7/27/2000	200	#/100ML
			9/13/2000	138	#/100ML
			6/5/2018	30	CFU/100ML
HHPS043	DRY	STORMWATER OUTFALL	8/23/2000		
			9/11/2000		
			6/9/2009		#/100ML
			6/11/2018		#/100ML
	WET	STORMWATER OUTFALL	9/13/2000		
			6/12/2001		
HHPS044	DRY	STORMWATER OUTFALL	8/23/2000		
			9/11/2000		
			6/9/2009		#/100ML
			6/11/2018		#/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
	WET	STORMWATER OUTFALL	9/13/2000	780	#/100ML
			6/12/2001		
HHPS054	DRY	STORMWATER OUTFALL	9/11/2000		
			7/26/2016	190	#/100ML
			6/10/2009		#/100ML
			8/10/2009		#/100ML
			9/18/2012		#/100ML
			5/9/2018		#/100ML
			10/2/2018		#/100ML
	HHTMDL	STORMWATER OUTFALL	7/23/2002		#/100ML
			10/16/2002		#/100ML
			10/16/2002		#/100ML
			10/16/2002		#/100ML
			10/16/2002		#/100ML
			10/16/2002		#/100ML
	WET	STORMWATER OUTFALL	7/27/2000	10220	#/100ML
			9/13/2000		
			9/19/2012		#/100ML
HHPS055	DRY	TIDAL CREEK	9/11/2000	< 20	#/100ML
			5/9/2018	< 10	CFU/100ML
			10/2/2018	800	CFU/100ML
			6/10/2009		#/100ML
			8/10/2009		#/100ML
			9/18/2012		#/100ML
			7/26/2016		#/100ML
	HHTMDL	TIDAL CREEK	7/23/2002	< 100	#/100ML
			7/23/2002	100	#/100ML
			7/23/2002	100	#/100ML
			7/23/2002	< 100	#/100ML
			10/16/2002	< 100	#/100ML
			10/16/2002	1300	#/100ML
			10/16/2002	4400	#/100ML
			10/16/2002	2800	#/100ML
			10/16/2002	6000	#/100ML
	WET	TIDAL CREEK	7/27/2000		
			9/13/2000	5960	#/100ML
			9/19/2012	5500	#/100ML
HHPS056	DRY	TIDAL CREEK	8/23/2000	3	#/100ML
			9/11/2000	< 1	#/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
			7/26/2016	160	#/100ML
			5/9/2018	< 10	CFU/100ML
			10/2/2018	300	CFU/100ML
			6/10/2009		#/100ML
			8/10/2009		#/100ML
			9/18/2012		#/100ML
	HHTMDL	TIDAL CREEK	7/23/2002	< 100	#/100ML
			7/23/2002	< 100	#/100ML
			7/23/2002	1100	#/100ML
			7/23/2002	1100	#/100ML
			7/23/2002	800	#/100ML
			10/16/2002	< 100	#/100ML
			10/16/2002	800	#/100ML
			10/16/2002	3500	#/100ML
			10/16/2002	1800	#/100ML
			10/16/2002	4400	#/100ML
	SURVEY	TIDAL CREEK	8/19/1998	23	#/100ML
	WET	TIDAL CREEK	7/27/2000	3740	#/100ML
			6/12/2001	220	#/100ML
			9/13/2000	10320	#/100ML
			9/19/2012	5100	#/100ML
HHPS057	DRY	ROAD CULVERT	8/23/2000	1	#/100ML
			9/11/2000	2	#/100ML
			7/26/2016	< 10	#/100ML
			6/10/2009		#/100ML
			8/10/2009		#/100ML
			9/18/2012		#/100ML
			5/9/2018		#/100ML
			10/2/2018		#/100ML
	HHTMDL	ROAD CULVERT	10/16/2002	< 50	#/100ML
			7/23/2002		#/100ML
			10/16/2002		#/100ML
			10/16/2002		#/100ML
			10/16/2002		#/100ML
			10/16/2002		#/100ML
	SURVEY	ROAD CULVERT	8/19/1998	71	#/100ML
	WET	ROAD CULVERT	7/27/2000	1760	#/100ML
			9/13/2000	1640	#/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
			6/12/2001	20	#/100ML
			9/19/2012		#/100ML
HHPS058	DRY	STORMWATER OUTFALL	10/5/2005		#/100ML
			11/29/2005		#/100ML
			6/19/2006		#/100ML
			6/9/2009		#/100ML
			9/18/2012		#/100ML
			7/26/2016		#/100ML
			5/9/2018		#/100ML
			10/2/2018		#/100ML
	WET	STORMWATER OUTFALL	11/22/2005		#/100ML
			8/29/2006		#/100ML
			6/23/2009		#/100ML
			9/19/2012		#/100ML
HHPS061	DRY	STORMWATER OUTFALL	8/23/2000	30	#/100ML
			9/11/2000	< 20	#/100ML
			7/26/2016	40	#/100ML
			5/9/2018	< 10	CFU/100ML
			10/2/2018	370	CFU/100ML
			6/8/2009		#/100ML
			12/17/2015		#/100ML
			12/20/2015		#/100ML
	HHTMDL	STORMWATER OUTFALL	10/16/2002	> 20000	#/100ML
			10/16/2002	19400	#/100ML
			10/16/2002	5500	#/100ML
			10/16/2002	17000	#/100ML
			10/16/2002	5900	#/100ML
	SURVEY	STORMWATER OUTFALL	9/18/2012		#/100ML
	WET	STORMWATER OUTFALL	7/27/2000	4360	#/100ML
			9/13/2000	7200	#/100ML
			6/12/2001	660	#/100ML
			9/19/2012	2300	#/100ML
			8/29/2006	460	#/100ML
			10/12/2006	850	#/100ML
			6/25/2009	260	#/100ML
			6/29/2009	390	#/100ML
			6/30/2009	4500	#/100ML
			6/23/2009		#/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
			12/15/2015		#/100ML
HHPS062	DRY	STORMWATER OUTFALL	8/23/2000	21	#/100ML
			9/11/2000	< 20	#/100ML
			12/17/2015	23	MPN/100ML
			7/26/2016	40	#/100ML
			5/9/2018	< 10	CFU/100ML
			10/2/2018	490	CFU/100ML
			6/8/2009		#/100ML
			9/18/2012		#/100ML
			12/20/2015		#/100ML
	HHTMDL	STORMWATER OUTFALL	10/16/2002	17600	#/100ML
			10/16/2002	4900	#/100ML
			10/16/2002	2900	#/100ML
			10/16/2002	3100	#/100ML
			10/16/2002	1600	#/100ML
	WET	STORMWATER OUTFALL	7/27/2000	2080	#/100ML
			9/13/2000	2900	#/100ML
			6/12/2001	60	#/100ML
			9/19/2012	970	#/100ML
			8/29/2006	> 260	#/100ML
			10/12/2006	670	#/100ML
			6/25/2009	30	#/100ML
			6/29/2009	70	#/100ML
			6/30/2009	220	#/100ML
			6/23/2009		#/100ML
			12/15/2015		#/100ML
HHPS066	DRY	PIPE	8/23/2000	40	#/100ML
			9/11/2000	980	#/100ML
			12/17/2015	23	MPN/100ML
			12/20/2015	7.8	MPN/100ML
			6/8/2009	< 10	#/100ML
			7/26/2016		#/100ML
			10/2/2018	1600	CFU/100ML
			9/18/2012		#/100ML
	HHTMDL	PIPE	7/23/2002	< 100	#/100ML
			7/23/2002	> 17000	#/100ML
			7/23/2002	8400	#/100ML
			7/23/2002	7500	#/100ML
			7/23/2002	570	#/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
			7/23/2002	8800	#/100ML
			10/16/2002	300	#/100ML
			10/16/2002	1800	#/100ML
			10/16/2002	11600	#/100ML
			10/16/2002	> 20000	#/100ML
			10/16/2002	7400	#/100ML
			10/16/2002	17600	#/100ML
			10/16/2002	14100	#/100ML
			10/16/2002	> 20000	#/100ML
	SURVEY	PIPE	8/26/1998	34	#/100ML
	WET	PIPE	7/27/2000	> 34840	#/100ML
			9/13/2000	13400	#/100ML
			6/12/2001	200	#/100ML
			9/19/2012	11400	#/100ML
			12/15/2015	540	MPN/100ML
			8/29/2006	2110	#/100ML
			10/12/2006	200	#/100ML
			6/25/2009	70	#/100ML
			6/29/2009	9300	#/100ML
			6/30/2009	1000	#/100ML
			6/23/2009		#/100ML
HHPS067	DRY	PIPE	8/23/2000	14	#/100ML
			9/11/2000	< 20	#/100ML
			6/8/2009		#/100ML
			9/18/2012		#/100ML
			9/19/2012		#/100ML
			12/17/2015		#/100ML
			12/20/2015		#/100ML
			7/26/2016		#/100ML
			5/9/2018		#/100ML
			10/2/2018		#/100ML
	HHTMDL	PIPE	7/23/2002	200	#/100ML
			7/23/2002	8600	#/100ML
			7/23/2002	> 20000	#/100ML
			7/23/2002	> 20000	#/100ML
			7/23/2002	9000	#/100ML
			10/16/2002	> 20000	#/100ML
			10/16/2002	17200	#/100ML
			10/16/2002	6500	#/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
			10/16/2002	13700	#/100ML
			10/16/2002	11300	#/100ML
			10/16/2002	16200	#/100ML
			7/23/2002		#/100ML
			7/23/2002		#/100ML
			10/16/2002		#/100ML
			10/16/2002		#/100ML
	WET	PIPE	7/27/2000	3280	#/100ML
			9/13/2000	> 8000	#/100ML
			6/12/2001	100	#/100ML
			8/29/2006		#/100ML
			6/23/2009		#/100ML
			6/29/2009		#/100ML
			6/25/2009		#/100ML
			12/15/2015		#/100ML
HHPS068	DRY	STORMWATER OUTFALL	8/23/2000	31	#/100ML
			9/11/2000	20	#/100ML
			6/8/2009	50	#/100ML
			7/26/2016	12800	#/100ML
			5/9/2018	410	CFU/100ML
			10/2/2018	1000	CFU/100ML
			12/20/2015		#/100ML
			9/18/2012		#/100ML
	HHTMDL	STORMWATER OUTFALL	7/23/2002	< 100	#/100ML
			7/23/2002	100	#/100ML
			7/23/2002	> 20000	#/100ML
			7/23/2002	> 20000	#/100ML
			7/23/2002	8700	#/100ML
			7/23/2002	200	#/100ML
			7/23/2002	300	#/100ML
			10/16/2002	**600**	#/100ML
			10/16/2002	**1100**	#/100ML
			10/16/2002	**1100**	#/100ML
			10/16/2002	**1300**	#/100ML
			10/16/2002	**7000**	#/100ML
			10/16/2002	**5600**	#/100ML
			10/16/2002	**5200**	#/100ML
			10/16/2002	**1300**	#/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
	SURVEY	STORMWATER OUTFALL	8/26/1998	**102**	#/100ML
	WET	STORMWATER OUTFALL	7/27/2000	**> 7200**	#/100ML
			9/13/2000	**15600**	#/100ML
			6/12/2001	**700**	#/100ML
			9/19/2012	**8500**	#/100ML
			8/29/2006	**1280**	#/100ML
			10/12/2006	**> 2000**	#/100ML
			6/25/2009	**570**	#/100ML
			6/29/2009	**1890**	#/100ML
			6/30/2009	**2100**	#/100ML
			12/15/2015		#/100ML
HHPS069	DRY	STORMWATER OUTFALL	8/23/2000	**17**	#/100ML
			9/11/2000	**< 20**	#/100ML
			9/18/2012	**4800**	#/100ML
			12/17/2015	**2**	MPN/100ML
			12/20/2015	**< 2**	MPN/100ML
			6/8/2009	**110**	#/100ML
			7/26/2016	**14500**	#/100ML
			5/9/2018	**340**	CFU/100ML
			10/2/2018	**600**	CFU/100ML
	HHTMDL	STORMWATER OUTFALL	7/23/2002	**< 100**	#/100ML
			7/23/2002	**< 100**	#/100ML
			7/23/2002	**> 20000**	#/100ML
			7/23/2002	**5100**	#/100ML
			7/23/2002	**1000**	#/100ML
			7/23/2002	**700**	#/100ML
			10/16/2002	**1300**	#/100ML
			10/16/2002	**1300**	#/100ML
			10/16/2002	**1000**	#/100ML
			10/16/2002	**9800**	#/100ML
			10/16/2002	**18800**	#/100ML
			10/16/2002	**18200**	#/100ML
			10/16/2002	**14800**	#/100ML
			10/16/2002	**13800**	#/100ML
			10/16/2002	**13100**	#/100ML
			10/16/2002	**9300**	#/100ML
			10/16/2002	**9700**	#/100ML
	SURVEY	STORMWATER OUTFALL	8/26/1998	**230**	#/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
	WET	STORMWATER OUTFALL	7/27/2000	**16640**	#/100ML
			9/13/2000	**20800**	#/100ML
			6/12/2001	**740**	#/100ML
			9/19/2012	**8500**	#/100ML
			12/15/2015	**110**	MPN/100ML
			8/29/2006	**1690**	#/100ML
			10/12/2006	**1450**	#/100ML
			6/23/2009	**610**	#/100ML
			6/25/2009	**50**	#/100ML
			6/29/2009	**7700**	#/100ML
			6/30/2009	**780**	#/100ML
HHPS070	DRY	STORMWATER OUTFALL	8/23/2000	**660**	#/100ML
			9/11/2000	**< 20**	#/100ML
			9/18/2012	**20**	#/100ML
			6/8/2009	**< 10**	#/100ML
			7/26/2016	**4600**	#/100ML
			5/9/2018	**< 10**	CFU/100ML
			10/2/2018	**2200**	CFU/100ML
			8/10/2009		#/100ML
	HHTMDL	STORMWATER OUTFALL	7/23/2002	**6600**	#/100ML
			7/23/2002	**100**	#/100ML
			7/23/2002	**< 100**	#/100ML
			7/23/2002	**1000**	#/100ML
			7/23/2002	**1700**	#/100ML
			10/16/2002	**100**	#/100ML
			10/16/2002	**4600**	#/100ML
			10/16/2002	**7000**	#/100ML
			10/16/2002	**7200**	#/100ML
			10/16/2002	**16700**	#/100ML
			10/16/2002	**17000**	#/100ML
			10/16/2002		#/100ML
	WET	STORMWATER OUTFALL	7/27/2000	12840	#/100ML
			9/13/2000	9600	#/100ML
			6/12/2001	7060	#/100ML
			9/19/2012	> 20000	#/100ML
			6/25/2009	230	#/100ML
HHPS071	DRY	PIPE	8/23/2000	20	#/100ML
			9/11/2000	< 20	#/100ML
			7/26/2016	3300	#/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
			5/9/2018	10	CFU/100ML
			10/2/2018	1200	CFU/100ML
			10/5/2005		#/100ML
			6/8/2009		#/100ML
			8/10/2009		#/100ML
			9/18/2012		#/100ML
	HHTMDL	PIPE	7/23/2002	800	#/100ML
			7/23/2002	1500	#/100ML
			7/23/2002	1500	#/100ML
			7/23/2002	800	#/100ML
			10/16/2002	40	#/100ML
			10/16/2002	3100	#/100ML
			10/16/2002	2200	#/100ML
			10/16/2002	2800	#/100ML
			10/16/2002	1700	#/100ML
			7/23/2002		#/100ML
	SURVEY	PIPE	9/2/1998	4	#/100ML
	WET	PIPE	7/27/2000	2260	#/100ML
			9/13/2000	10560	#/100ML
			6/12/2001	120	#/100ML
			9/19/2012	9500	#/100ML
			6/25/2009		#/100ML
HHPS072	DRY	STORMWATER OUTFALL	8/23/2000		
			9/11/2000		
			10/5/2005		#/100ML
			6/8/2009		#/100ML
	HHTMDL	STORMWATER OUTFALL	7/23/2002	500	#/100ML
			7/23/2002	14800	#/100ML
			7/23/2002	2500	#/100ML
			7/23/2002	500	#/100ML
			10/16/2002	400	#/100ML
			10/16/2002	4900	#/100ML
			10/16/2002	1300	#/100ML
			10/16/2002	5200	#/100ML
			7/23/2002		#/100ML
			10/16/2002		#/100ML
	WET	STORMWATER OUTFALL	7/27/2000	3200	#/100ML
			9/13/2000	5480	#/100ML
			6/12/2001	500	#/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
HHPS086	DRY	ROAD CULVERT	9/11/2000	36	#/100ML
			6/10/2009		#/100ML
			10/25/2018		#/100ML
	WET	ROAD CULVERT	6/12/2001	100	#/100ML
			9/13/2000	6400	#/100ML
			12/18/2012	470	#/100ML
			10/29/2018	> 20000	CFU/100ML
HHPS089	DRY	PERENNIAL STREAM	8/23/2000	< 9	#/100ML
			9/11/2000	191	#/100ML
			10/25/2018		#/100ML
	WET	PERENNIAL STREAM	6/12/2001	600	#/100ML
			9/13/2000	3100	#/100ML
			12/18/2012	520	#/100ML
			10/29/2018	160	CFU/100ML
			6/29/2009		#/100ML
HHPS092	DRY	STORMWATER OUTFALL	8/23/2000		
			9/11/2000		
			6/10/2009		#/100ML
			10/25/2018		#/100ML
	WET	STORMWATER OUTFALL	6/12/2001	550	#/100ML
			9/13/2000	< 10	#/100ML
			12/18/2012		#/100ML
			10/29/2018		#/100ML
HHPS094	DRY	INTERMITTENT STREAM	8/23/2000		
			9/11/2000		
			6/10/2009		#/100ML
			10/25/2018		#/100ML
	WET	INTERMITTENT STREAM	6/12/2001	4100	#/100ML
			9/13/2000	< 10	#/100ML
			10/29/2018	1800	CFU/100ML
			12/18/2012		#/100ML
HHPS095	DRY	TIDAL CREEK	8/23/2000	127	#/100ML
			9/11/2000	37	#/100ML
			9/11/2012	30	#/100ML
			9/12/2012	10	#/100ML
			7/25/2016	920	MPN/100ML
			5/16/2018	350	CFU/100ML
			9/17/2018	450	CFU/100ML
	SURVEY	TIDAL CREEK	4/29/1998	56	#/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
	WET	TIDAL CREEK	9/13/2000	300	#/100ML
			6/5/2018	490	CFU/100ML
HHPS106	DRY	INTERMITTENT STREAM	8/23/2000	73	#/100ML
			9/11/2000	140	#/100ML
			6/9/2009	3100	#/100ML
			10/10/2018	110	CFU/100ML
	WET	INTERMITTENT STREAM	6/12/2001	1100	#/100ML
			9/13/2000	610	#/100ML
			12/18/2012	350	#/100ML
			6/25/2009	50	#/100ML
			5/27/2009		#/100ML
HHPS107	DRY	INTERMITTENT STREAM	8/23/2000		
			9/11/2000		
	WET	INTERMITTENT STREAM	6/12/2001		
			9/13/2000		
			5/27/2009		#/100ML
HHPS108	DRY	STORMWATER OUTFALL	8/23/2000	670	#/100ML
			9/11/2000		
			10/10/2018		#/100ML
	WET	STORMWATER OUTFALL	6/12/2001	160	#/100ML
			9/13/2000	260	#/100ML
			12/18/2012	40	#/100ML
			5/27/2009		#/100ML
HHPS109	DRY	STORMWATER OUTFALL	8/23/2000	19	#/100ML
			9/11/2000		
			10/10/2018		#/100ML
	WET	STORMWATER OUTFALL	6/12/2001	100	#/100ML
			9/13/2000	2025	#/100ML
			12/18/2012	< 10	#/100ML
			5/27/2009		#/100ML
HHPS124	DRY	INTERMITTENT STREAM	8/23/2000	500	MPN/100ML
			9/11/2000		
			6/9/2009	500	#/100ML
			10/10/2018	40	CFU/100ML
	SURVEY	INTERMITTENT STREAM	6/3/1998	355	#/100ML
	WET	INTERMITTENT STREAM	6/12/2001	> 1600	#/100ML
			9/13/2000		
			12/18/2012	700	#/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
			6/23/2009	470	#/100ML
			5/27/2009		#/100ML
HHPS127	DRY	PIPE	8/23/2000	< 9	#/100ML
			9/11/2000	< 20	#/100ML
			10/10/2018		#/100ML
	WET	PIPE	6/12/2001	< 10	#/100ML
			9/13/2000	< 10	#/100ML
			5/27/2009		#/100ML
HHPS128	DRY	PIPE	8/23/2000	9	#/100ML
			9/11/2000	< 20	#/100ML
	WET	PIPE	6/12/2001	90	#/100ML
			9/13/2000	330	#/100ML
			5/27/2009		#/100ML
			7/2/2009		#/100ML
HHPS132	DRY	INTERMITTENT STREAM	8/23/2000	73	#/100ML
			9/11/2000	< 10	#/100ML
			6/9/2009	60	#/100ML
			10/10/2018	10	CFU/100ML
	SURVEY	INTERMITTENT STREAM	6/3/1998	90	#/100ML
	WET	INTERMITTENT STREAM	6/12/2001	1500	#/100ML
			9/13/2000	5750	#/100ML
			12/18/2012	380	#/100ML
			6/23/2009	1600	#/100ML
			5/27/2009		#/100ML
HHPS134	DRY	TIDAL RIVER	8/23/2000	9	#/100ML
			9/11/2000	6	#/100ML
			9/11/2012	20	#/100ML
			9/12/2012	40	#/100ML
			7/25/2016	46	MPN/100ML
			5/16/2018	10	CFU/100ML
			5/23/2018	10	CFU/100ML
			9/17/2018	20	CFU/100ML
	SFPOSTRF	TIDAL RIVER	11/18/2014	= 49	MPN/100ML
	WET	TIDAL RIVER	6/12/2001		
			9/13/2000	64	#/100ML
			9/27/2016	10	#/100ML
			6/5/2018	10	CFU/100ML
HHPS135	DRY	PIPE	8/23/2000	> 20000	#/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
			9/11/2000	> 8000	#/100ML
			10/5/2005	10	#/100ML
			6/20/2006		#/100ML
			10/15/2012		#/100ML
	WET	PIPE	6/12/2001	20	#/100ML
			9/13/2000	> 20000	#/100ML
			5/27/2009		#/100ML
HHPS136	DRY	LOBSTER TANK DISCHARGE	9/11/2000	< 20	#/100ML
			6/20/2006	40	#/100ML
	WET	LOBSTER TANK DISCHARGE	9/13/2000		
			5/27/2009		#/100ML
HHPS137	DRY	STORMWATER OUTFALL	8/23/2000		
			9/11/2000		
	WET	STORMWATER OUTFALL	6/12/2001		
			9/13/2000		
			5/27/2009		#/100ML
HHPS139	DRY	PIPE	8/23/2000		
			9/11/2000		
			10/5/2005		#/100ML
			6/20/2006		#/100ML
			6/19/2006		#/100ML
			9/17/2012		#/100ML
	WET	PIPE	6/12/2001		
			9/13/2000		
HHPS140	DRY	PIPE	8/23/2000		
			9/11/2000		
			10/5/2005		#/100ML
			6/20/2006		#/100ML
			6/19/2006		#/100ML
			9/17/2012		#/100ML
	WET	PIPE	6/12/2001		
			9/13/2000		
HHPS141	DRY	PIPE	8/23/2000		
			9/11/2000	18	#/100ML
			10/5/2005		#/100ML
			6/20/2006		#/100ML
			6/19/2006		#/100ML
	WET	PIPE	6/12/2001		
			9/13/2000	5	#/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
HHPS142	DRY	PIPE	9/17/2012	< 10	#/100ML
			8/23/2000	< 9	#/100ML
			9/11/2000	10	#/100ML
			10/5/2005		#/100ML
			6/20/2006		#/100ML
			6/19/2006		#/100ML
	WET	PIPE	6/12/2001	< 5	#/100ML
			9/13/2000	9	#/100ML
HHPS143	DRY	PIPE	8/23/2000	73	#/100ML
			9/11/2000	> 1600	MPN/100ML
			10/5/2005		#/100ML
			6/20/2006		#/100ML
			6/19/2006		#/100ML
	WET	PIPE	6/12/2001	800	#/100ML
			9/13/2000	945	#/100ML
HHPS144	DRY	PIPE	10/5/2005		#/100ML
			9/17/2012		#/100ML
HHPS157	DRY	OTHER	8/23/2000		
			9/11/2000		
			10/15/2012		#/100ML
	WET	OTHER	6/12/2001		
			9/13/2000		
			5/27/2009		#/100ML
HHPS158	DRY	PIPE	9/11/2000	< 10	#/100ML
			10/15/2012		#/100ML
	SURVEY	PIPE	7/22/1998	0	#/100ML
	WET	PIPE	6/12/2001		
			9/13/2000		
			5/27/2009		#/100ML
HHPS162	DRY	OLD INACTIVE PIPE	9/11/2000		
	WET	OLD INACTIVE PIPE	6/12/2001		
			9/13/2000		
			5/27/2009		#/100ML
HHPS204	DRY	NPDES FACILITY	9/28/2011	24000	MPN/100ML
			9/13/2012	3300	MPN/100ML
			3/14/2016	79000	MPN/100ML
			3/20/2017	130000	MPN/100ML
			7/24/2000	8000	MPN/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
			9/26/2000	80000	MPN/100ML
			11/20/2000	50000	MPN/100ML
			12/6/2000	3000	MPN/100ML
			2/22/2001	< 20	MPN/100ML
			12/3/2001	1700000	MPN/100ML
	SURVEY	NPDES FACILITY	6/18/2001	70000	MPN/100ML
	WET	NPDES FACILITY	8/17/2000	80000	MPN/100ML
			4/10/2001	2200	MPN/100ML
			6/18/2001	70000	MPN/100ML
			8/13/2001	13000	MPN/100ML
			10/16/2001	28000	MPN/100ML
HHPS206	DRY	SALTMARSH DITCH	10/26/2000	< 10	#/100ML
			9/12/2012	40	#/100ML
			6/20/2006	40	#/100ML
			10/5/2005	20	#/100ML
			5/23/2018	10	CFU/100ML
	WET	SALTMARSH DITCH	9/25/2001	10	#/100ML
			7/1/2009	40	#/100ML
			9/27/2016	< 10	#/100ML
HHPS207	DRY	SALTMARSH DITCH	10/26/2000	< 10	#/100ML
			9/12/2012	20	#/100ML
			6/20/2006	20	#/100ML
			10/5/2005	< 10	#/100ML
			5/23/2018	10	CFU/100ML
	WET	SALTMARSH DITCH	9/25/2001	20	#/100ML
			7/1/2009	9	#/100ML
			9/27/2016	< 10	#/100ML
HHPS208	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			9/12/2012	20	#/100ML
			6/20/2006	30	#/100ML
			10/5/2005	10	#/100ML
			5/23/2018	< 10	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	50	#/100ML
			7/1/2009	9	#/100ML
			9/27/2016	< 10	#/100ML
HHPS209	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			9/12/2012	60	#/100ML
			6/20/2006	30	#/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
			10/5/2005	10	#/100ML
			5/23/2018	< 10	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	30	#/100ML
			7/1/2009	9	#/100ML
			9/27/2016	< 10	#/100ML
HHPS210	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			9/12/2012	10	#/100ML
			6/20/2006	20	#/100ML
			10/5/2005	20	#/100ML
			5/23/2018	< 10	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	10	#/100ML
			7/1/2009	40	#/100ML
			9/27/2016	< 10	#/100ML
HHPS211	DRY	MARINA	10/26/2000	< 10	#/100ML
			10/15/2012	9	#/100ML
			9/2/2009	< 10	#/100ML
			9/16/2009	< 10	#/100ML
			6/9/2009		#/100ML
	WET	MARINA	9/25/2001	20	#/100ML
HHPS212	DRY	MARINA	10/26/2000	10	#/100ML
			9/19/2011	30	#/100ML
			12/17/2015	33	MPN/100ML
			12/20/2015	4.5	MPN/100ML
			12/28/2015	130	MPN/100ML
			9/2/2009	< 10	#/100ML
			9/16/2009	50	#/100ML
			7/19/2016	20	#/100ML
			6/9/2009		#/100ML
	SFPOSTWW	MARINA	1/6/2016	4.5	MPN/100ML
			1/6/2016	< 2	MPN/100ML
			1/7/2016	17	MPN/100ML
			1/19/2016	70	MPN/100ML
			1/25/2016	110	MPN/100ML
			1/27/2016	130	MPN/100ML
			2/1/2016	110	MPN/100ML
			2/2/2016	79	MPN/100ML
			2/10/2016	4.5	MPN/100ML
			2/11/2016	4.5	MPN/100ML
			2/16/2016	< 2	MPN/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
	WET	MARINA	9/25/2001	40	#/100ML
			1/11/2016	> 1600	MPN/100ML
			1/13/2016	540	MPN/100ML
			8/8/2017	130	#/100ML
HHPS213	DRY	MARINA	10/26/2000	< 10	#/100ML
			10/15/2012	9	#/100ML
			12/17/2015	49	MPN/100ML
			12/20/2015	46	MPN/100ML
			12/28/2015	540	MPN/100ML
			9/2/2009	< 10	#/100ML
			9/16/2009	< 10	#/100ML
			7/19/2016	20	#/100ML
			6/9/2009		#/100ML
	SFPOSTRF	MARINA	12/18/2008	33	MPN/100ML
			1/4/2017	79	MPN/100ML
			1/25/2017	11	MPN/100ML
			1/16/2018	110	MPN/100ML
			11/5/2018	79	MPN/100ML
			11/19/2018	110	MPN/100ML
			11/26/2018	70	MPN/100ML
			1/28/2019	2	MPN/100ML
			5/6/2019	< 2	MPN/100ML
			1/2/2013	= 23	MPN/100ML
			3/7/2007		MPN/100ML
			11/8/2006	= 49	MPN/100ML
			11/18/2014	= 49	MPN/100ML
			12/2/2010	2	MPN/100ML
	SFPOSTWW	MARINA	1/6/2016	11	MPN/100ML
			1/6/2016	33	MPN/100ML
			1/7/2016	33	MPN/100ML
			1/19/2016	540	MPN/100ML
			1/25/2016	27	MPN/100ML
			1/27/2016	79	MPN/100ML
			2/2/2016	< 2	MPN/100ML
			2/10/2016	11	MPN/100ML
			2/11/2016	4.5	MPN/100ML
			2/16/2016	< 2	MPN/100ML
			3/8/2019	6.8	MPN/100ML
	WET	MARINA	9/25/2001	10	#/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
			1/11/2016	350	MPN/100ML
			1/13/2016	170	MPN/100ML
HHPS214	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			9/12/2012	< 10	#/100ML
			6/20/2006	10	#/100ML
			10/5/2005	10	#/100ML
			5/23/2018	< 10	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	60	#/100ML
			7/1/2009	70	#/100ML
			9/27/2016	< 10	#/100ML
HHPS215	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			9/12/2012	< 10	#/100ML
			6/20/2006	40	#/100ML
			10/5/2005	< 10	#/100ML
			5/23/2018	< 10	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	10	#/100ML
			10/12/2006	150	#/100ML
			7/1/2009	10	#/100ML
			9/27/2016	< 10	#/100ML
HHPS216	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			9/12/2012	< 10	#/100ML
			6/19/2006	50	#/100ML
			6/20/2006	10	#/100ML
			10/5/2005	< 10	#/100ML
			5/23/2018	< 10	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	20	#/100ML
			10/12/2006	430	#/100ML
			7/1/2009	50	#/100ML
			9/27/2016	20	#/100ML
HHPS217	DRY	TIDAL CREEK	10/26/2000	10	#/100ML
			9/12/2012	20	#/100ML
			6/19/2006	10	#/100ML
			10/5/2005	10	#/100ML
			5/23/2018	< 10	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	30	#/100ML
			10/12/2006	470	#/100ML
			7/1/2009	50	#/100ML
			9/27/2016	10	#/100ML
HHPS218	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
			9/12/2012	20	#/100ML
			6/19/2006	< 10	#/100ML
			10/5/2005	10	#/100ML
			5/23/2018	< 10	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	30	#/100ML
			7/1/2009	20	#/100ML
			9/27/2016	20	#/100ML
HHPS219	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			5/23/2018	< 10	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	< 10	#/100ML
			7/1/2009	50	#/100ML
			9/27/2016	10	#/100ML
HHPS219A	DRY	TIDAL CREEK	9/12/2012	< 10	#/100ML
HHPS220	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			9/12/2012	10	#/100ML
			6/19/2006	10	#/100ML
			10/5/2005	< 10	#/100ML
			5/23/2018	< 10	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	10	#/100ML
			7/1/2009	9	#/100ML
			9/27/2016	< 10	#/100ML
HHPS221	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			9/12/2012	< 10	#/100ML
			6/19/2006	10	#/100ML
			5/23/2018	< 10	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	20	#/100ML
			10/12/2006	110	#/100ML
			7/1/2009	20	#/100ML
			9/27/2016	10	#/100ML
HHPS222	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			10/15/2012	50	#/100ML
			6/19/2006	< 10	#/100ML
			6/8/2009	< 10	#/100ML
			10/5/2005	10	#/100ML
	WET	TIDAL CREEK	9/25/2001	< 10	#/100ML
			6/25/2009	80	#/100ML
HHPS223	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			9/11/2012	< 10	#/100ML
			6/19/2006	20	#/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
			9/2/2009	9	#/100ML
			9/16/2009	< 10	#/100ML
			10/5/2005	10	#/100ML
			6/28/2016	< 10	#/100ML
			10/12/2016	< 10	#/100ML
			10/4/2018	60	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	30	#/100ML
			8/29/2006	50	#/100ML
			10/12/2006	280	#/100ML
			10/12/2006	930	#/100ML
			6/25/2009	290	#/100ML
			6/30/2009	20	#/100ML
HHPS224	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			9/11/2012	390	#/100ML
			6/19/2006	10	#/100ML
			6/28/2016	< 10	#/100ML
			10/12/2016	10	#/100ML
			10/4/2018	50	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	60	#/100ML
			6/30/2009	30	#/100ML
HHPS225	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			9/11/2012	850	#/100ML
			6/19/2006	5	#/100ML
			6/28/2016	30	#/100ML
			10/12/2016	40	#/100ML
			10/4/2018	90	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	40	#/100ML
			6/30/2009	20	#/100ML
HHPS226	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			9/11/2012	< 10	#/100ML
			6/19/2006	10	#/100ML
			9/2/2009	8	#/100ML
			9/16/2009	20	#/100ML
			6/28/2016	< 10	#/100ML
			10/12/2016	< 10	#/100ML
			10/4/2018	30	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	20	#/100ML
			10/12/2006	> 290	#/100ML
			6/30/2009	50	#/100ML

Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
HHPS227	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			9/11/2012	9	#/100ML
			6/28/2016	20	#/100ML
			10/12/2016	< 10	#/100ML
			5/30/2018	40	CFU/100ML
			10/4/2018	10	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	< 5	#/100ML
HHPS228	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			9/11/2012	< 10	#/100ML
			6/19/2006	< 10	#/100ML
			6/28/2016	< 10	#/100ML
			10/12/2016	< 10	#/100ML
			10/4/2018	30	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	< 10	#/100ML
			10/12/2006	110	#/100ML
			6/30/2009	8	#/100ML
HHPS229	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			9/11/2012	20	#/100ML
			6/19/2006	10	#/100ML
			6/28/2016	< 10	#/100ML
			10/12/2016	< 10	#/100ML
			10/4/2018	110	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	20	#/100ML
			10/12/2006	60	#/100ML
			6/30/2009	20	#/100ML
HHPS230	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			9/11/2012	30	#/100ML
			6/19/2006	< 10	#/100ML
			10/12/2016	< 10	#/100ML
			10/4/2018	10	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	< 10	#/100ML
			10/12/2006	20	#/100ML
			6/30/2009	20	#/100ML
HHPS231	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			9/11/2012	9	#/100ML
			6/19/2006	< 10	#/100ML
			10/12/2016	10	#/100ML
			10/4/2018	110	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	80	#/100ML

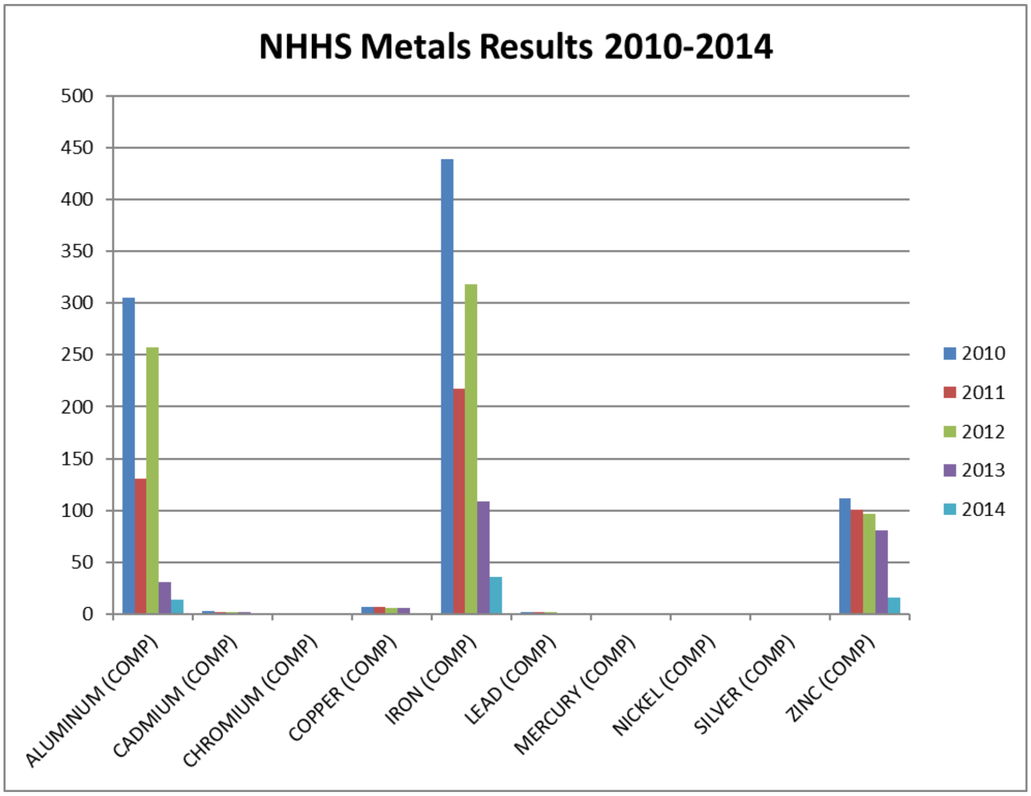
Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
			6/30/2009	40	#/100ML
HHPS232	DRY	SALTMARSH DITCH	10/26/2000	< 10	#/100ML
			9/11/2012	9	#/100ML
			6/19/2006	30	#/100ML
			10/5/2005	< 10	#/100ML
			10/12/2016	20	#/100ML
			10/4/2018	50	CFU/100ML
	WET	SALTMARSH DITCH	9/25/2001	220	#/100ML
			6/30/2009	20	#/100ML
HHPS233	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			9/11/2012	20	#/100ML
			6/19/2006	40	#/100ML
			10/5/2005	< 10	#/100ML
			10/12/2016	< 10	#/100ML
			10/4/2018	40	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	90	#/100ML
			6/30/2009	70	#/100ML
HHPS234	DRY	SALTMARSH DITCH	10/26/2000	< 10	#/100ML
			9/11/2012	40	#/100ML
			6/19/2006	10	#/100ML
			10/5/2005	10	#/100ML
			10/12/2016	< 10	#/100ML
			10/4/2018	150	CFU/100ML
	WET	SALTMARSH DITCH	9/25/2001	70	#/100ML
			6/30/2009	50	#/100ML
HHPS235	DRY	SALTMARSH DITCH	10/26/2000	< 10	#/100ML
			9/11/2012	20	#/100ML
			6/19/2006	< 10	#/100ML
			10/5/2005	< 10	#/100ML
			10/12/2016	< 10	#/100ML
			10/4/2018	130	CFU/100ML
	WET	SALTMARSH DITCH	9/25/2001	40	#/100ML
			6/30/2009	9	#/100ML
HHPS236	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			9/11/2012	30	#/100ML
			6/19/2006	20	#/100ML
			10/5/2005	30	#/100ML
			10/12/2016	< 10	#/100ML
			10/4/2018	90	CFU/100ML

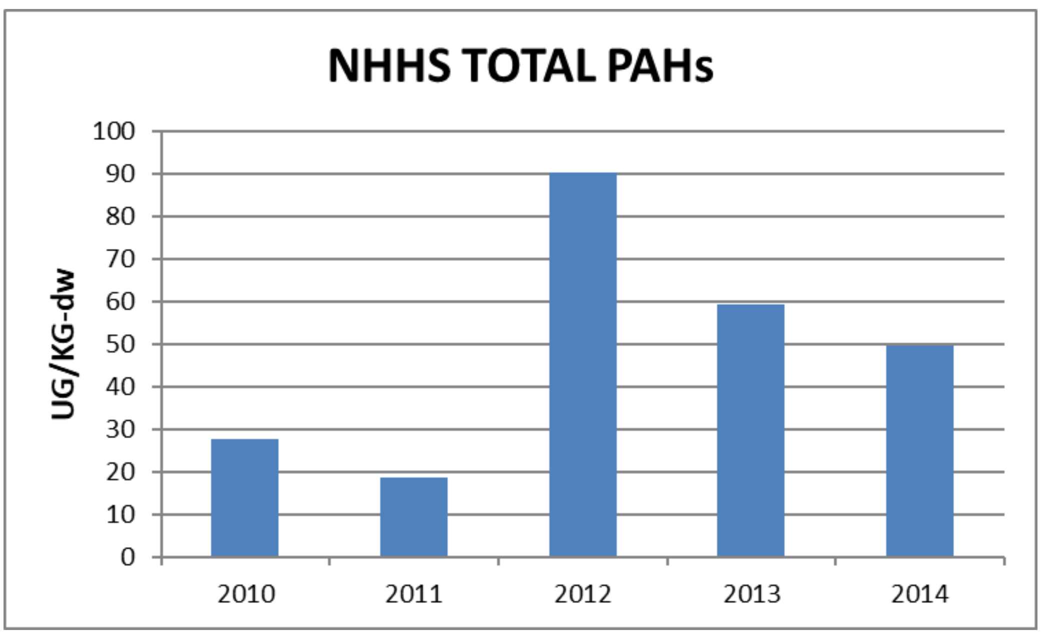
Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
	WET	TIDAL CREEK	9/25/2001	10	#/100ML
			6/30/2009	9	#/100ML
HHPS237	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			9/11/2012	< 10	#/100ML
			6/19/2006	20	#/100ML
			10/5/2005	20	#/100ML
			10/12/2016	< 10	#/100ML
			10/4/2018	100	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	80	#/100ML
			6/30/2009	90	#/100ML
HHPS238	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			9/11/2012	9	#/100ML
			6/19/2006	10	#/100ML
			10/5/2005	< 10	#/100ML
			10/12/2016	10	#/100ML
			10/4/2018	170	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	90	#/100ML
			6/30/2009	50	#/100ML
HHPS239	DRY	TIDAL CREEK	10/26/2000	10	#/100ML
			9/11/2012	< 10	#/100ML
			6/19/2006	10	#/100ML
			10/5/2005	< 10	#/100ML
			10/12/2016	< 10	#/100ML
			10/4/2018	40	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	40	#/100ML
			6/30/2009	80	#/100ML
HHPS240	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			9/11/2012	< 10	#/100ML
			6/19/2006	50	#/100ML
			10/5/2005	< 10	#/100ML
			6/28/2016	20	#/100ML
			10/12/2016	< 10	#/100ML
			10/4/2018	20	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	10	#/100ML
			10/12/2006	> 2000	#/100ML
			6/30/2009	690	#/100ML
HHPS241	DRY	TIDAL CREEK	10/26/2000	< 10	#/100ML
			9/11/2012	< 10	#/100ML
			6/19/2006	40	#/100ML

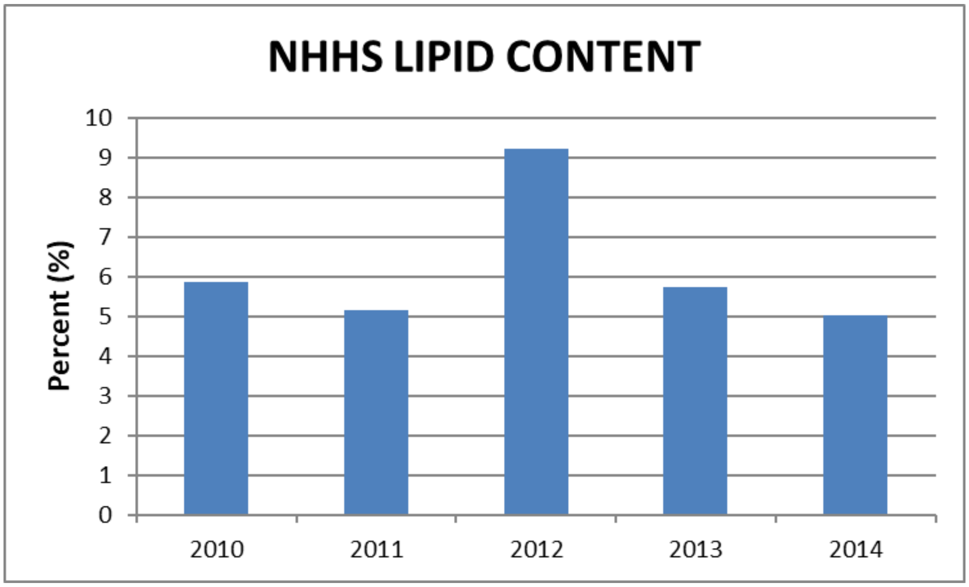
Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
			10/5/2005	10	#/100ML
			10/12/2016	20	#/100ML
			10/4/2018	30	CFU/100ML
	WET	TIDAL CREEK	9/25/2001	10	#/100ML
			6/30/2009	60	#/100ML
HHPS242	DRY	TIDAL CREEK	9/11/2012	< 10	#/100ML
			6/19/2006	40	#/100ML
			10/12/2016	< 10	#/100ML
			10/4/2018	30	CFU/100ML
	WET	TIDAL CREEK	6/30/2009	50	#/100ML
			9/25/2001	5	#/100ML
HHPS246	DRY	TIDAL CREEK	9/11/2012	20	#/100ML
			6/28/2016	< 10	#/100ML
			10/12/2016	< 10	#/100ML
			10/4/2018	70	CFU/100ML
	WET	TIDAL CREEK	6/30/2009	70	#/100ML
HHPS248	DRY	MARINA	9/19/2011	60	#/100ML
			9/18/2012	90	#/100ML
			12/17/2015	33	MPN/100ML
			12/20/2015	7.8	MPN/100ML
			12/28/2015	49	MPN/100ML
			6/8/2009	< 10	#/100ML
			9/2/2009	9	#/100ML
			9/16/2009	9	#/100ML
			7/19/2016	< 10	#/100ML
			7/26/2016	10	#/100ML
			10/2/2018	50	CFU/100ML
			6/16/2003	50	#/100ML
			7/7/2003	< 10	#/100ML
			8/18/2003	20	#/100ML
			8/11/2003	140	#/100ML
	SFPOSTRF	MARINA	1/4/2017	21	MPN/100ML
			1/25/2017	< 2	MPN/100ML
			11/18/2014	= 21	MPN/100ML
	SFPOSTWW	MARINA	1/6/2016	4.5	MPN/100ML
			1/6/2016	< 2	MPN/100ML
			1/7/2016	2	MPN/100ML
			1/19/2016	49	MPN/100ML
			1/25/2016	31	MPN/100ML

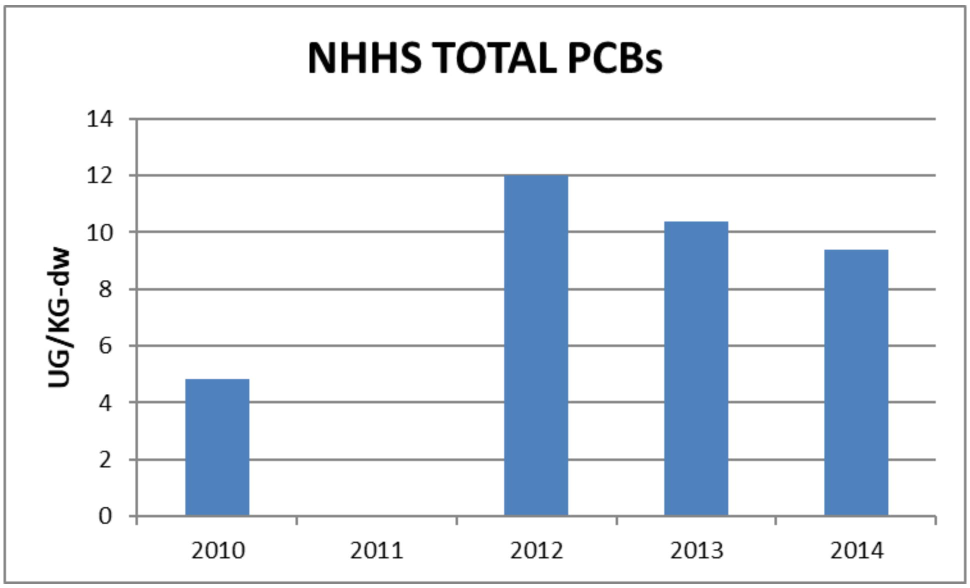
Station ID	Project Sampling Conditions	Pollution Source	Date	FC/100ml	FC Units
			1/27/2016	540	MPN/100ML
			2/1/2016	17	MPN/100ML
			2/2/2016	4	MPN/100ML
			2/10/2016	2	MPN/100ML
			2/11/2016	4.5	MPN/100ML
			2/16/2016	2	MPN/100ML
	SURVEY	MARINA	6/9/2003	10	#/100ML
			6/23/2003	10	#/100ML
	WET	MARINA	9/19/2012	3500	#/100ML
			1/11/2016	110	MPN/100ML
			1/13/2016	240	MPN/100ML
			8/8/2017	40	#/100ML
HHPS249	DRY	MARINA	9/19/2011	9	#/100ML
			9/18/2012	10	#/100ML
			6/8/2009	10	#/100ML
			9/2/2009	< 10	#/100ML
			9/16/2009	20	#/100ML
			7/26/2016	40	#/100ML
			10/2/2018	10	CFU/100ML
			6/16/2003	90	#/100ML
			7/7/2003	< 10	#/100ML
			8/11/2003	120	MPN/100ML
			8/18/2003	40	#/100ML
	SURVEY	MARINA	6/9/2003	20	#/100ML
			6/23/2003	10	#/100ML
	WET	MARINA	9/19/2012	1730	#/100ML
			8/8/2017	150	#/100ML
HHPS250	DRY	OTHER	6/9/2009		#/100ML

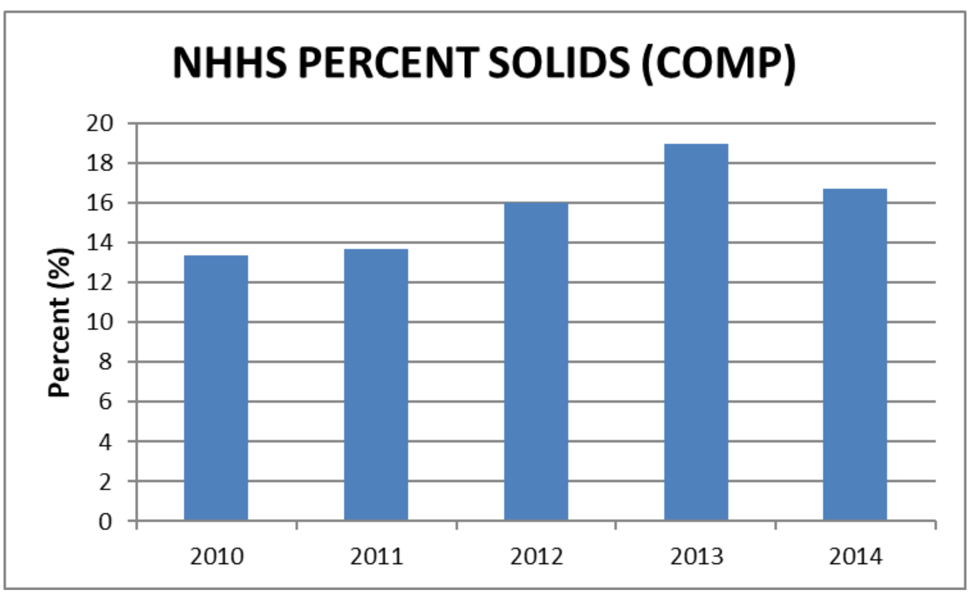
Appendix III: Summary of Gulfwatch Mussel Tissue Toxin Concentration Data, Hampton/Seabrook Station (NHHS), 2010-2014



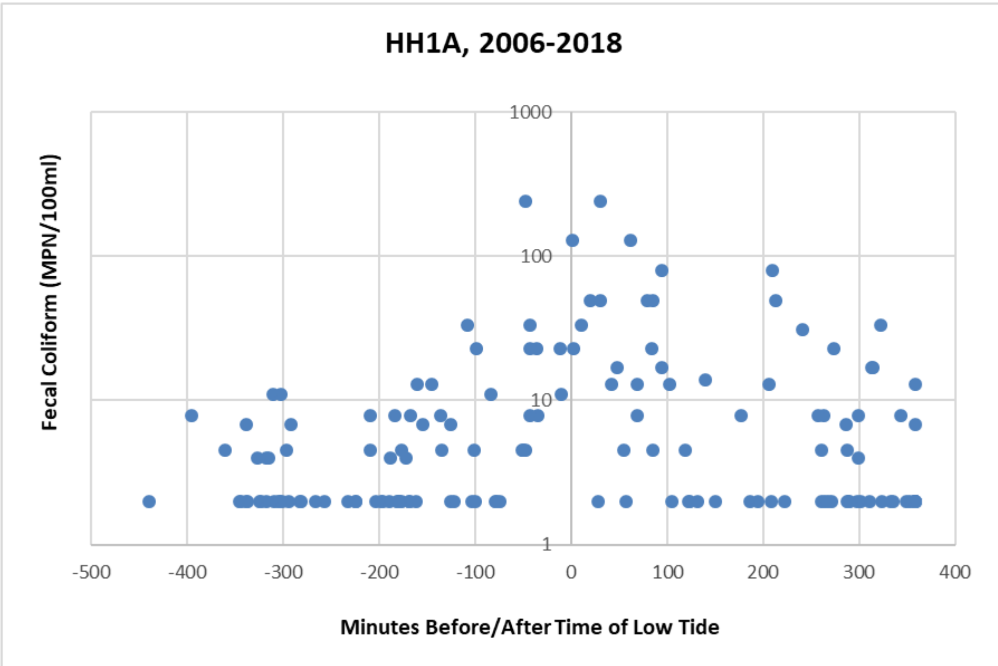


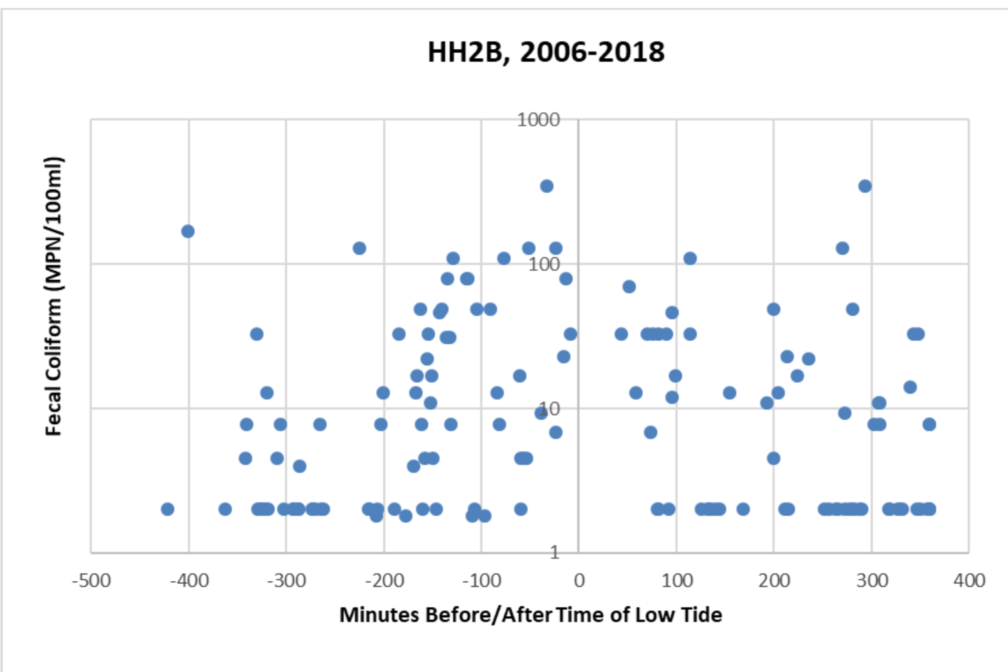

NHHS LIPID CONTENT
Percent (%)
10
9
8
7
6
5
4
3
2
1
0
2010
2011
2012
2013
2014

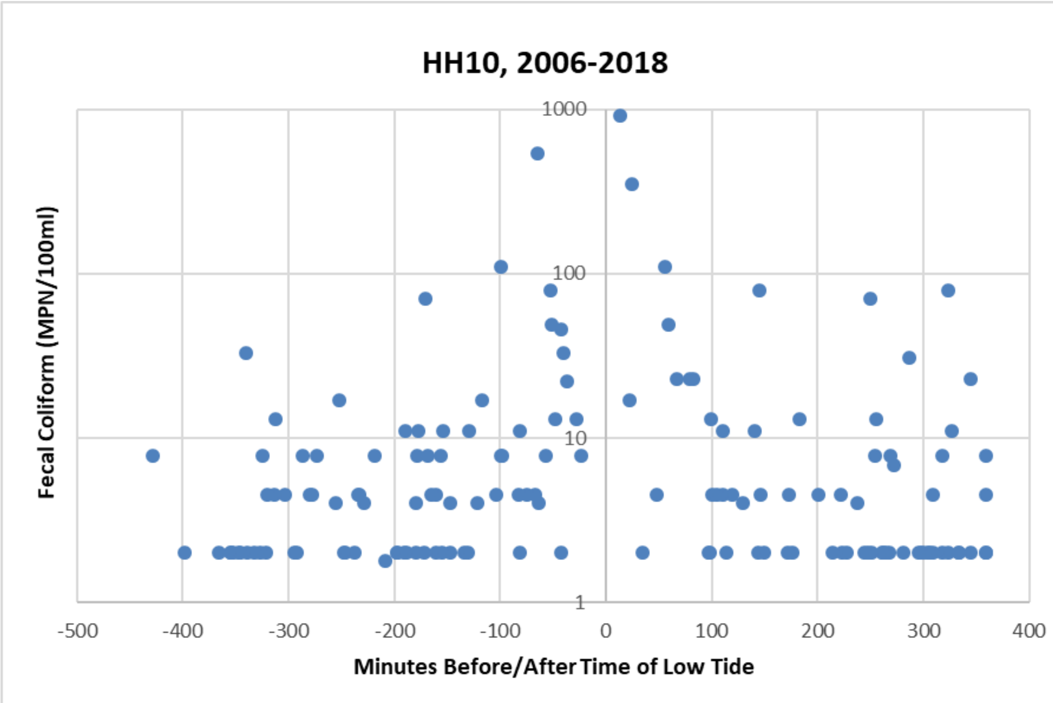

NHHS TOTAL PCBs
UG/KG-dw
14
12
10
8
6
4
2
0
2010
2011
2012
2013
2014


NHHS PERCENT SOLIDS (COMP)
Percent (%)
20
18
16
14
12
10
8
6
4
2
0
2010
2011
2012
2013
2014

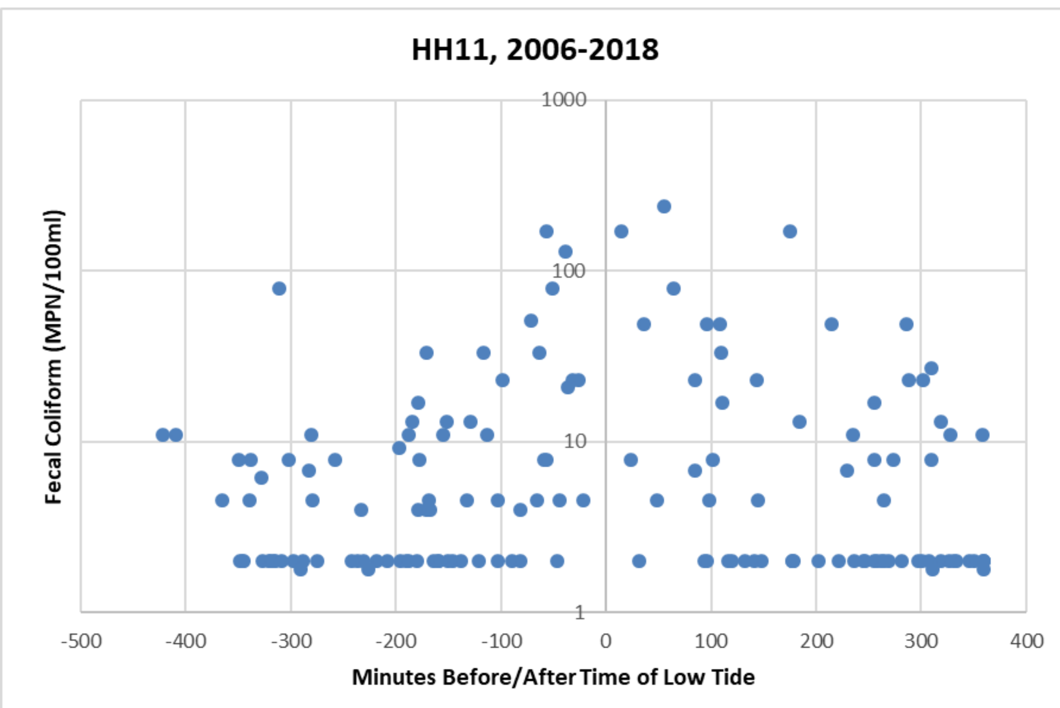
Appendix IV: Relationship of Fecal Coliform to Tide Stage, 2006-2018, All Hampton/Seabrook Harbor Sites



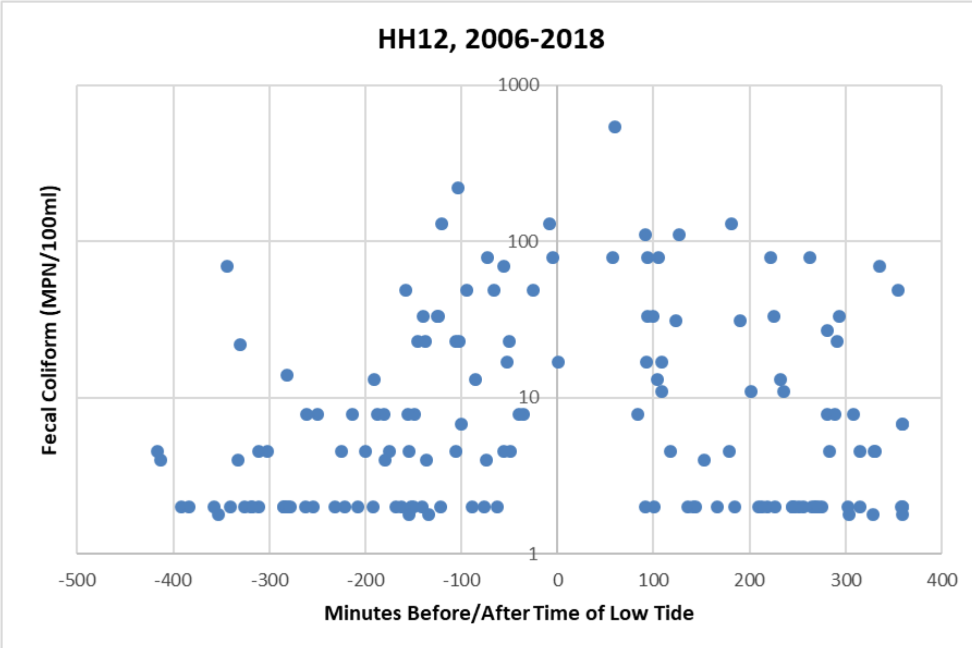


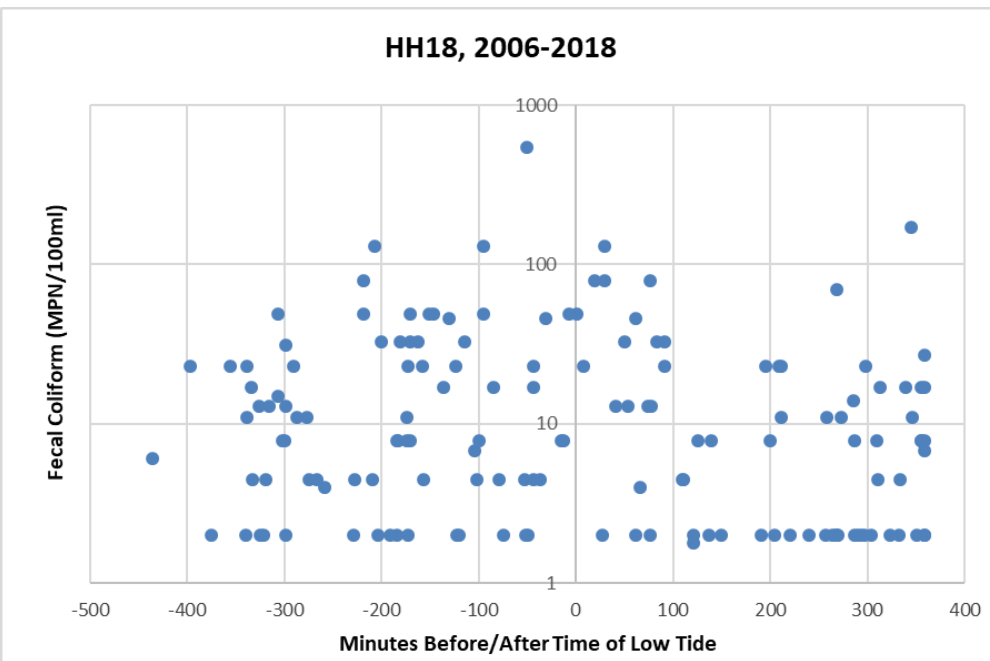


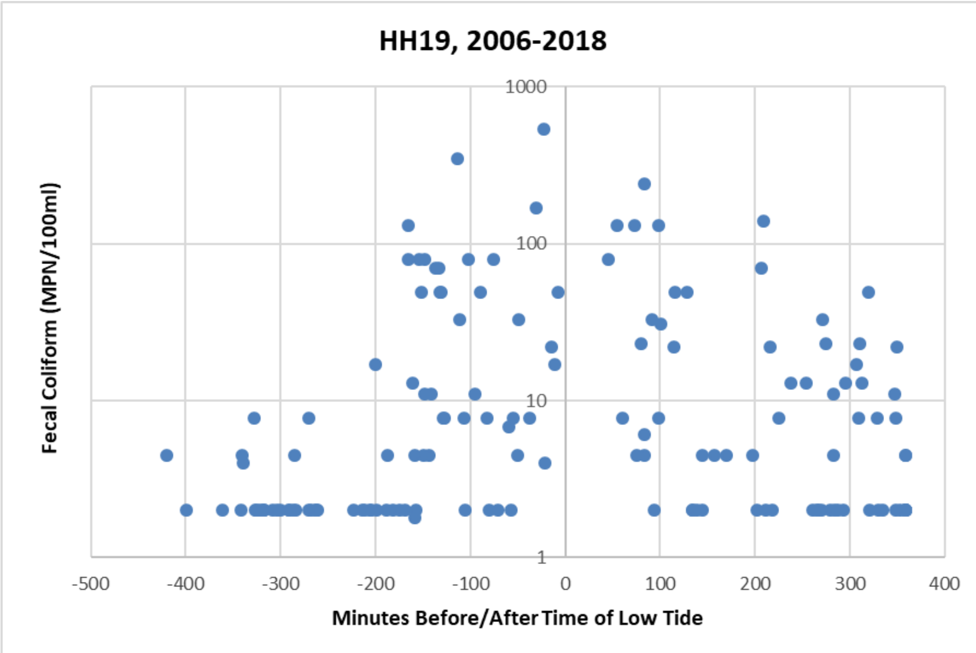
HH10, 2006-2018
Fecal Coliform (MPN/100ml)
1000
100
10
1
-500
-400
-300
-200
-100
0
100
200
300
400
Minutes Before/After Time of Low Tide

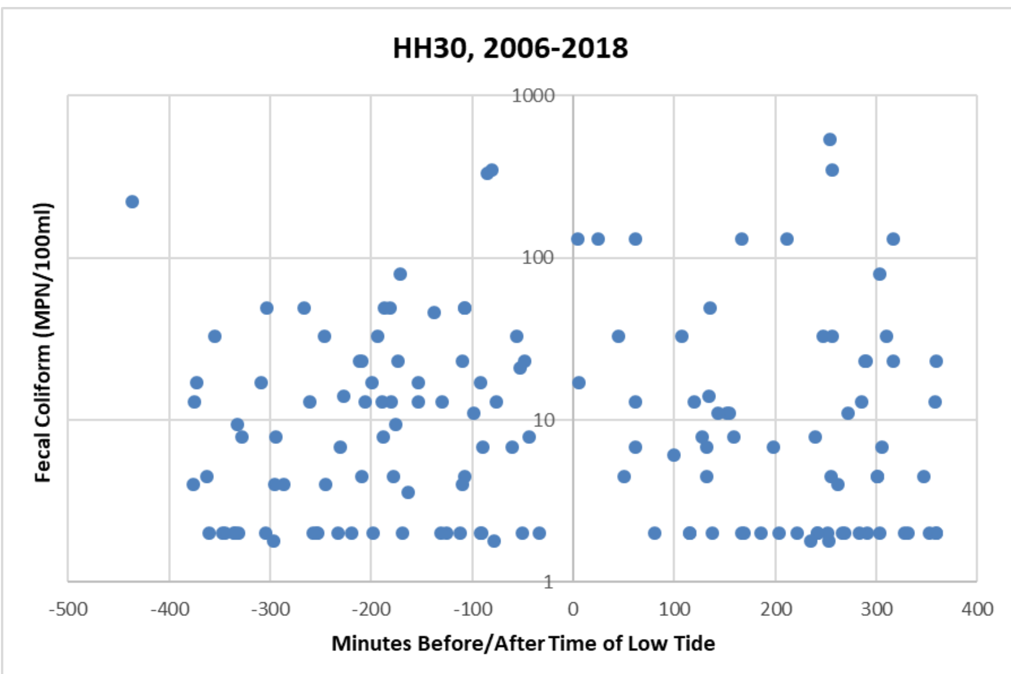


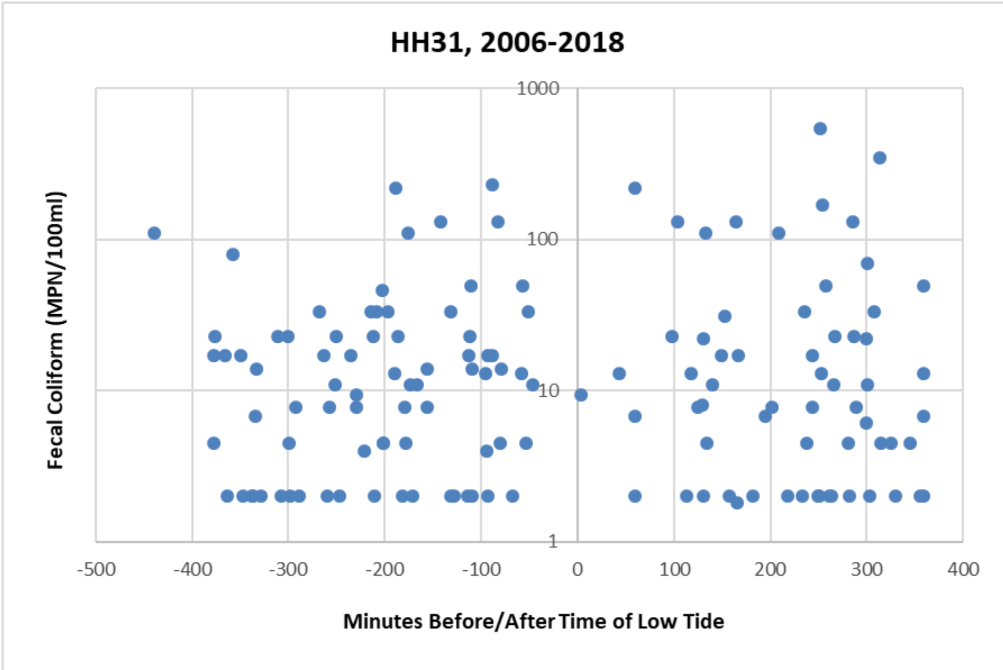
HH11, 2006-2018
Fecal Coliform (MPN/100ml)
1000
100
10
1
-500
-400
-300
-200
-100
0
100
200
300
400
Minutes Before/After Time of Low Tide

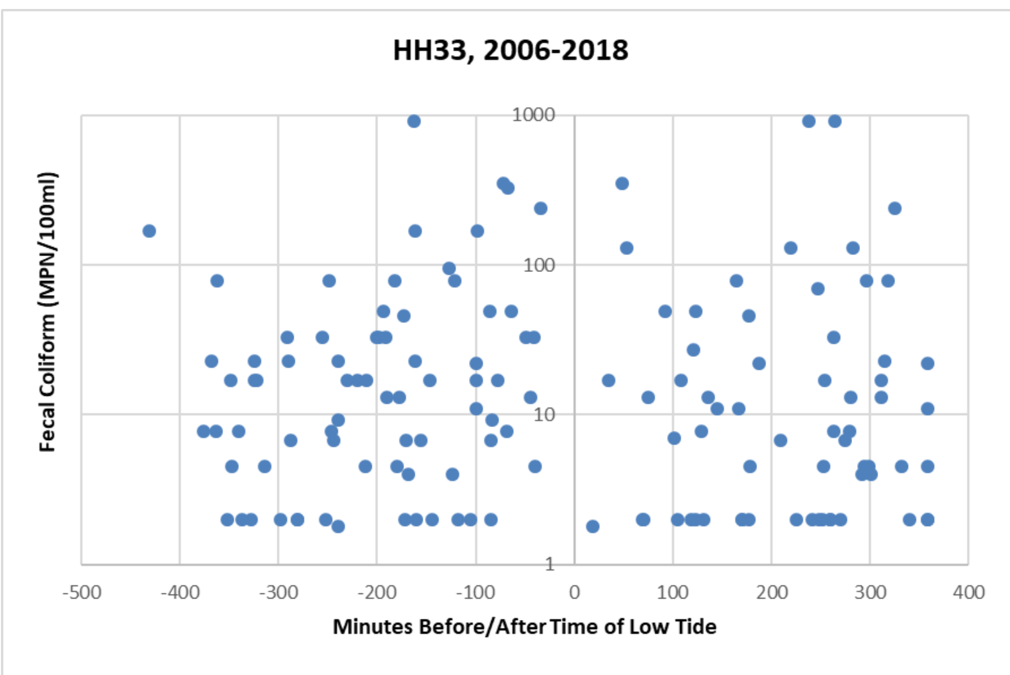

HH12, 2006-2018
Fecal Coliform (MPN/100ml)
1000
100
10
1
-500
-400
-300
-200
-100
0
100
200
300
400
Minutes Before/After Time of Low Tide

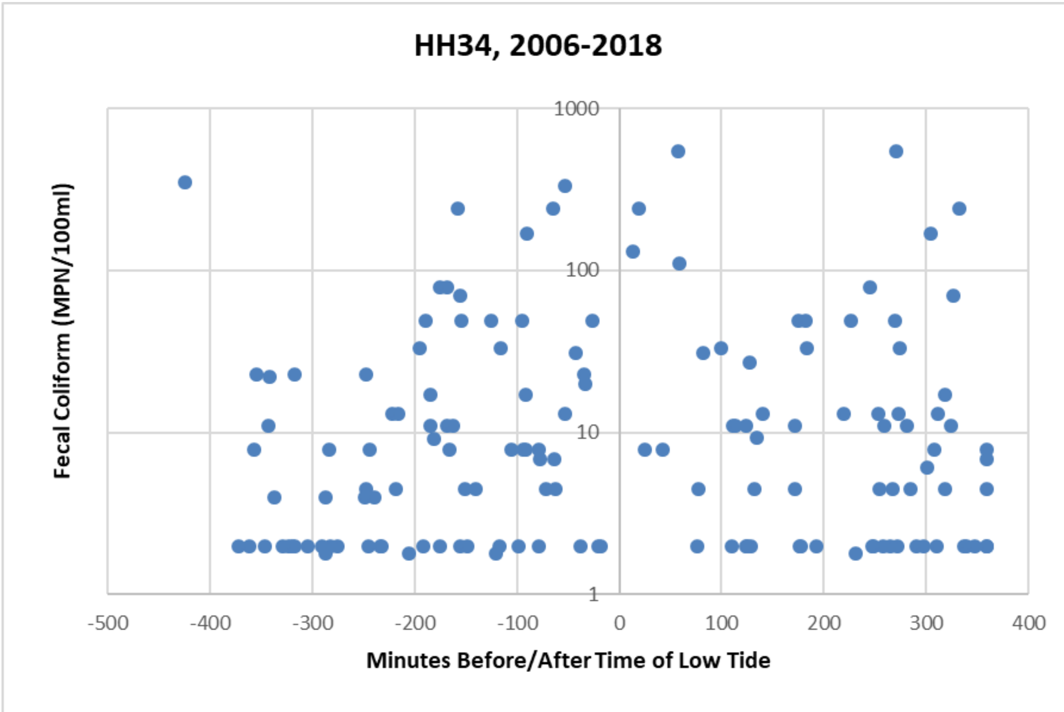

HH18, 2006-2018
Fecal Coliform (MPN/100ml)
1000
100
10
1
-500
-400
-300
-200
-100
0
100
200
300
400
Minutes Before/After Time of Low Tide

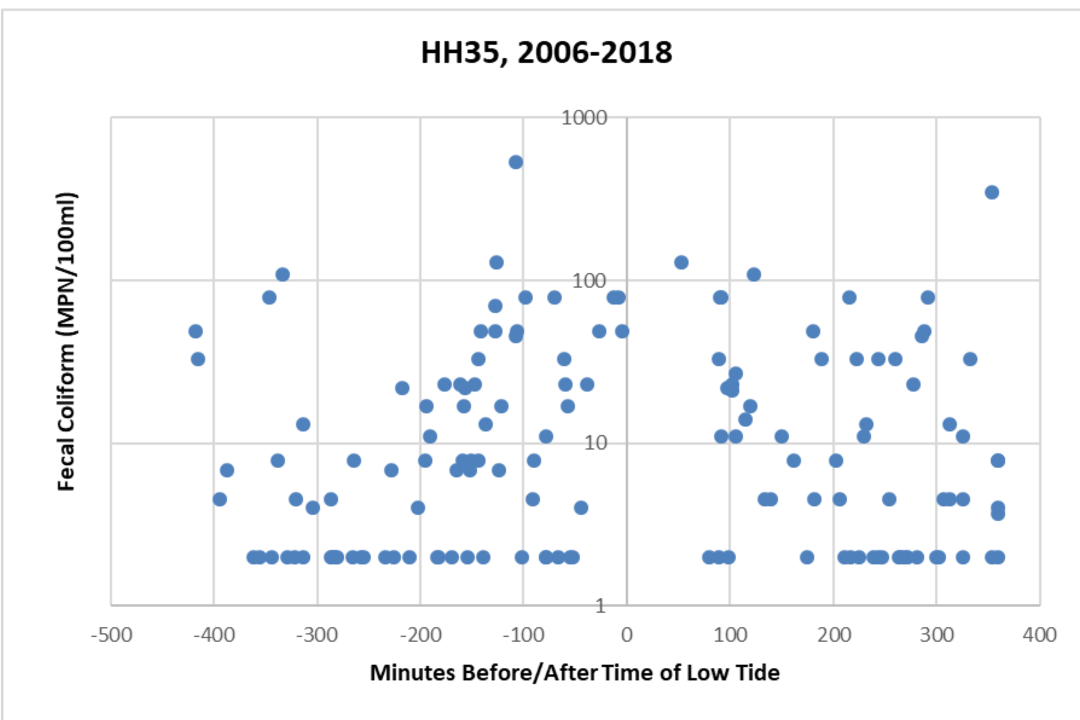

HH19, 2006-2018
Fecal Coliform (MPN/100ml)
1000
100
10
1
-500
-400
-300
-200
-100
0
100
200
300
400
Minutes Before/After Time of Low Tide

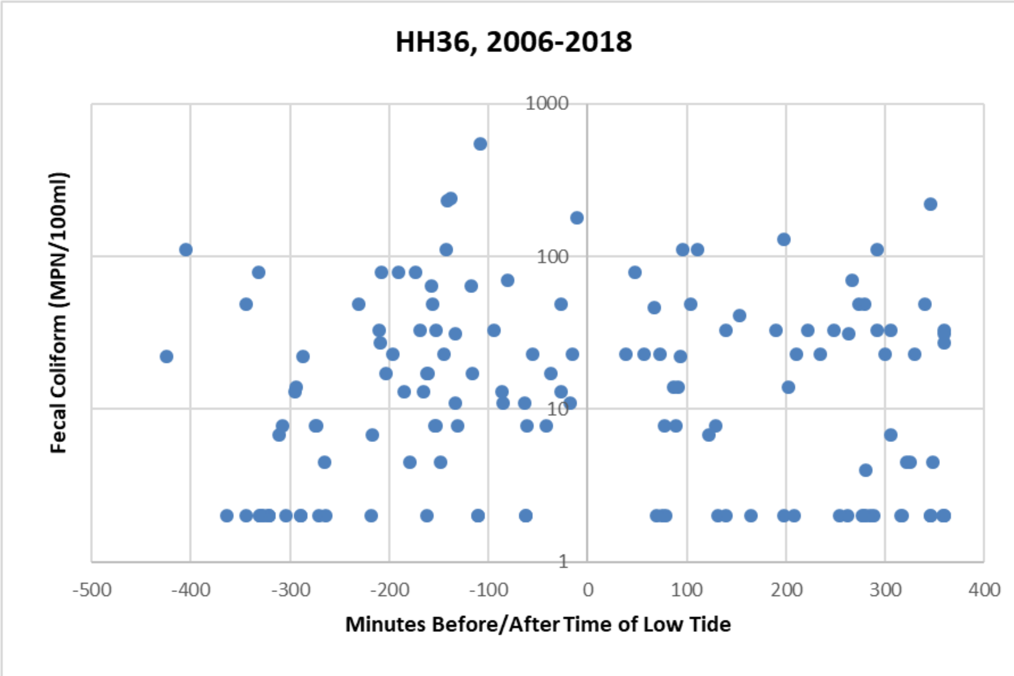

HH30, 2006-2018
Fecal Coliform (MPN/100ml)
1000
100
10
1
-500
-400
-300
-200
-100
0
100
200
300
400
Minutes Before/After Time of Low Tide

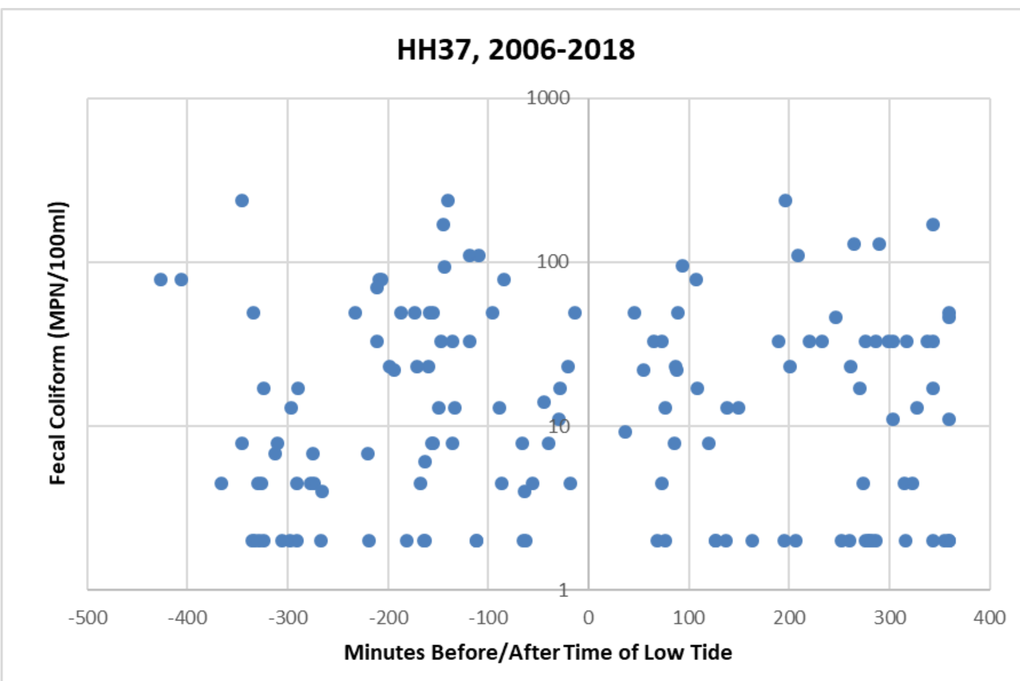

HH31, 2006-2018
Fecal Coliform (MPN/100ml)
1000
100
10
1
-500
-400
-300
-200
-100
0
100
200
300
400
Minutes Before/After Time of Low Tide

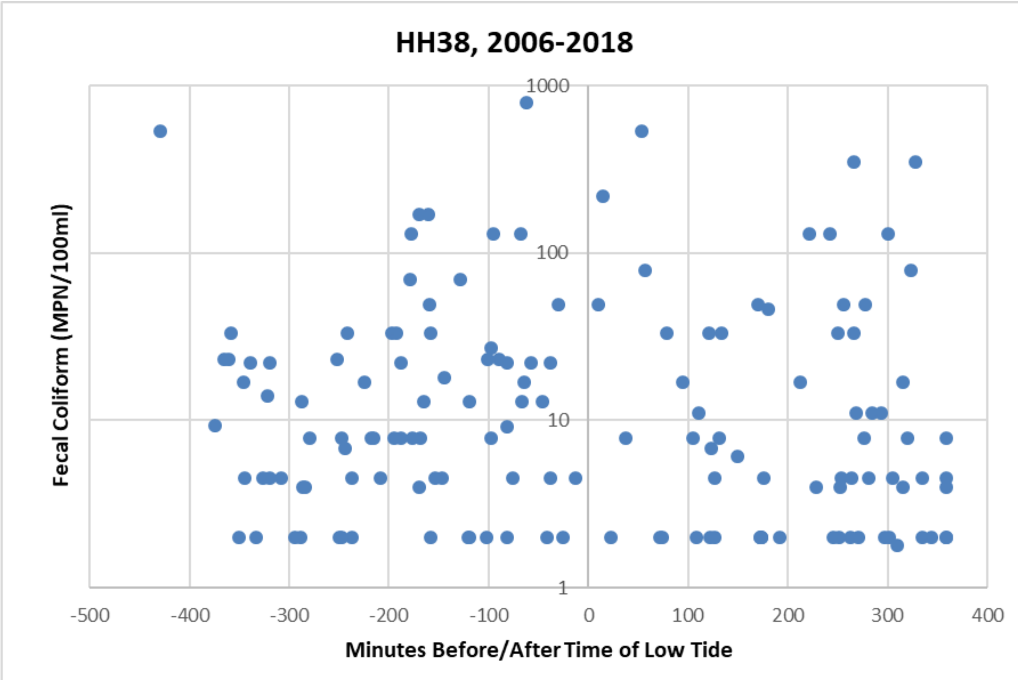

HH33, 2006-2018
Fecal Coliform (MPN/100ml)
1000
100
10
1
-500
-400
-300
-200
-100
0
100
200
300
400
Minutes Before/After Time of Low Tide

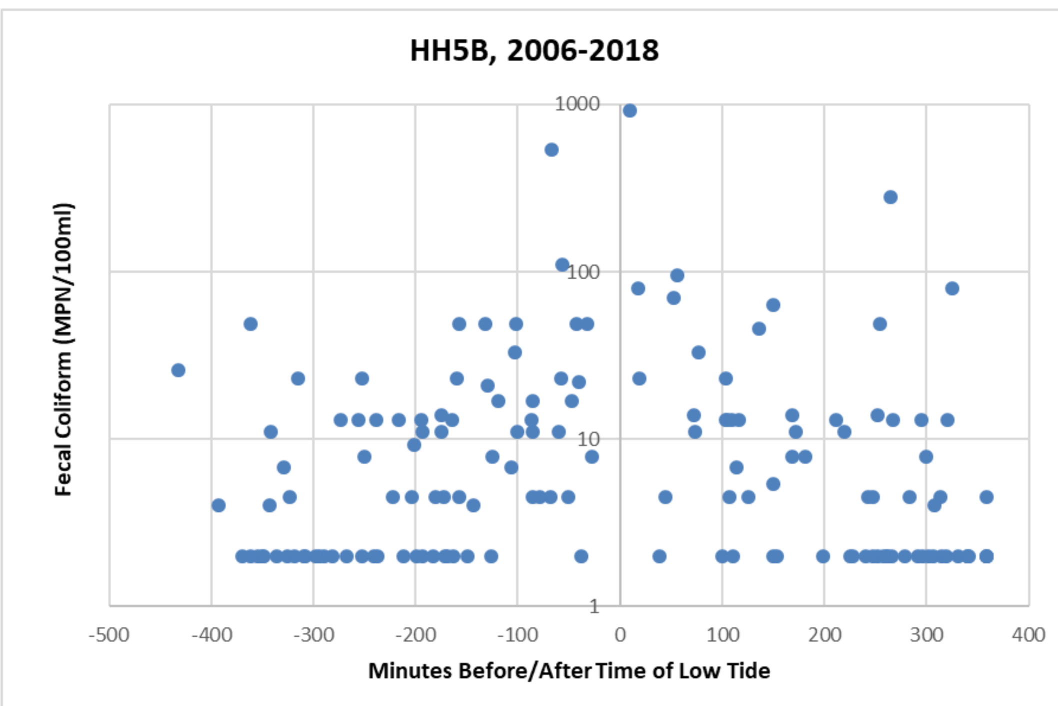

HH34, 2006-2018
Fecal Coliform (MPN/100ml)
1000
100
10
1
-500
-400
-300
-200
-100
0
100
200
300
400
Minutes Before/After Time of Low Tide

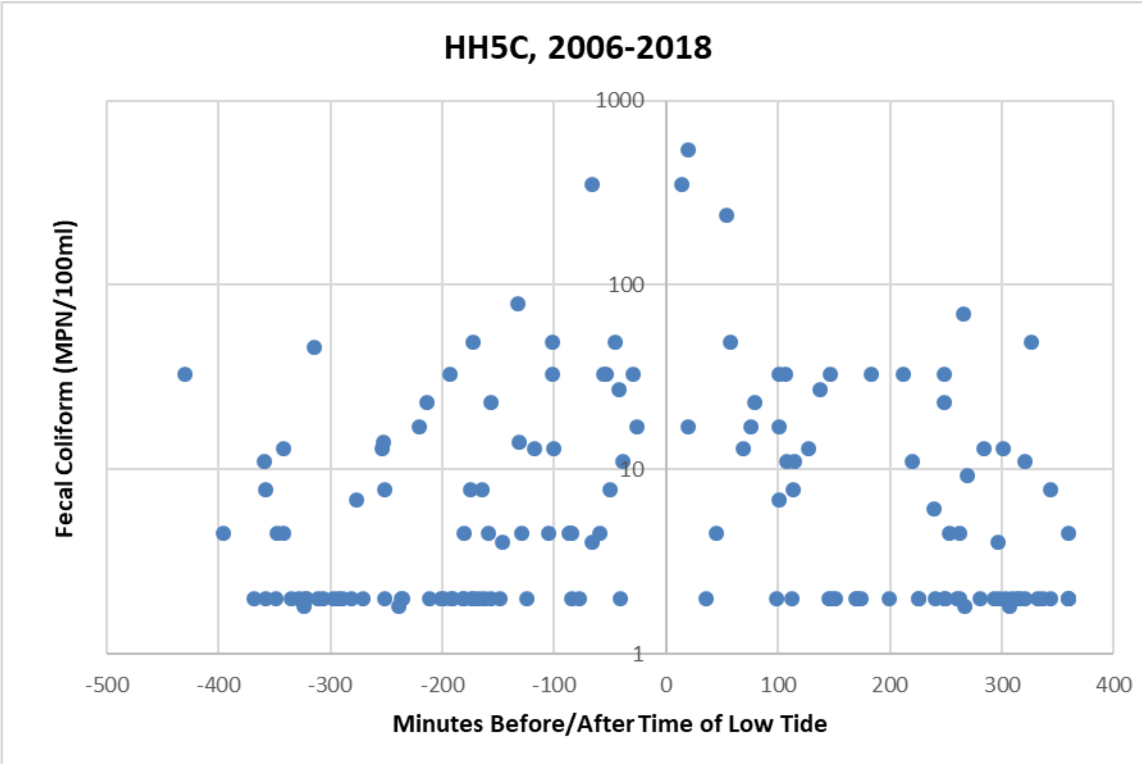

HH35, 2006-2018
Fecal Coliform (MPN/100ml)
1000
100
10
1
-500
-400
-300
-200
-100
0
100
200
300
400
Minutes Before/After Time of Low Tide


HH36, 2006-2018
Fecal Coliform (MPN/100ml)
1000
100
10
1
-500
-400
-300
-200
-100
0
100
200
300
400
Minutes Before/After Time of Low Tide


HH37, 2006-2018
Fecal Coliform (MPN/100ml)
1000
100
10
1
-500
-400
-300
-200
-100
0
100
200
300
400
Minutes Before/After Time of Low Tide


HH38, 2006-2018
1000
100
10
1
-500
-400
-300
-200
-100
0
100
200
300
400
Fecal Coliform (MPN/100ml)
Minutes Before/After Time of Low Tide


HH5B, 2006-2018
1000
100
10
1
-500
-400
-300
-200
-100
0
100
200
300
400
Fecal Coliform (MPN/100ml)
Minutes Before/After Time of Low Tide



HH5C, 2006-2018
Fecal Coliform (MPN/100ml)
1000
100
10
1
-500
-400
-300
-200
-100
0
100
200
300
400
Minutes Before/After Time of Low Tide

Appendix V: Hampton/Seabrook Harbor Ambient Monitoring Stations Bacterial Data 2006-2018 (Sorted by Rainfall Amount)

5 Day Rain	Date	HH10	HH11	HH12	HH18	HH19	HH1A	HH2B	HH30	HH31	HH33	HH34	HH35	HH36	HH37	HH38	HH5B	HH5C
0.01	5/25/2010			2	2	2	2	2	4.5									2
0.01	11/16/2010			2	7.8	31	11	7.8	7.8									17
0.01	3/19/2014	2	2	4	2	4.5	6.8	2	2	2	2	2	2	4.5	13	2	2	2
0.02	12/6/2011	7.8	2	6.8	27	2	2	7.8	13	6.8	4.5	6.8	3.7	27	49	7.8	4.5	4.5
0.02	12/14/2011	2	2	4.5	2	2	4	4.5	2	2	2	2	4	6.8	6.8	4.5	6.8	2
0.03	12/18/2006	7.8	2	2	7.8	4.5	2	2	2	11	9.3	7.8	2	2	4.5	33	2	2
0.03	3/10/2009	4	7.8	7.8	11	7.8	6.8	2	2	7.8	17	4.5	7.8	7.8	4.5	7.8	7.8	14
0.03	11/4/2015	7.8	13	4	6.8	2	1.8	11	2	1.8	7.8	4	6.8	2	2	7.8	13	14
0.04	12/11/2006	2	2	17	4	4.5	4.5	2	6.8	8	27	11	11	2	2	6.8	13	17
0.05	5/7/2014	2	2	2	2	2	2	4.5	7.8	2	2	2	4.5	2	2	2	14	2
0.06	11/4/2009	4	13	7.8	33	130	13	17	23	33	17	13	11	23	23	17	13	23
0.06	*12/4/2012	33	130	130	49	540	130	130	2	4.5	4.5	23	79	49	11	4.5	49	27
0.06	5/15/2018	2	2	7.8	7.8	2	2	4	17	4.5	33	17	7.8	79	49	22	11	2
0.07	12/7/2006	7.8	7.8	17	22	23	11	17	49	33	79	46	33	23	79	23	14	13
0.08	12/1/2014	4.5	4	17	4.5	6.8	2	17	6.8	17	9.2	6.8	2	11	7.8	9.2	17	4.5
0.08	11/9/2017	79	79	23	23	33	23	79	13	14	49	13	49	17	33	22	23	33
0.08	12/5/2017	2	2	2	7.8	2	2	4.5	7.8	13	4.5	2	6.8	17	6.1	7.8	2	2
0.1	3/3/2008	2	2	2	2	2	2	2	2	4.5	2	4.5	2	2	2	2	2	2
0.1	3/9/2010			4.5	2	2	2	2										2
0.1	11/14/2013	4.5	1.8	6.8	17	2	2	2	2	13	2	2	7.8	33	11	4	2	2
0.1	11/9/2016			33	6.8	13	2	33	2									4.5
0.11	3/21/2017	2	4.5	2	2	4.5	4.5	2	2	2	2	2	2	2	2	2	2	4.5

5 Day Rain	Date	HH10	HH11	HH12	HH18	HH19	HH1A	HH2B	HH30	HH31	HH33	HH34	HH35	HH36	HH37	HH38	HH5B	HH5C
0.12	5/7/2007	2	2	2	4.5	49	2	2	2	1.8	4.5	11	4.5	6.8	7.8	4.5	5.4	2
0.12	5/6/2010	2	2	2	2	2	2	2	1.8	2	2	4.5	2	2	2	4.5	2	2
0.12	4/29/2015			2	7.8	2	2	4.5	2									2
0.14	5/14/2015	2	2	2	4.5	2	2	2					2	2	2		2	2
0.14	4/20/2017	2	2	2	7.8	2	2	2	2	2	2	2	2	4	2	4.5	2	2
0.16	11/7/2016	23	6.8	31	33	22	17	110	6.8	2	2	4.5	17	49	17	2	11	17
0.17	3/13/2007	2	2	2	2	2	2	2	2	7.8	4.5	2	2	2	2	4	2	2
0.17	12/4/2013	4.5	2	33	17	11	4.5	4.5	9.3	4.5	4	11	33	7.8	7.8	13	2	2
0.19	3/22/2016	2	2	2	1.8	4.5	2	2	2	2	2	2	2	2	2	2	2	2
0.21	11/7/2006				79	2	1.8	13		23			46	17				13
0.22	11/23/2009			6.8	70	33	13	350	4.5									11
0.23	11/13/2007	2	4	4.5	79	2	2	1.8	4.5	7.8	2	11	4	33	33	4	14	2
0.24	5/25/2017	7.8	7.8	23	49	49	4.5	33	33	33	79	79	23	49	49	130	4.5	4.5
0.26	12/29/2008	2	9.2	4.5	33	2	2	33	13	33	33	33	23	13	49	33	9.3	2
0.26	11/2/2010	7.8	13	4.5	6.8	2	2	2	2	11	13	4.5	11	4.5	33	4	2	2
0.26	5/23/2017			2	2	4.5	2	2	33									7.8
0.3	5/13/2009	4.5	4.5	7.8	2	2	4.5	4.5	17	17	17	4.5	23	2	4	4.5	4.5	2
0.3	11/21/2011	31	23	33	4.5	7.8	17	11	23	23	6.8	11	79	33	33	7.8	4.5	13
0.31	1/22/2018	7.8	7.8	2	2	11	4.5	1.8	21	49		6.8	4.5			13	11	4.5
0.33	4/10/2013	2	2	1.8	2	13	7.8	49	2	4.5	13	11	22	13	4.5	7.8	2	2
0.33	1/22/2015	11	17	7.8	2	2			13	7.8	2	2	2			4.5	4.5	7.8
0.34	4/28/2009			23	2	12	12	7.8	31									13
0.36	12/1/2015	920	170	79	79	79	49	33	130			130	130	23	9.2	49	920	350
0.38	11/13/2012	13	79	2	49	2	2	2	17	23	17	23	4.5	13	13	22	23	46
0.39	4/11/2018	2	2	2	2	2	2	2	2	2	2	1.8	2	2	2	4	2	2
0.41	4/15/2009			4.5	2	2	2	2	2									2

5 Day Rain	Date	HH10	HH11	HH12	HH18	HH19	HH1A	HH2B	HH30	HH31	HH33	HH34	HH35	HH36	HH37	HH38	HH5B	HH5C
0.45	5/3/2016	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
0.5	11/8/2006	7.8	4.5	7.8	7.8	22	2		4.5	26	7.8	4.5					4.5	4.5
0.52	5/8/2012	7.8	23	23	4.5	2	7.8	7.8	23	17	11	7.8	17	13	13	7.8	11	13
0.53	11/12/2014	17	7.8	70	130	170	240	350	17	9.3	1.8	7.8	33	17	7.8	2	23	17
0.57	1/17/2017	2	2	4	4.5	4.5	7.8	4.5	2	4	6.8	2	2	7.8	2	2	4.5	2
0.59	5/9/2018			2	2	2	2	2	2									2
0.62	5/17/2012			2	9.3	2	2	4.5	46									2
0.63	12/1/2011			49	11	49	110	130	46									110
0.64	11/27/2007			2	4.5	2	2	4.5	6.8									2
0.68	5/2/2012	2	2	2	2	2	2	2	2	7.8	4.5	7.8	2	4.5	4.5	2	2	2
0.7	4/9/2008	13	2	6.8	2	7.8	2	1.8	6.8	2	33	31	2	2	2	13	4.5	7.8
0.73	5/7/2008	4.5	4.5	4.5	7.8	7.8	11	9.3	11	13	49	17	23	7.8	14	23	13	4.5
0.73	3/14/2011			33	7.8	13	11	4.5	2									2
0.75	11/12/2008	4.5	2	2	23	2	2	2	7.8	7.8	2	4	4.5	2	4.5	4	2	2
0.76	11/19/2008	7.8	4.5	7.8	4.5	2	4.5	6.8	7.8	1.8	4.5	6.8	4.5	2	2	1	1.8	6.8
0.78	4/24/2006	2	2	1.8	2	49	2	2	2	2	11	4.5	2	2	4.5	2	2	2
0.82	5/24/2006	2	2	1.8	2	2	4	2	2	14	23	2	2	2	4.5	14	2	1.8
0.85	12/4/2006				2	2	2			17			2	2				2
0.86	1/3/2007	2	2	2	2	2	2	2	4	2	2	2	2	2	2	2	2	1.8
0.86	5/1/2018	2	4.5	4.5	49	7.8	2	110	3.6	11	6.8	4.5	17	7.8	13	4.5	4.5	2
0.88	4/6/2009	2	2	1.8	2	2	2	2	2	2	2	2	2	2	2	2	2	2
0.91	12/3/2018			7.8	2	2	2	2	4.5									2
1.01	11/16/2016			22	70	33	4.5	23	33									23
1.05	11/19/2007			23	33	23	33	79	7.8									2
1.05	12/6/2016	4	7.8	7.8	4.5	4	4.5	6.8	1.8	4.5	7.8	4.5	4	13	17	17	4.5	4
1.11	5/18/2011			33	33	49	49	33	33									33

5 Day Rain	Date	HH10	HH11	HH12	HH18	HH19	HH1A	HH2B	HH30	HH31	HH33	HH34	HH35	HH36	HH37	HH38	HH5B	HH5C
1.12	2/29/2016			2	9.2	7.8	6.8	4.5	2									2
1.14	4/21/2010	4.5	2	4	7.8	2	4.5	2	13	13	7	11	11	33	13	7.8	6.8	11
1.14	1/15/2014	2	4.5	2	11	4.5	2	4.5	13	4.5	23	2	2	2	7.8	23	2	2
1.19	3/24/2008			7.8	4	2	13	17	4									2
1.2	12/2/2008	4.5	2	4.5	46	70	7.8	49	49	220	920	240	17	110	170	170	13	7.8
1.21	11/22/2010			7.8	46	33	33	170	79									4
1.29	5/1/2007			23	22	11	2	7.8										22
1.29	12/7/2009			33	79	49	23	13	17									23
1.3	12/8/2009	4.5	7.8	33	13	33	7.8	33	7.8	7.8	13	4.5	22	14	7.8	33	13	33
1.43	11/23/2015			4	33	7.8	4.5	17	49									4.5
1.49	12/14/2009			4	4.5	7.8	2	4.5	11									7.8
1.51	12/28/2006				2	4.5	6.8			17			7.8	7.8				7.8
1.52	11/2/2015	110	240	110	46	240	130	33	33	13	130	110	33	7.8	13	79	70	240
1.53	11/2/2009			4	11	2	2	1.8	11									17
1.54	2/12/2018	2	2	2	2	2	2	2	33	79	17	22	2	2	2	17	2	4.5
1.54	11/12/2018	11	13	49	23	79	2	49	46	130	95	49	79	540	110	70	49	14
1.55	12/14/2010			23	130	17	17	130	350									49
1.55	1/30/2012			2	9.3	2	4.5	4.5	2									4
1.6	3/4/2013			33	6.8	2	2	2										13
1.6	3/5/2013	11	17	4.5	7.8	2	14	2	6.1	23	17	11	14	7.8	2	11	4.5	11
1.65	11/1/2006	4	11	13	11	7.8	13	17	33	49	33	49	11	33	33	33	4.5	6.1
1.71	4/14/2011	2	2	7.8	4.5	7.8	2	2	79	70	17	17				17	4.5	2
1.76	3/17/2015	4.5	2	2	2	2	2	2	2	7.8	22	2	4.5			2	2	2
1.9	5/16/2017	49	33	17	13	31	49	17	130	220	350	540	27	110	95	540	95	49
1.91	11/1/2016	6.8	4.5	33	33	33	49	49	23	46	79	70	33	23	33	33	27	13
1.92	11/7/2007			2	23	2	2	2	7.8									2

5 Day Rain	Date	HH10	HH11	HH12	HH18	HH19	HH1A	HH2B	HH30	HH31	HH33	HH34	HH35	HH36	HH37	HH38	HH5B	HH5C
1.93	4/21/2015	2	4	23	23	79	4	17	49	49	170	170	49	33	49	130	21	79
2.09	4/10/2017			2	2	2	2	4.5	4.5									2
2.1	2/12/2008	2	2	4.5	6.8	2	2	2				2	2	2	2	4.5	2	2
2.12	3/11/2008			2	2	1.8	1.8	2	2									2
2.13	12/12/2011			2	33	2	2	33	23									4.5
2.49	4/30/2008			2	2	2	2	2	79									11
2.64	4/18/2011			17	79	9.3	4.5	14	33									4.5
2.93	4/2/2014	2	2	2	2	2	2	1.8	4.5	2	33	2	2	4.5	2	7.8	2	2
2.95	4/25/2012			49	17	350	240	350	240									1600
3.3	11/9/2010			33	48	13	13	130										4.5
3.41	12/15/2008	2	4	2	17	23	2	33	79			79	22				4.5	7.8
3.44	11/17/2009			14	49	13	7.8	2	49									2
3.65	2/19/2008			6.8	4.5	33	4.5	2										49
5.23	4/5/2010			4.5	2	4	2	2	4.5									4
5.23	12/16/2014			4.5	13	17	2	7.8	33									11
7.59	3/17/2010	110	33	49	130	79	23	110	49	14	22	49	79	70	79	27	49	49

Appendix VI: Observed Seawater and Shellfish Tissue Flushing Times at Sites HHHR2 and HHMG1

Water FC/100ml															
Site	**Pre-Storm**	**Rain Date**	**Rain (inches)**	**Day+1**	**Day+2**	**Day+3**	**Day+4**	**Day+5**	**Day+6**	**Day+7**	**Day+8**	**Day+9**	**Day+10**	**Day+11**	**Day+12**
HHMG1	11/30 WFC=130	12/1/2004	0.83	130				11							
HHMG1	4/28 WFC=2	5/4/2004	0.88	46					7.8		2				
HHMG1	5/7 WFC=23	5/12/2003	0.94	23						13					
HHMG1		12/1/2008	1.04	33						33					
HHHR2		11/23/2011	1.38						33	(0.63" rain)	33				
HHHR2	10/26 WFC= 17	10/29/2015	1.53				49		13						
HHHR2		10/30/2017	1.68	79						7.8					
HHHR2	10/24 WFC=14	10/28/2016	1.82				11						130		7.5
HHMG1		10/16/2004	2.1		540	170									
HHHR2		4/29/2008	2.46						4.5		7.8				
HHMG1	10/10 WFC=540	10/15/2005	3.13		130		11								
HHHR2		2/25/2010	3.92					4.5						2	
HHHR2		4/24/2012	>5	220						4.5					
Meat FC/100ml															
Site	**Pre-Storm**	**Rain Date**	**Rain (inches)**	**Day+1**	**Day+2**	**Day+3**	**Day+4**	**Day+5**	**Day+6**	**Day+7**	**Day+8**	**Day+9**	**Day+10**	**Day+11**	**Day+12**
HHMG1	11/30 MFC=170	12/1/2004	0.83	230				45							
HHMG1	4/28 MFC=1700	5/4/2004	0.88	490					460		78				
HHMG1	5/7 MFC=1400	5/12/2003	0.94	130						68					
HHMG1		12/1/2008	1.04	1700						20					
HHHR2		11/23/2011	1.38						490	(0.63" rain)	330				
HHHR2	10/26 MFC= 330	10/29/2015	1.53				490		330						
HHHR2		10/30/2017	1.68	no data						330					
HHHR2	10/24 MFC=490	10/28/2016	1.82				330						460		45

HHMG1		10/16/2004	2.1		490	3500									
HHHR2		4/29/2008	2.46						230		78				
HHMG1	10/10 MFC=11000	10/15/2005	3.13		460		170								
HHHR2		2/25/2010	3.92					790						20	
HHHR2		4/24/2012	>5	490						45					

Appendix VII: Conditional Area Management Plan
Hampton/Seabrook Harbor and Tributaries
Revision 12: December 6, 2019

DESCRIPTION OF CONDITIONALLY APPROVED AREA

Portions of Hampton/Seabrook Harbor and its tributaries are classified as Conditionally Approved. This area includes most of the harbor itself, the Blackwater River, and portions of the Browns River, Hampton River, Taylor River, Hampton Falls River, and Hunts Island Creek.

FACTORS INDICATING SUITABILITY OF A PORTION OF HAMPTON/SEABROOK HARBOR AS CONDITIONALLY APPROVED

1. The major pollution source with the potential to adversely affect water quality in Hampton/Seabrook Harbor is point source in origin, namely, the wastewater treatment facility in Hampton. The Conditionally Approved area is separated spatially from the wastewater treatment facility outfall by a Prohibited/Safety Zone. National Pollutant Discharge Elimination System (NPDES) permit requirements for the facility 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 DES. Other NPDES outfalls with the potential to affect harbor water quality include the Seabrook municipal wastewater outfall in the Atlantic Ocean and a Taylor River outfall servicing Envirosystems, Inc. and Aquatic Research Organisms, Inc. Given the nature of these outfalls' discharges and the characteristics of the receiving water, actual adverse impact to the harbor water quality would be rare.
2. For the period of November through May, the waters of Hampton/Seabrook Harbor can be affected by nonpoint sources of pollution following rainfall events of one inch or more per 24 hours. Weather records indicate that such storms occur, on average, 6.7 times during the November-May time period. Following such rainfall events, fecal coliform concentrations in exceedence of NSSP standards for Approved waters are typically observed. Weather information is available in real-time from NextEra Energy/ Seabrook Station. Lesser amounts of rainfall appear to adversely affect harbor water quality at other times of the year (June through October), but as noted below, the area is kept in the closed status during this time period.
3. The waters of Hampton/Seabrook Harbor exhibit intermittent and unpredictably high bacteria levels during the period of June through October. Waters frequently exhibit fecal coliform concentrations in exceedence of NSSP standards for Approved waters during these months.
4. The waters of the Hampton/Seabrook Harbor growing area are subject to the risk of boat sewage contamination for parts of the year. Generally, the boating season in this growing area begins in May and ends in mid/late October.
5. Hampton/Seabrook Harbor exhibits a tidal range that indicates substantial exchange with coastal ocean waters.

POLLUTION EVENTS THAT MAY TRIGGER CONDITIONAL AREA CLOSURE

Wastewater Treatment Plant Discharges

Hampton Wastewater Treatment Facility (100 Winnacunnet Road, Hampton, New Hampshire 03842. Mike Dube, Operations Manager and Mike Carle, Chief Operator, 929-5931)

The following performance standards may be used to trigger a closure of the Conditionally Approved areas in Hampton/Seabrook Harbor or its tributaries. Exceedence of any of the following shall trigger immediate notification of the NHDES Shellfish Program by the Town of Hampton:

- Effluent flow: Shall not exceed an effluent total daily flow of 3.9 MGD.
- Bacteriological quality of the effluent: maximum daily value 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

For the period of November through May, rainfall events of more than one inch total precipitation shall trigger a closure of the Conditionally Approved areas. 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. Historical rainfall records indicate that 5-10 rainfall events of over one inch CHECK THAT FIGURE AGAINST THE UPDATED RAINFALL ANALYSIS THAT BROOKE AND MEG DIDare likely to occur during the November to May harvesting season. 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 NextEra Energy/Seabrook Station in Seabrook, New Hampshire. Real-time checks of rainfall data are made via phone calls and emails to the weather observation station. Data from other coastal New Hampshire weather stations (e.g., Portsmouth) 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 Hampton/Seabrook Harbor and its tributaries will be placed in the closed status for the months of June through October. Fecal coliform data from water and shellfish tissue samples collected in mid/late October will be used as the basis for reopening. This closure is implemented because of historically unpredictable bacteria levels during this time and because of the potential for boat sewage contamination.

Although all New Hampshire tidal waters have received federal “No Discharge” designation, the potential for boat sewage contamination exists. The primary concern is with recreational vessels, especially those that rarely leave the harbor. The main concentration of these vessels is at the Hampton River Marina.

Dilution analyses indicate that when the marina is occupied by more than 57 boats with onboard sanitary facilities, the Prohibited area around the marina (eastern side of the Hampton River) does not have a sufficient volume of water to adequately dilute the assumed sewage load. A seasonal closure for the Conditionally Approved areas adjacent to the Prohibited area is therefore put in place when weekly boat surveys and interviews with the marina operator indicate that the number of boats with heads exceeds 57. This typically occurs in late May/early June. The area remains in the closed status until the number of boats with heads is 57 or less. This typically occurs by mid/late October.

During the non-boating season, some boats are stored in their slips under shrink wrap, thereby posing no sewage risk. Most of the other boats kept at the marina during the winter are commercial lobster or offshore fishing vessels. The number of winter “liveaboards” at the Hampton River marina was seven in 2008; thus, the Prohibited area around the marina is adequately sized for sewage contamination risk in winter.

IMPLEMENTATION OF A CONDITIONALLY APPROVED AREA CLOSURE

Notification of Management Plan Violation

The Hampton WWTF is 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 DES can vary, depending on the sewage discharge. However, historical experience with this WWTF indicates notification can be expected within eight to ten 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 number (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.

NHDES Shellfish Program staff are responsible for monitoring weather forecasts and conditions and acquiring real-time rainfall data from NextEra Energy/Seabrook Station 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, typically within four to six hours. The short response times are aided by the automated alarm systems at the WWTF and the fact that the NHDES Shellfish Program staff are on call (cellphone and pager) every day, 6 am-9 pm. Rainfall closures are also implemented quickly, as NHDES maintains direct contact with NextEra/Seabrook Station. Notification of NHF&G (patrol agency) by NHDES typically occurs immediately following NHDES notification. Implementation of closure by NHF&G typically occurs immediately after notification by NHDES. The following notification protocol is followed for each closure:

> Initiation of Closure: 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.
>
> 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 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 sites HH30, HH5C, HH1A, HH12, HH19, HH2B and HH18. If site access is limited by ice cover or other conditions, alternative shoreline sites near these 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 or ice packs 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 MPN 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 monitoring sites HH30, HH5C, HH1A, HH12, HH19, HH2B and HH18. If site access is limited by ice cover or other conditions, alternative shoreline sites 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 greater than one inch have elapsed and confirmatory water samples show FC of 43/100ml or less, whichever is less.

NHDES will be the lead agency in collecting samples from sites in the Conditionally Approved area and will notify the DHHS 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.

Marina Closure Periods: When weekly boat surveys and interviews with marina operators indicate that the number of boats with heads in active use is 57 or less at the Hampton River Marina, the seasonal boat closure can be lifted. This typically occurs by mid/late October. Note that once the seasonal closure is lifted, harvesting shall not be permitted until the provisions for reopening under the seasonal closure period are met.

NHDES will be the lead agency in conducting boat surveys and interviews with marina operators.

Seasonal Closure Periods: Water sampling from the Conditionally Approved area will be conducted in mid/late October of each year. At a minimum, water sampling will be conducted at Sites HH30, HH5C, HH1A, HH12, HH19, HH2B and HH18. If these samples show fecal coliform MPN of 43/100ml or less, then the closure will be lifted with no additional sampling. If any site shows FC MPN over 43/100ml, then the area will remain in the closed status until water samples show FC of 43/100ml or less and meat samples show a FC MPN of 230/100g or less (or a different baseline value established for a particular site). 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.

NHDES will be the lead agency in collecting samples from sites in the Conditionally Approved area and will notify the DHHS 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 (or other pollution event) has ended, will be held on ice or ice packs, 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 if the results warrant a change in status for any growing area 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 and triennial updates.