Illicit Discharge Detection and Elimination (IDDE) Plan

Town of Boxford, MA

June 28, 2019

Rev. Sept 25,2020

Rev. Sept 27, 2021

This document has been prepared by Bayside Engineering using a template dated June 30, 2016 developed by the Central Massachusetts Stormwater Coalition and Fuss and O'Neill which was financed with Funds from the Massachusetts Department of Environmental Protection (the Department). The contents do not necessarily reflect the views and policies of the Department, nor does the mention of trade names or commercial products constitute endorsement or recommendation for use.

BAYSIDE ENGINEERING

Table of Contents

Illicit Discharge Detection and Elimination Plan

Tables

Figures

Appendices

1 Introduction

1.1 MS4 Program

This Illicit Discharge Detection and Elimination (IDDE) Plan has been developed by the Town of Boxford, MA (Boxford) to address the requirements of the United States Environmental Protection Agency's (USEPA's) 2016 National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4) in Massachusetts, hereafter referred to as the "2016 Massachusetts MS4 Permit" or "MS4 Permit." The Town of Boxford has been issued a General Permit For Stormwater Discharges from Small Municipal Separate Storm Sewers in Massachusetts with an Issue Date or April 4, 2016 and an Effective Date of July 1, 2018. The permit will expire at midnight, June 30, 2023.

The 2016 Massachusetts MS4 Permit requires that each permittee, or regulated community, address six Minimum Control Measures. These measures include the following:

1. Public Education and Outreach
2. Public Involvement and Participation
3. Illicit Discharge Detection and Elimination Program
4. Construction Site Stormwater Runoff Control
5. Stormwater Management in New Development and Redevelopment (Post Construction Stormwater Management); and
6. Good Housekeeping and Pollution Prevention for Permittee Owned Operations.

Under Minimum Control Measure 3, the permittee is required to implement an IDDE program to systematically find and eliminate sources of non-stormwater discharges to its municipal separate storm sewer system and implement procedures to prevent such discharges. The IDDE program must also be recorded in a written (hardcopy or electronic) document. This IDDE Plan has been prepared to address this requirement.

1.2 Illicit Discharges

An "illicit discharge" is any discharge to a drainage system that is not composed entirely of stormwater, with the exception of discharges pursuant to a NPDES permit (other than the NPDES permit for discharges from the MS4) and discharges resulting from fire-fighting activities.

Illicit discharges may take a variety of forms. Illicit discharges may enter the drainage system through direct or indirect connections. Direct connections may be relatively obvious, such as cross-connections of sewer services to the storm drain system. Indirect illicit discharges may be more difficult to detect or address, such as failing septic systems that discharge untreated sewage to a ditch within the MS4, or a sump pump that discharges contaminated water on an intermittent basis.

Some illicit discharges are intentional, such as dumping used oil (or other pollutant) into catch basins, a resident or contractor illegally tapping a new sewer lateral into a storm drain pipe, and illegal dumping of yard wastes into surface waters.
Some illicit discharges are related to the unsuitability of original infrastructure to the modern regulatory environment. Examples of illicit discharges in this category include connected floor drains in old buildings, as well as overflows that enter the drainage system. Sump pumps legally connected to the storm drain system may be used inappropriately, such as for the disposal of floor washwater or old household products, in many cases due to a lack of understanding on the part of the homeowner.

Elimination of some discharges may require substantial costs and efforts. Others, such as improving self-policing of dog waste management, can be accomplished by outreach in conjunction with the minimal additional cost of dog waste bins and the municipal commitment to disposal of collected materials on a regular basis.

Regardless of the intention, when not addressed, illicit discharges can contribute high levels of pollutants, such as heavy metals, toxics, oil, grease, solvents, nutrients, and pathogens to surface waters.

1.3 Allowable Non-Stormwater Discharges

The following categories of non-storm water discharges are allowed under the MS4 Permit unless the permittee, USEPA or Massachusetts Department of Environmental Protection (MassDEP) identifies any category or individual discharge of non-stormwater discharge as a significant contributor of pollutants to the MS4:

- Water line flushing
- Landscape irrigation
- Diverted stream flows
- Rising ground water
- Uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(20))
- Uncontaminated pumped groundwater
- Discharge from potable water sources
- Foundation drains
- Air conditioning condensation
- Irrigation water, springs
- Water from crawl space pumps
- Footing drains
- Lawn watering
- Individual resident car washing
- De-chlorinated swimming pool discharges
- Street wash waters
- Residential building wash waters without detergents

If these discharges are identified as significant contributors to the MS4, they must be considered an “illicit discharge” and addressed in the IDDE Plan (i.e., control these sources so they are no longer significant contributors of pollutants, and/or eliminate them entirely).

1.4 Receiving Waters and Impairments

Table 1-1 lists the "impaired waters" within the boundaries of Boxford's regulated area based on the 2016 Massachusetts Integrated List of Waters produced by MassDEP every two years. Impaired waters are water bodies that do not meet water quality standards for one or more designated use(s) such as recreation or aquatic habitat

Table 1-1. Impaired Waters

Boxford, Massachusetts

Water Body Name	Segment ID	Category	Impairment(s)	Associated Approved TMDL
Lower Fourmile Pond ***Ipswich River***	**MA92032**	**4c**	**(Non-Native Aquatic Plants)**	
Stevens Pond ***Ipswich River***	**MA92062**	**4c**	**(Non-Native Aquatic Plants)**	
Parker River	MA91-01	4c	(Low-flow Alterations)	
Fish Brook ***Ipswich River***	**MA92-14**	**5**	**Escherichia coli**	Draft TMDL for Pathogens
Lowes Pond ***Ipswich River***	**MA92034**	**5**	**Non-Native Aquatic Plants) Mercury in Fish Tissue**	Mercury Hotspot 1*
Chadwicks Pond	**MA84006**	**5**	**Mercury in Fish Tissue**	Mercury 1
Hoveys Pond *Merrimack River*	MA84025	5	Mercury in Fish Tissue	Mercury Hotspot 1*
Johnsons Pond ***Merrimack River***	**MA84027**	**5**	**Mercury in Fish Tissue Oxygen, Dissolved**	Mercury Hotspot 1*
Baldpate Pond ***Parker River***	**MA91001**	**5**	**(Non-Native Aquatic Plants) Mercury in Fish Tissue Oxygen, Dissolved**	Mercury 1
Mill River *Parker River*	MA91-08	5	(Non-Native Aquatic Plants); Aquatic Macroinvertebrate Bioassessments;	

			Aquatic Plants (Macrophytes); Excess Algal Growth	
Stevens Pond ***Ipswich River***	**MA92062**	**4c**	**(Non-Native Aquatic Plants)**	
Bold represents waters located either fully or partially within an urbanized area as determined by the latest Decennial Census by the Bureau of Census as of the effective date of the MS4 permit (2010 Census)				
Italics indicate receiving water				
Source: https://www.mass.gov/files/documents/2017/08/zu/16ilwplist.pdf https://www.mass.gov/files/documents/2016/08/sa/14list2_0.pdf Accessed May 29, 2019				

Category 4c Waters – impaired water bodies where the impairment is not caused by a pollutant. No TMDL required.
Category 5 Waters – impaired water bodies that require a TMDL.
"Approved TMDLs" are those that have been approved by EPA as of the date of issuance of the 2016 MS4 Permit.

1 Excerpt from Mercury TMDL:
Any point source of mercury from stormwater is assumed to be from atmospheric deposition. "When stormwater is addressed in a TMDL, it is generally included with the point source load and subsequently included in the wasteload allocation. …Because the majority of mercury in stormwater originates from atmospheric deposition, reductions of mercury loading in stormwater will be addressed through controls on atmospheric deposition."
* Those identified by an asterisk are located in a mercury hot spot area and are not covered by this TMDL.

1.5 IDDE Program Goals, Framework, and Timeline

The goals of the IDDE program are to find and eliminate illicit discharges to municipal separate storm sewer system and to prevent illicit discharges from happening in the future. The program consists of the following major components as outlined in the MS4 Permit:

- Legal authority and regulatory mechanism to prohibit illicit discharges and enforce this prohibition
- Storm system mapping
- Inventory and ranking of outfalls
- Dry weather outfall screening
- Catchment investigations
- Identification/confirmation of illicit sources
- Illicit discharge removal
- Followup screening
- Employee training.

The IDDE investigation procedure framework is shown in **Figure 1-1.** The required timeline for implementing the IDDE program is shown in **Table 1-2**.

Figure 1-1. IDDE Investigation Procedure Framework

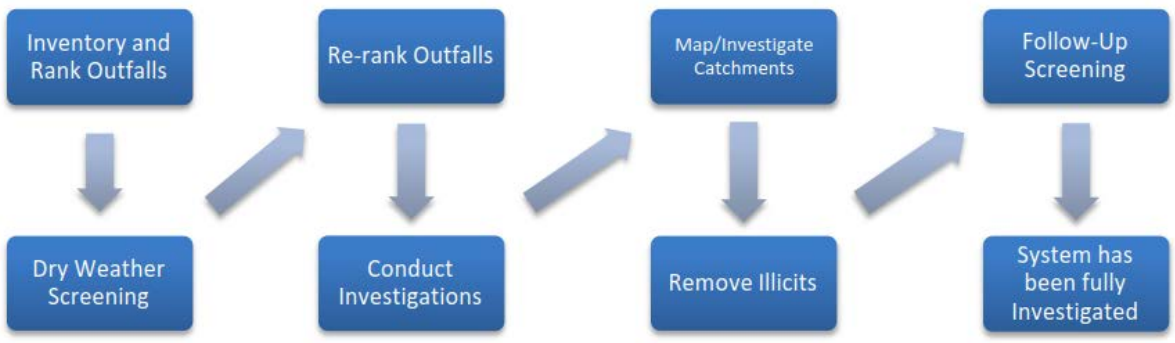

Table 1-2. IDDE Program Implementation Timeline

IDDE Program Requirement	Completion Date from Effective Date of Permit					
	1 Year	1.5 Years	2 Years	3 Years	7 Years	10 Years
Written IDDE Program Plan	X					
Written Catchment Investigation Procedure / SVF Inventory		X				
Phase I Mapping			X			
Phase II Mapping						X
IDDE Regulatory Mechanism or By-law (if not already in place)				X		
Dry Weather Outfall Screening				X		
Follow-up Ranking of Outfalls and Interconnections				X		
Catchment Investigations – Problem Outfalls					X	
Catchment Investigations – all Problem, High and Low Priority Outfalls						X

1.6 Work Completed to Date

The 2003 MS4 Permit required each MS4 community to develop a plan to detect illicit discharges using a combination of storm system mapping, adopting a regulatory mechanism to prohibit illicit discharges and enforce this prohibition, and identifying tools and methods to investigate suspected illicit discharges. Each MS4 community was also required to define how confirmed discharges would be eliminated and how the removal would be documented.

The Town of Boxford has completed the following IDDE program activities consistent with the 2003 MS4 Permit requirements:

- Developed a map of outfalls and receiving waters
- Adopted an IDDE bylaw or regulatory mechanism

This document is fulfilling the following IDDE program activities consistent with the 2003 MS4 Permit requirements:

- Developed procedures for locating illicit discharges (i.e., visual screening of outfalls for dry weather discharges, dye or smoke testing)
- Developed procedures for locating the source of the discharge
- Developed procedures for removal of the source of an illicit discharge
- Developed procedures for documenting actions and evaluating impacts on the storm sewer system subsequent to removal

In addition to the 2003 MS4 Permit requirements, other IDDE-related activities that have been completed include:

- Limited/targeted outfall inspection
- Additional storm system mapping, including the locations of catch basins, manholes and pipe connectivity

2 Authority and Statement of IDDE Responsibilities

2.1 Legal Authority

The Town of Boxford has adopted a Stormwater Management Bylaw (as amended May 2019). A copy of the Stormwater Management Bylaw is provided in **Appendix A**. The Stormwater Management Bylaw provides the Town of Boxford with adequate legal authority to:

- Prohibit illicit discharges
- Investigate suspected illicit discharges
- Eliminate illicit discharges, including discharges from properties not owned by or controlled by the MS4 that discharge into the MS4 system
- Implement appropriate enforcement procedures and actions.

The Town of Boxford will continue to review its current Stormwater Management Bylaw and related land use regulations and policies for consistency with the 2016 MS4 Permit and if necessary, any bylaw, ordinance, or other regulatory mechanism will meet the requirements of the 2016 MS4 Permit and will be in place within 3 years of the permit effective date (July 1, 2020).

2.2 Statement of Responsibilities

The Boxford Department of Public Works (DPW) is the lead municipal agency or department responsible for implementing the IDDE program. The Boxford (DPW) is responsible for identifying and categorizing outfalls and interconnections, dry weather screening and sampling, investigating and monitoring catchments, and reporting to the Conservation Commission of any illicit discharges for action by the Commission. pursuant to the provisions of the Stormwater Management Bylaw.

The DPW is also responsible for maintaining and updating the IDEE plan, maintaining all associated records, and IDDE training.

The Boxford Conservation Commission is responsible for administering the Boxford Wetland Protection Bylaw and Stormwater Management Bylaw, including aspects that pertain to the review and permitting and/or enforcement against illicit discharges. Enforcement includes the potential for fines, civil action and/or referral for criminal action, as appropriate.

The Boxford Board of Health carefully regulates all private drinking water wells and septic leaching systems under state and local regulations.

Persons with responsibility for aspects of the program include:

- DPW Superintendent/Town Engineer – Chris Olbrot (Member Stormwater Advisory Committee)
- Planning Agent/Conservation Agent - Ross Povenmire (Member Stormwater Advisory Committee)
- Board of Health/Health Director – Kendell Longo (Member Stormwater Advisory Committee)
- Building Inspector – Robert Aldenberg (Member Stormwater Advisory Committee)
- Town Administrator – Alan J. Benson (Member Stormwater Advisory Committee)

3 Stormwater System Mapping

The Town of Boxford originally developed mapping of its stormwater system to meet the mapping requirements of the 2003 MS4 Permit. A copy of the existing storm system map is provided in **Appendix B**. The 2016 MS4 Permit requires a more detailed storm system map than was required by the 2003 MS4 Permit. The revised mapping is intended to facilitate the identification of key infrastructure, factors influencing proper system operation, and the potential for illicit discharges.

The 2016 MS4 Permit requires the storm system map to be updated in two phases as outlined below. The Boxford Department of Public Works (working with the Merrimack Valley Planning Commission or MVPC) is responsible for updating the stormwater system mapping pursuant to the 2016 MS4 Permit. The Town of Boxford will report on the progress towards completion of the storm system map in each annual report. Updates to the stormwater mapping will be included in **Appendix B**.

3.1 Phase I Mapping

Phase I mapping must be completed within two (2) years of the effective date of the permit (July 1, 2020) and include the following information:

- Outfalls and receiving waters (previously required by the MS4-2003 permit)
- Open channel conveyances (swales, ditches, etc.)
- Interconnections with other MS4s and other storm sewer systems
- Municipally owned stormwater treatment structures

The Town of Boxford has completed the following updates to its stormwater mapping to meet the Phase I requirements:

- Outfalls and receiving waters (previously required by the MS4-2003 permit)
- Open channel conveyances (swales, ditches, etc.)
- Pipes
- Culverts
- Structures (manholes, catch basins, drop inlets
- Outfalls
- Inlets

The Town of Boxford will update its stormwater mapping by July 1, 2020 to include the remaining Phase I information.

- Water bodies identified by name and indication of all use impairments as identified on the most recent EPA approved Massachusetts Integrated List of Waters report
- Initial catchment delineations. Topographic contours and drainage system information may be used to produce initial catchment delineations.

3.2 Phase II Mapping

Phase II mapping must be completed within ten (10) years of the effective date of the permit (July 1, 2028) and include the following information:

- Outfall spatial location (latitude and longitude with a minimum accuracy of +/-30 feet)
- Pipes
- Manholes
- Catch basins
- Refined catchment delineations. Catchment delineations must be updated to reflect information collected during catchment investigations.

The Town of Boxford has completed the following updates to its stormwater mapping to meet the Phase II requirements:

- Pipes
- Manholes
- Catch basins

The Town of Boxford will update its stormwater mapping by July 1, 2028 to include the remaining following Phase II information.

- Outfall spatial location (latitude and longitude with a minimum accuracy of +/-30 feet)
- Refined catchment delineations. Catchment delineations shall be updated to reflect information collected during catchment investigations.

3.3 Additional Recommended Mapping Elements

Although not a requirement of the 2016 MS4 Permit, the Town of Boxford may include the following recommended elements in its storm system mapping:

- Storm sewer material, size (pipe diameter), age
- Privately owned stormwater treatment structures
- Area where the permittee's MS4 has received or could receive flow from septic system discharges
- Topography
- Orthophotography.

4 Sanitary Sewer Overflows (SSOs)

The 2016 MS4 Permit requires municipalities to prohibit illicit discharges, including sanitary sewer overflows (SSOs), to the separate storm sewer system. SSOs are discharges of untreated sanitary wastewater from a municipal sanitary sewer that can contaminate surface waters, cause serious water quality problems and property damage, and threaten public health. SSOs can be caused by blockages, line breaks, sewer defects that allow stormwater and groundwater to overload the system, power failures, improper sewer design, and vandalism. **The Town of Boxford has no municipal sanitary sewer systems or municipal combined sewer systems.**

5 Assessment and Priority Ranking of Outfalls

The 2016 MS4 Permit requires an assessment and priority ranking of outfalls in terms of their potential to have illicit discharges and the related public health significance. The ranking helps determine the priority order for performing IDDE investigations and meeting permit milestones.

5.1 Outfall Catchment Delineations

A catchment is the area that drains to an individual outfall[1] or interconnection.[2] The catchments for each of the MS4 outfalls will be delineated to define contributing areas for investigation of potential sources of illicit discharges. Catchments are typically delineated based on topographic contours and mapped drainage infrastructure, where available. As described in **Section 3**, initial catchment delineations will be completed as part of the Phase I mapping, and refined catchment delineations will be completed as part of the Phase II mapping to reflect information collected during catchment investigations

5.2 Outfall and Interconnection Inventory and Initial Ranking

The Boxford Department of Public Works will complete an initial outfall and interconnection inventory and priority ranking to assess illicit discharge potential based on existing information. The initial inventory and ranking will be completed within one (1) year from the effective date of the permit. An updated inventory and ranking will be provided in each annual report thereafter. The inventory will be updated annually to include data collected in connection with dry weather screening and other relevant inspections.

The outfall and interconnection inventory will identify each outfall and interconnection discharging from the MS4, record its location and condition, and provide a framework for tracking inspections, screenings and other IDDE program activities.

Outfalls and interconnections will be classified into one of the following categories:

1. **Problem Outfalls**: Outfalls/interconnections with known or suspected contributions of illicit discharges based on existing information shall be designated as Problem Outfalls. This shall

[1] **Outfall** means a point source as defined by 40 CFR § 122.2 as the point where the municipal separate storm sewer discharges to waters of the United States. An outfall does not include open conveyances connecting two municipal separate storm sewers or pipes, tunnels or other conveyances that connect segments of the same stream or other waters of the United States and that are used to convey waters of the United States. Culverts longer than a simple road crossing shall be included in the inventory unless the permittee can confirm that they are free of any connections and simply convey waters of the United States.

[2] **Interconnection** means the point (excluding sheet flow over impervious surfaces) where the permittee's MS4 discharges to another MS4 or other storm sewer system, through which the discharge is conveyed to waters of the United States or to another storm sewer system and eventually to a water of the United States.

include any outfalls/interconnections where previous screening indicates likely septic input. Likely sewer input indicators are any of the following:

- Olfactory or visual evidence of sewage,
- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and bacteria levels greater than the water quality criteria applicable to the receiving water, or
- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and detectable levels of chlorine.

Dry weather screening and sampling, as described in **Section 6** of this IDDE Plan and Part 2.3.4.7.b of the MS4 Permit, is not required for Problem Outfalls.

2. **High Priority Outfalls**: Outfalls/interconnections that have not been classified as Problem Outfalls and that are:

   - Discharging to an area of concern to public health due to proximity of public beaches, recreational areas, drinking water supplies or shellfish beds
   - Determined by the permittee as high priority based on the characteristics listed below or other available information.

3. **Low Priority Outfalls**: Outfalls/interconnections determined by the permittee as low priority based on the characteristics listed below or other available information.

4. **Excluded outfalls**: Outfalls/interconnections with no potential for illicit discharges may be excluded from the IDDE program. This category is limited to roadway drainage in undeveloped areas with no dwellings and no sanitary sewers; drainage for athletic fields, parks or undeveloped green space and associated parking without services; cross-country drainage alignments (that neither cross nor are in proximity to sanitary sewer alignments) through undeveloped land.

Outfalls will be ranked into the above priority categories (except for excluded outfalls, which may be excluded from the IDDE program) based on the following characteristics of the defined initial catchment areas, where information is available. Additional relevant characteristics, including location-specific characteristics, may be considered but must be documented in this IDDE Plan.

- **Previous screening results** – previous screening/sampling results indicate likely sewer input (see criteria above for Problem Outfalls).
- **Past discharge complaints and reports.**
- **Poor receiving water quality** – the following guidelines are recommended to identify waters as having a high illicit discharge potential:
  - Exceeding water quality standards for bacteria
  - Ammonia levels above 0.5 mg/l
  - Surfactants levels greater than or equal to 0.25 mg/l
- **Culverted streams** – Any river or stream that is culverted for distances greater than a simple roadway crossing may have a high illicit discharge potential.

- **Water quality limited waterbodies** that receive a discharge from the MS4 or waters with approved TMDLs applicable to the permittee, where illicit discharges have the potential to contain the pollutant identified as the cause of the water quality impairment.

Table 5-1 provides the outfall inventory and priority ranking matrix.

Table 5-1. Outfall Inventory and Priority Ranking Matrix

Town of Boxford, Massachusetts
Revision Date: Initial Ranking June 28, 2019

UA = Urbanized Area

#	MIMAP Object ID	Outfall ID OUT-	In UA	Previous Screening Results Indicate Likely Septic Input? [1]	Discharging to Area of Concern to Public Health? [2]	Frequency of Past Discharge Complaints	Receiving Water Quality [3]	Culverted Streams? [4]	Additional Characteristics	Score	Priority Ranking
	Information Source			Outfall Inspections and Sample Results	GIS Maps	Town Staff	Impaired Waters List	GIS and Storm System Maps	Other		
	Scoring Criteria		Y/N	Yes = 3 (Problem Outfall) No = 0	Yes = 3 No = 0	Frequent = 3 Occasional = 2 None = 0	Poor = 3 Fair = 2 Good = 0	Yes = 3 No = 0	TBD		
1	44	1669	Y		0	0			ID Catchment Area	0	Low
2	45	1673	Y		0	0			ID Catchment Area	0	Low
3	46	1688	Y		0	0			ID Catchment Area	0	Low
4	48	1621	Y		0	0			ID Catchment Area	0	Low
5	49	1626	Y		0	0			ID Catchment Area	0	Low
6	50	1499	Y		0	0	2		Baldpate Pond Direct	2	Low
7	51	1508	Y		0	0	2		Baldpate Pond Indirect	2	Low
8	52	1511	Y		0	0			ID Catchment Area	0	Low
9	53	1521	Y		0	0			Baldpate Pond Indirect	2	Low
10	54	1530	Y		0	0			ID Catchment Area	0	Low
11	55	1535	Y		0	0			ID Catchment Area	0	Low
12	56	1538	Y		0	0			ID Catchment Area	0	Low
13	57	1545	Y		0	0			ID Catchment Area	0	Low
14	58	1554	Y		0	0			ID Catchment Area	0	Low
15	59	1557	Y		0	0			ID Catchment Area	0	Low
16	60	1558	Y		0	0	2		Fourmile Pond Indirect	2	Low
17	61	1568	Y		0	0	2		Fourmile Pond Indirect	2	Low
18	62	1571	N								

#	MIMAP Object ID	Outfall ID OUT-	In UA	Previous Screening Results Indicate Likely Septic Input? [1]	Discharging to Area of Concern to Public Health? [2]	Frequency of Past Discharge Complaints	Receiving Water Quality [3]	Culverted Streams? [4]	Additional Characteristics	Score	Priority Ranking
	Information Source			Outfall Inspections and Sample Results	GIS Maps	Town Staff	Impaired Waters List	GIS and Storm System Maps	Other		
	Scoring Criteria		Y/N	Yes = 3 (Problem Outfall) No = 0	Yes = 3 No = 0	Frequent = 3 Occasional = 2 None = 0	Poor = 3 Fair = 2 Good = 0	Yes = 3 No = 0	TBD		
19	63	1583	Y		0	0	2		Fourmile Pond Indirect	2	Low
20	64	1608	Y		0	0	2		Fourmile Pond Direct	2	Low
21	65	1338	Y		0	0	3		Fish Brook Indirect	3	High
22	66	1339	Y		0	0	3		Fish Brook Indirect	3	High
23	67	1350	Y		0	0			ID Catchment Area	0	Low
24	68	1364	N								
25	69	1368	N								
26	70	1371	N								
27	71	1374	N								
28	72	1375	Y		0	0			ID Catchment Area	0	Low
29	73	1384	Y		0	0			ID Catchment Area	0	Low
30	74	1387	Y		0	0			ID Catchment Area	0	Low
31	75	1416	N								
32	76	1427	N								
33	77	1442	N								
34	78	1451	Y		0	0	2		Lowe Pond Direct	2	Low
35	79	1457	Y		0	0			ID Catchment Area		Low
36	80	1467	Y		0	0	2		Lowe Pond Direct	2	Low
37	81	1224	N								
38	82	1232	N								
39	83	1240	Y		0	0			ID Catchment Area	0	Low
40	84	1261	Y		0	0			ID Catchment Area	0	Low
41	85	1266	Y		0	0	0		Pye Brook Direct	0	Low

#	MIMAP Object ID	Outfall ID OUT-	In UA	Previous Screening Results Indicate Likely Septic Input? [1]	Discharging to Area of Concern to Public Health? [2]	Frequency of Past Discharge Complaints	Receiving Water Quality [3]	Culverted Streams? [4]	Additional Characteristics	Score	Priority Ranking
	Information Source			Outfall Inspections and Sample Results	GIS Maps	Town Staff	Impaired Waters List	GIS and Storm System Maps	Other		
	Scoring Criteria		Y/N	Yes = 3 (Problem Outfall) No = 0	Yes = 3 No = 0	Frequent = 3 Occasional = 2 None = 0	Poor = 3 Fair = 2 Good = 0	Yes = 3 No = 0	TBD		
42	86	1271	Y		0	0			ID Catchment Area	0	Low
43	87	1283	N								
44	88	1297	N								
45	90	1309	Y		0	0	2		Lowe Pond Direct	2	Low
46	91	1317	Y		0	0			ID Catchment Area	0	Low
47	92	1320	Y		0	0			ID Catchment Area	0	Low
48	93	972	N								
49	94	975	N								
50	95	990	N								
51	96	997	N								
52	97	1003	N								
53	98	1031	N								
54	99	1034	N								
55	100	1045	N								
56	101	1056	N								
57	102	1063	Y		0	0			ID Catchment Area	0	Low
58	103	1067	Y		0	0			ID Catchment Area	0	Low
59	104	1069	Y		0	0			ID Catchment Area	0	Low
60	105	1076	Y		0	0	2		Ipswich River Indirect	2	Low
61	106	1087	N								
62	107	1105	N								
63	108	1125	N								
64	109	1144	N								

#	MIMAP Object ID	Outfall ID OUT-	In UA	Previous Screening Results Indicate Likely Septic Input? [1]	Discharging to Area of Concern to Public Health? [2]	Frequency of Past Discharge Complaints	Receiving Water Quality [3]	Culverted Streams? [4]	Additional Characteristics	Score	Priority Ranking
	Information Source			Outfall Inspections and Sample Results	GIS Maps	Town Staff	Impaired Waters List	GIS and Storm System Maps	Other		
	Scoring Criteria		Y/N	Yes = 3 (Problem Outfall) No = 0	Yes = 3 No = 0	Frequent = 3 Occasional = 2 None = 0	Poor = 3 Fair = 2 Good = 0	Yes = 3 No = 0	TBD		
65	110	1148	Y		0	0			ID Catchment Area	0	Low
66	111	1151	Y		0	0			ID Catchment Area	0	Low
67	112	1165	Y		0	0			ID Catchment Area	0	Low
68	113	1174	Y		0	0			ID Catchment Area	0	Low
69	114	1175	Y		0	0			ID Catchment Area	0	Low
70	115	1185	Y		0	0			ID Catchment Area	0	Low
71	116	1191	Y		0	0			ID Catchment Area	0	Low
72	117	1194	Y		0	0			ID Catchment Area	0	Low
73	118	1141	N								
74	119	1099	Y		0	0			ID Catchment Area	0	Low
75	120	812	N								
76	121	817	N								
77	122	828	Y		0	0			ID Catchment Area	0	Low
78	123	832	Y		0	0			ID Catchment Area	0	Low
79	124	845	Y		0	0			ID Catchment Area	0	Low
80	125	850	Y		0	0			ID Catchment Area	0	Low
81	126	863	Y		0	0			ID Catchment Area	0	Low
82	127	873	Y		0	0			ID Catchment Area	0	Low
83	128	877	Y		0	0			ID Catchment Area	0	Low
84	129	884	N								
85	130	891	N								
86	131	893	Y		0	0			ID Catchment Area	0	Low
87	132	898	Y		0	0			ID Catchment Area	0	Low

#	MIMAP Object ID	Outfall ID OUT-	In UA	Previous Screening Results Indicate Likely Septic Input? [1]	Discharging to Area of Concern to Public Health? [2]	Frequency of Past Discharge Complaints	Receiving Water Quality [3]	Culverted Streams? [4]	Additional Characteristics	Score	Priority Ranking
	Information Source			Outfall Inspections and Sample Results	GIS Maps	Town Staff	Impaired Waters List	GIS and Storm System Maps	Other		
	Scoring Criteria		Y/N	Yes = 3 (Problem Outfall) No = 0	Yes = 3 No = 0	Frequent = 3 Occasional = 2 None = 0	Poor = 3 Fair = 2 Good = 0	Yes = 3 No = 0	TBD		
88	133	913	N								
89	134	933	N								
90	135	951	Y		0	0	0		Parker River (Sperry's Pond - Direct)	0	Low
91	136	715	N								
92	137	724	N								
93	138	755	N								
94	139	760	N								
95	140	763	N								
96	141	769	N								
97	142	776	N								
98	143	780	N								
99	144	790	Y		0	0			ID Catchment Area	0	Low
100	145	109	N								
101	146	128	N								
102	147	156	N								
103	148	170	Y		0	0			ID Catchment Area	0	Low
104	149	185	Y		0	0			ID Catchment Area	0	Low
105	150	186	Y		0	0			ID Catchment Area	0	Low
106	151	208	Y		0	0	2		Johnsons Pond Indirect	2	Low
107	152	210	N								
108	153	217	N								
109	154	222	N								

#	MIMAP Object ID	Outfall ID OUT-	In UA	Previous Screening Results Indicate Likely Septic Input? [1]	Discharging to Area of Concern to Public Health? [2]	Frequency of Past Discharge Complaints	Receiving Water Quality [3]	Culverted Streams? [4]	Additional Characteristics	Score	Priority Ranking
	Information Source			Outfall Inspections and Sample Results	GIS Maps	Town Staff	Impaired Waters List	GIS and Storm System Maps	Other		
	Scoring Criteria		Y/N	Yes = 3 (Problem Outfall) No = 0	Yes = 3 No = 0	Frequent = 3 Occasional = 2 None = 0	Poor = 3 Fair = 2 Good = 0	Yes = 3 No = 0	TBD		
110	155	223	N								
111	156	253	N								
112	157	256	N								
113	158	263	N								
114	159	266	N								
115	160	269	Y		0	0			ID Catchment Area	0	Low
116	161	279	Y		0	0			ID Catchment Area	0	Low
117	162	289	N								
118	163	292	Y		0	0			ID Catchment Area	0	Low
119	164	299	N								
120	165	179	N								
121	166	308	Y		0	0			ID Catchment Area	0	Low
122	167	312	Y		0	0			ID Catchment Area	0	Low
123	168	315	Y		0	0			ID Catchment Area	0	Low
124	169	329	Y		0	0			ID Catchment Area	0	Low
125	170	334	Y		0	0			ID Catchment Area	0	Low
126	171	337	Y		0	0			ID Catchment Area	0	Low
127	172	365	Y		0	0			ID Catchment Area	0	Low
128	173	371	Y		0	0			ID Catchment Area	0	Low
129	174	374	Y		0	0			ID Catchment Area	0	Low
130	175	379	Y		0	0			ID Catchment Area	0	Low
131	176	393	N								
132	177	401	Y		0	0			ID Catchment Area	0	Low

#	MIMAP Object ID	Outfall ID OUT-	In UA	Previous Screening Results Indicate Likely Septic Input? [1]	Discharging to Area of Concern to Public Health? [2]	Frequency of Past Discharge Complaints	Receiving Water Quality [3]	Culverted Streams? [4]	Additional Characteristics	Score	Priority Ranking
	Information Source			Outfall Inspections and Sample Results	GIS Maps	Town Staff	Impaired Waters List	GIS and Storm System Maps	Other		
	Scoring Criteria		Y/N	Yes = 3 (Problem Outfall) No = 0	Yes = 3 No = 0	Frequent = 3 Occasional = 2 None = 0	Poor = 3 Fair = 2 Good = 0	Yes = 3 No = 0	TBD		
133	178	421	N								
134	179	424	N								
135	180	427	N								
136	181	432	N								
137	182	435	N								
138	183	438	N								
139	184	351	N								
140	185	452	N								
141	186	411	N								
142	187	462	Y		0	0			ID Catchment Area	0	Low
143	188	485	N								
144	189	492	Y		0	0			ID Catchment Area	0	Low
145	190	508	N								
146	191	528	N								
147	192	532	N								
148	193	537	N								
149	194	540	N								
150	196	544	Y		0	0			ID Catchment Area	0	Low
151	197	545	Y		0	0			ID Catchment Area	0	Low
152	198	640	N								
153	199	646	N								
154	200	650	N								
155	201	658	N								

#	MIMAP Object ID	Outfall ID OUT-	In UA	Previous Screening Results Indicate Likely Septic Input? [1]	Discharging to Area of Concern to Public Health? [2]	Frequency of Past Discharge Complaints	Receiving Water Quality [3]	Culverted Streams? [4]	Additional Characteristics	Score	Priority Ranking
	Information Source			Outfall Inspections and Sample Results	GIS Maps	Town Staff	Impaired Waters List	GIS and Storm System Maps	Other		
	Scoring Criteria		Y/N	Yes = 3 (Problem Outfall) No = 0	Yes = 3 No = 0	Frequent = 3 Occasional = 2 None = 0	Poor = 3 Fair = 2 Good = 0	Yes = 3 No = 0	TBD		
156	202	665	N								
157	203	670	N								
158	204	676	N								
159	205	678	Y		0	0			ID Catchment Area	0	Low
160	206	680	Y		0	0			ID Catchment Area	0	Low
161	207	687	Y		0	0			ID Catchment Area	0	Low
162	208	699	N								
163	209	702	N								
164	210	705	N								
165	211	801	N								
166	212	1698	N								
167	613				0	0			ID Catchment Area	0	Low
168	1413				0	0			ID Catchment Area	0	Low
169	1813				0	0			ID Catchment Area	0	Low
170	2213				0	0			ID Catchment Area	0	Low
171	2613				0	0			ID Catchment Area	0	Low
172	3013				0	0			ID Catchment Area	0	Low
173	3413	1691	N								
174	3813				0	0			ID Catchment Area	0	Low
175	4213				0	0			ID Catchment Area	0	Low
176	4613	1306	Y		0	0	2		Lowe Pond Direct	2	Low

UA = Urbanized Area

Scoring Criteria:

[1] Previous screening results indicate likely septic input if any of the following are true:

- Olfactory or visual evidence of sewage,
- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and bacteria levels greater than the water quality criteria applicable to the receiving water, or
- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and detectable levels of chlorine

[2] Outfalls/interconnections that discharge to or in the vicinity of any of the following areas: public beaches, recreational areas, drinking water supplies, or shellfish beds

[3] Receiving water quality based on latest version of MassDEP Integrated List of Waters.

- Poor = Waters with approved TMDLs (Category 4a Waters) where illicit discharges have the potential to contain the pollutant identified as the cause of the impairment
- Fair = Water quality limited waterbodies that receive a discharge from the MS4 (Category 5 Waters)
- Good = No water quality impairments

[4] Any river or stream that is culverted for distance greater than a simple roadway crossing.

6 Dry Weather Outfall Screening and Sampling

Dry weather flow is a common indicator of potential illicit connections. The MS4 Permit requires all outfalls/interconnections (excluding Problem and excluded Outfalls) to be inspected for the presence of dry weather flow. The Town of Boxford DPW is responsible for conducting dry weather outfall screening, starting with High Priority outfalls, followed by Low Priority outfalls, based on the initial priority rankings described in the previous section.

6.1 Weather Conditions

Dry weather outfall screening and sampling may occur when no more than 0.1 inches of rainfall has occurred in the previous 24-hour period and no significant snow melt is occurring. For purposes of determining dry weather conditions, program staff will use precipitation data from US NOAA Weather Station located at the Lawrence Municipal Airport (https://w1.weather.gov/data/obhistory/KLWC.html).

6.2 Dry Weather Screening/Sampling Procedure

6.2.1 General Procedure

The dry weather outfall inspection and sampling procedure consists of the following general steps:

1. Identify outfall(s) to be screened/sampled based on initial outfall inventory and priority ranking
2. Acquire the necessary staff, mapping, and field equipment (see **Table 6-1** for list of potential field equipment)
3. Conduct the outfall inspection during dry weather:
    a. Mark and photograph the outfall
    b. Record the inspection information and outfall characteristics (using paper forms or digital form using a tablet or similar device) (see form in **Appendix C**)
    c. Look for and record visual/olfactory evidence of pollutants in flowing outfalls including odor, color, turbidity, and floatable matter (suds, bubbles, excrement, toilet paper or sanitary products). Also observe outfalls for deposits and stains, vegetation, and damage to outfall structures.
4. If flow is observed, sample and test the flow following the procedures described in the following sections.
5. If no flow is observed, but evidence of illicit flow exists (illicit discharges are often intermittent or transitory), revisit the outfall during dry weather within one week of the initial observation, if practicable, to perform a second dry weather screening and sample any observed flow. Other techniques can be used to detect intermittent or transitory flows including conducting inspections during evenings or weekends and using optical brighteners.
6. Input results from screening and sampling into spreadsheet/database. Include pertinent information in the outfall/interconnection inventory and priority ranking.

7. Include all screening data in the annual report.

6.2.2 Field Equipment

Table 6-1 lists field equipment commonly used for dry weather outfall screening and sampling.

Table 6-1. Field Equipment – Dry Weather Outfall Screening and Sampling

Equipment	Use/Notes
Clipboard	For organization of field sheets and writing surface
Field Sheets	Field sheets for both dry weather inspection and Dry weather sampling should be available with extras
Chain of Custody Forms	To ensure proper handling of all samples
Pens/Pencils/Permanent Markers	For proper labeling
Nitrile Gloves	To protect the sampler as well as the sample from contamination
Flashlight/headlamp w/batteries	For looking in outfalls or manholes, helpful in early mornings as well
Cooler with Ice	For transporting samples to the laboratory
Digital Camera	For documenting field conditions at time of inspection
Personal Protective Equipment (PPE)	Reflective vest, Safety glasses and boots at a minimum
GPS Receiver	For taking spatial location data
Water Quality Sonde	If needed, for sampling conductivity, temperature, pH
Water Quality Meter	Hand held meter, if available, for testing for various water quality parameters such as ammonia, surfactants and chlorine
Test Kits	Have extra kits on hand to sample more outfalls than are anticipated to be screened in a single day
Label Tape	For labeling sample containers
Sample Containers	Make sure all sample containers are clean. Keep extra sample containers on hand at all times. Make sure there are proper sample containers for what is being sampled for (i.e., bacteria requires sterile containers).
Pry Bar or Pick	For opening catch basins and manholes when necessary
Sandbags	For damming low flows in order to take samples
Small Mallet or Hammer	Helping to free stuck manhole and catch basin covers
Utility Knife	Multiple uses
Measuring Tape	Measuring distances and depth of flow
Safety Cones	Safety
Hand Sanitizer	Disinfectant/decontaminant
Zip Ties/Duct Tape	For making field repairs
Rubber Boots/Waders	For accessing shallow streams/areas
Sampling Pole/Dipper/Sampling Cage	For accessing hard to reach outfalls and manholes

6.2.3 Sample Collection and Analysis

If flow is present during a dry weather outfall inspection, a sample will be collected and analyzed for the required permit parameters[3] listed in **Table 6-2**. The general procedure for collection of outfall samples is as follows:

1. Fill out all sample information on sample bottles and field sheets (see **Appendix C** for Sample Labels and Field Sheets)
2. Put on protective gloves (nitrile/latex/other) before sampling
3. Collect sample with dipper or directly in sample containers. If possible, collect water from the flow directly in the sample bottle. Be careful not to disturb sediments.
4. If using a dipper or other device, triple rinse the device with distilled water and then in water to be sampled (not for bacteria sampling)
5. Use test strips, test kits, and field meters (rinse similar to dipper) for most parameters (see **Table 6-2**)
6. Place laboratory samples on ice for analysis of bacteria and pollutants of concern
7. Fill out chain-of-custody form (**Appendix C**) for laboratory samples
8. Deliver samples to Alpha Analytical
9. Dispose of used test strips and test kit ampules properly
10. Decontaminate all testing personnel and equipment

In the event that an outfall is submerged, either partially or completely, or inaccessible, field staff will proceed to the first accessible upstream manhole or structure for the observation and sampling and report the location with the screening results. Field staff will continue to the next upstream structure until there is no longer an influence from the receiving water on the visual inspection or sampling.

Field test kits or field instrumentation are permitted for all parameters except indicator bacteria and any pollutants of concern. Field kits need to have appropriate detection limits and ranges. **Table 6-2** lists various field test kits and field instruments that can be used for outfall sampling associated with the 2016 MS4 Permit parameters, other than indicator bacteria and any pollutants of concern. Analytic procedures and user's manuals for field test kits and field instrumentation are provided in **Appendix D**.

Table 6-2. Sampling Parameters and Analysis Methods

Analyte or Parameter	Instrumentation (Portable Meter)	Field Test Kit
Ammonia	CHEMetrics™ V-2000 Colorimeter Hach™ DR/890 Colorimeter Hach™ Pocket Colorimeter™ II	CHEMetrics™ K-1410 CHEMetrics™ K-1510 (series) Hach™ NI-SA Hach™ Ammonia Test Strips

[3] Other potentially useful parameters, although not required by the MS4 Permit, include **fluoride** (indicator of potable water sources in areas where water supplies are fluoridated), **potassium** (high levels may indicate the presence of septic wastewater), and **optical brighteners** (indicative of laundry detergents).

Analyte or Parameter	Instrumentation (Portable Meter)	Field Test Kit
Surfactants (Detergents)	CHEMetrics™ I-2017	CHEMetrics™ K-9400 and K-9404 Hach™ DE-2
Chlorine	CHEMetrics™ V-2000, K-2513 Hach™ Pocket Colorimeter™ II	NA
Conductivity	CHEMetrics™ I-1200 YSI Pro30 YSI EC300A Oakton 450	NA
Temperature	YSI Pro30 YSI EC300A Oakton 450	NA
Salinity	YSI Pro30 YSI EC300A Oakton 450	NA
Temperature	YSI Pro30 YSI EC300A Oakton 450	NA
Indicator Bacteria: *E. coli* (freshwater) or Enterococcus (saline water)	EPA certified laboratory procedure (40 CFR § 136)	NA
Pollutants of Concern[1]	EPA certified laboratory procedure (40 CFR § 136)	NA

[1] Where the discharge is directly into a water quality limited water or a water subject to an approved TMDL, the sample must be analyzed for the pollutant(s) of concern identified as the cause of the water quality impairment.

Testing for indicator bacteria and any pollutants of concern must be conducted using analytical methods and procedures found in 40 CFR § 136.[4] Samples for laboratory analysis must also be stored and preserved in accordance with procedures found in 40 CFR § 136. **Table 6-3** lists analytical methods, detection limits, hold times, and preservatives for laboratory analysis of dry weather sampling parameters.

Table 6-3. Required Analytical Methods, Detection Limits, Hold Times, and Preservatives[4]

Analyte or Parameter	Analytical Method	Detection Limit	Max. Hold Time	Preservative
Ammonia	**EPA**: 350.2, **SM**: 4500-NH3C	0.05 mg/L	28 days	Cool ≤6°C, H_2SO_4 to pH <2, No preservative required if

[4] 40 CFR § 136: http://www.ecfr.gov/cgi-bin/text-idx?SID=b3b41fdea0b7b0b8cd6c4304d86271b7&mc=true&node=pt40.25.136&rgn=div5

Analyte or Parameter	Analytical Method	Detection Limit	Max. Hold Time	Preservative
				analyzed immediately
Surfactants	**SM**: 5540-C	0.01 mg/L	48 hours	Cool ≤6°C
Chlorine	**SM**: 4500-Cl G	0.02 mg/L	Analyze within 15 minutes	None Required
Temperature	**SM**: 2550B	*NA*	Immediate	None Required
Specific Conductance	**EPA**: 120.1, **SM**: 2510B	0.2 µs/cm	28 days	Cool ≤6°C
Salinity	**SM**: 2520	-	28 days	Cool ≤6°C
Indicator Bacteria: *E.coli* Enterococcus	*E.coli* **EPA**: 1603 **SM**: 9221B, 9221F , 9223 B **Other**: Colilert®, Colilert-18® *Enterococcus* **EPA**: 1600 **SM**: 9230 C **Other**: Enterolert®	*E.coli* **EPA**: 1 cfu/100mL **SM**: 2 MPN/100mL **Other**: 1 MPN/100mL *Enterococcus* **EPA**: 1 cfu/100mL **SM**: 1 MPN/100mL **Other**: 1 MPN/100mL	8 hours	Cool ≤10°C, 0.0008% $Na_2S_2O_3$
Total Phosphorus	**EPA**: Manual-365.3, Automated Ascorbic acid digestion-365.1 Rev. 2, ICP/AES4-200.7 Rev. 4.4 **SM**: 4500-P E-F	**EPA**: 0.01 mg/L **SM** : 0.01 mg/L	28 days	Cool ≤6°C, H_2SO_4 to pH <2
Total Nitrogen (Ammonia + Nitrate/Nitrite, methods are for Nitrate-Nitrite and need to be combined with Ammonia listed above.)	**EPA**: Cadmium reduction (automated)-353.2 Rev. 2.0, **SM**: 4500-NO_3 E-F	**EPA**: 0.05 mg/L **SM** : 0.05 mg/L	28 days	Cool ≤6°C, H_2SO_4 to pH <2

SM = Standard Methods

6.3 Interpreting Outfall Sampling Results

Outfall analytical data from dry weather sampling can be used to help identify the major type or source of discharge. **Table 6-4** shows values identified by the U.S. EPA and the Center for Watershed Protection as typical screening values for select parameters. These represent the typical concentration (or value) of each parameter expected to be found in stormwater. Screening values that exceed these benchmarks may be indicative of pollution and/or illicit discharges.

Table 6-4. Benchmark Field Measurements for Select Parameters

Analyte or Parameter	Benchmark
Ammonia	>0.5 mg/L
Conductivity	>2,000 µS/cm
Surfactants	>0.25 mg/L
Chlorine	>0.02 mg/L (detectable levels per the 2016 MS4 Permit)
Indicator Bacteria[5]: *E.coli* *Enterococcus*	*E.coli*: the geometric mean of the five most recent samples taken during the same bathing season shall not exceed 126 colonies per 100 ml and no single sample taken during the bathing season shall exceed 235 colonies per 100 ml *Enterococcus:* the geometric mean of the five most recent samples taken during the same bathing season shall not exceed 33 colonies per 100 ml and no single sample taken during the bathing season shall exceed 61 colonies per 100 ml

6.4 Follow-up Ranking of Outfalls and Interconnections

The Town of Boxford DPW will update and re-prioritize the initial outfall and interconnection rankings based on information gathered during dry weather screening. The rankings will be updated periodically as dry weather screening information becomes available, but will be updated within three (3) years of the effective date of the permit (July 1, 2021).

Outfalls/interconnections where relevant information was found indicating septic input to the MS4 or sampling results indicating septic input are highly likely to contain illicit discharges from sanitary/septic sources. Such outfalls/interconnections will be ranked at the top of the High Priority Outfalls category for investigation. Other outfalls and interconnections may be re-ranked based on any new information from the dry weather screening.

[5] Massachusetts Water Quality Standards: http://www.mass.gov/eea/docs/dep/service/regulations/314cmr04.pdf

7 Catchment Investigations

Once stormwater outfalls with evidence of illicit discharges have been identified, various methods can be used to trace the source of the potential discharge within the outfall catchment area. Catchment investigation techniques include but are not limited to review of maps, historic plans, and records; manhole observation; dry and wet weather sampling; video inspection; smoke testing; and dye testing. This section outlines a systematic procedure to investigate outfall catchments to trace the source of potential illicit discharges. All data collected as part of the catchment investigations will be recorded and reported in each annual report. **Written Catchment Investigation Procedures are due December 2019.**

7.1 System Vulnerability Factors

The Boxford DPW will review relevant mapping and historic plans and records to identify areas within the catchment with higher potential for illicit connections. The following information will be reviewed:

- Plans related to the construction of the drainage network
- Prior work on storm drains
- Board of Health or other municipal data on septic systems
- Septic system breakouts.

Based on the review of this information, the presence of any of the following **System Vulnerability Factors (SVFs)** may be identified for each catchment:

- Any storm drain infrastructure greater than 40 years old
- Widespread code-required septic system upgrades required at property transfers (indicative of inadequate soils, water table separation, or other physical constraints of the area rather that poor owner maintenance) or known basement sump interconnection
- History of multiple Board of Health actions addressing widespread septic system failures (indicative of inadequate soils, water table separation, or other physical constraints of the area rather that poor owner maintenance).

A SVF inventory will be documented for each covered catchment (see **Table 7-1**) **by December 2019**, retained as part of this IDDE Plan, and included in the annual report.

Table 7-1. Outfall Catchment System Vulnerability Factor (SVF) Inventory

Town of Boxford, Massachusetts

#	MIMAP Object ID	Outfall ID OUT-	UA?	Receiving Water	1 Storm Drain Infrastructure >40 years Old	2 Septic with Poor Soils or Water Table Separation or Known Sump	3 History of BOH Actions Addressing Septic Failure	Notes
			Yes/No	Name	Yes/No	Yes/No	Yes/No	

Presence/Absence Evaluation Criteria:

1. Any storm drain infrastructure greater than 40 years old
2. Widespread code-required septic system upgrades required at property transfers (indicative of inadequate soils, water table separation, or other physical constraints of the area rather that poor owner maintenance) or known basement sump interconnection
3. History of multiple Board of Health actions addressing widespread septic system failures (indicative of inadequate soils, water table separation, or other physical constraints of the area rather that poor owner maintenance)

7.2 Dry Weather Manhole Inspections

The Town of Boxford will implement a dry weather storm drain network investigation that involves systematically and progressively observing, sampling and evaluating key junction manholes in the MS4 to determine the approximate location of suspected illicit discharges.

The DPW will be responsible for implementing the dry weather manhole inspection program and making updates as necessary. Infrastructure information will be incorporated into the storm system map, and catchment delineations will be refined based on the field investigation, where necessary. The SVF inventory will also be updated based on information obtained during the field investigations, where necessary.

Several important terms related to the dry weather manhole inspection program are defined by the MS4 Permit as follows:

- *Junction Manhole* is a manhole or structure with two or more inlets accepting flow from two or more MS4 alignments. Manholes with inlets solely from private storm drains, individual catch basins, or both are not considered junction manholes for these purposes.

- *Key Junction Manholes* are those junction manholes that can represent one or more junction manholes without compromising adequate implementation of the illicit discharge program. Adequate implementation of the illicit discharge program would not be compromised if the exclusion of a particular junction manhole as a key junction manhole would not affect the permittee's ability to determine the possible presence of an upstream illicit discharge. A permittee may exclude a junction manhole located upstream from another located in the immediate vicinity or that is serving a drainage alignment with no potential for illicit connections.

For all catchments identified for investigation, during dry weather, field crews will systematically inspect **key junction manholes** for evidence of illicit discharges. This program involves progressive inspection and sampling at manholes in the storm drain network to isolate and eliminate illicit discharges.

The manhole inspection methodology will be conducted in one of two ways (or a combination of both):

- By working progressively up from the outfall and inspecting key junction manholes along the way, or
- By working progressively down from the upper parts of the catchment toward the outfall.

For most catchments, manhole inspections will proceed from the outfall moving up into the system. However, the decision to move up or down the system depends on the nature of the drainage system and the surrounding land use and the availability of information on the catchment and drainage system. Moving up the system can begin immediately when an illicit discharge is detected at an outfall, and only a map of the storm drain system is required. Moving down the system requires more advance preparation and reliable drainage

system information on the upstream segments of the storm drain system, but may be more efficient if the sources of illicit discharges are believed to be located in the upstream portions of the catchment area. Once a manhole inspection methodology has been selected, investigations will continue systematically through the catchment.

Inspection of key junction manholes will proceed as follows:

1. Manholes will be opened and inspected for visual and olfactory evidence of illicit connections. A sample field inspection form is provided in **Appendix C**.

2. If flow is observed, a sample will be collected and analyzed at a minimum for ammonia, chlorine, and surfactants. Field kits can be used for these analyses. Sampling and analysis will be in accordance with procedures outlined in **Section 6**. Additional indicator sampling may assist in determining potential sources (e.g., bacteria for sanitary/septic flows, conductivity to detect tidal backwater, etc.).

3. Where sampling results or visual or olfactory evidence indicate potential illicit discharges, the area draining to the junction manhole will be flagged for further upstream manhole investigation and/or isolation and confirmation of sources.

4. Subsequent key junction manhole inspections will proceed until the location of suspected illicit discharges can be isolated to a pipe segment between two manholes.

5. If no evidence of an illicit discharge is found, catchment investigations will be considered complete upon completion of key junction manhole sampling.

7.3 Wet Weather Outfall Sampling

Where a minimum of one (1) System Vulnerability Factor (SVF) is identified based on previous information or the catchment investigation, a wet weather investigation must also be conducted at the associated outfall. The DPW will be responsible for implementing the wet weather outfall sampling program and making updates as necessary.

Outfalls will be inspected and sampled under wet weather conditions, to the extent necessary, to determine whether wet weather-induced high flows in sewers or high groundwater in areas served by septic systems result in discharges of sanitary flow to the MS4.

Wet weather outfall sampling will proceed as follows:

1. At least one wet weather sample will be collected at the outfall for the same parameters required during dry weather screening.

2. Wet weather sampling will occur during or after a storm event of sufficient depth or intensity to produce a stormwater discharge at the outfall. There is no specific rainfall amount that will

trigger sampling. To the extent feasible, sampling should occur during the spring (March through June) when groundwater levels are relatively high.

3. If wet weather outfall sampling indicates a potential illicit discharge, then additional wet weather source sampling will be performed, as warranted, or source isolation and confirmation procedures will be followed as described in **Section 7.4**.

4. If wet weather outfall sampling does not identify evidence of illicit discharges, and no evidence of an illicit discharge is found during dry weather manhole inspections, catchment investigations will be considered complete.

7.4 Source Isolation and Confirmation

Once the source of an illicit discharge is approximated between two manholes, more detailed investigation techniques will be used to isolate and confirm the source of the illicit discharge. The following methods may be used in isolating and confirming the source of illicit discharges

- Sandbagging
- Smoke Testing
- CCTV/Video Inspection
- Dye Testing
- Optical Brightener Monitoring

These methods are described in the sections below. Instructions and Standard Operating Procedures (SOPs) for these and other IDDE methods are provided in **Appendix F**.

Public notification is an important aspect of a detailed source investigation program. Prior to smoke testing, dye testing, or TV inspections, the DPW will notify property owners in the affected area. Notification will be made to single family homes, businesses and building lobbies for multi-family dwellings. The DPW will also notify the Board of Health, Fire Department, Police Department, etc., as appropriate.

7.4.1 Sandbagging

This technique can be particularly useful when attempting to isolate intermittent illicit discharges or those with very little perceptible flow. The technique involves placing sandbags or similar barriers (e.g., caulking, weirs/plates, or other temporary barriers) within outlets to manholes to form a temporary dam that collects any intermittent flows that may occur. Sandbags are typically left in place for 48 hours, and should only be installed when dry weather is forecast. If flow has collected behind the sandbags/barriers after 48 hours it can be assessed using visual observations or by sampling. If no flow collects behind the sandbag, the upstream pipe network can be ruled out as a source of the intermittent

discharge. Finding appropriate durations of dry weather and the need for multiple trips to each manhole makes this method both time-consuming and somewhat limiting.

7.4.2 Smoke Testing

Smoke testing involves injecting non-toxic smoke into drains and noting the emergence of smoke from sewer vents in illegally connected buildings or from cracks and leaks in the system itself. Typically a smoke bomb or smoke generator is used to inject the smoke into the system at a catch basin or manhole and air is then forced through the system. Test personnel are place in areas where there are suspected illegal connections or cracks/leaks, noting any escape of smoke (indicating an illicit connection or damaged storm drain infrastructure). It is important when using this technique to make proper notifications to area residents and business owners as well as local police and fire departments.

If the initial test of the storm drain system is unsuccessful then a more thorough smoke-test of the sewer lines can also be performed. Unlike storm drain smoke tests, buildings that do not emit smoke during sewer smoke tests may have problem connections and may also have sewer gas venting inside, which is hazardous.

It should be noted that smoke may cause minor irritation of respiratory passages. Residents with respiratory conditions may need to be monitored or evacuated from the area of testing altogether to ensure safety during testing.

7.4.3 Dye Testing

Dye testing involves flushing non-toxic dye into plumbing fixtures such as toilets, showers, floor drains, and sinks and observing nearby storm drains and sewer manholes as well as stormwater outfalls for the presence of the dye. Similar to smoke testing, it is important to inform local residents and business owners. Police, fire, and the Board of Health should also be notified prior to testing in preparation of responding to citizen phone calls concerning the dye and their presence in local surface waters.

A team of two or more people is needed to perform dye testing (ideally, all with two-way radios). One person is inside the building, while the others are stationed at the appropriate storm sewer and sewer manholes (which should be opened) and/or outfalls. The person inside the building adds dye into a plumbing fixture (i.e., toilet or sink) and runs a sufficient amount of water to move the dye through the plumbing system. The person inside the building then radios to the outside crew that the dye has been dropped, and the outside crew watches for the dye in the storm sewer, recording the presence or absence of the dye.

The test can be relatively quick (about 30 minutes per test), effective (results are usually definitive), and inexpensive. Dye testing is best used when the likely source of an illicit discharge has been narrowed down to a few specific houses or businesses.

7.4.4 CCTV/Video Inspection

Another method of source isolation involves the use of mobile video cameras that are guided remotely through stormwater drain lines to observe possible illicit discharges. IDDE program staff can review the videos and note any visible illicit discharges. While this tool is both effective and usually definitive, it can be costly and time consuming when compared to other source isolation techniques.

7.4.5 Optical Brightener Monitoring

Optical brighteners are fluorescent dyes that are used in detergents and paper products to enhance their appearance. The presence of optical brighteners in surface waters or dry weather discharges suggests there is a possible illicit discharge or insufficient removal through adsorption in nearby septic systems. Optical brightener monitoring involves placing a cotton pad in a wire cage and securing it in a pipe, manhole, catch basin, or inlet to capture intermittent dry weather flows. The pad is retrieved at a later date and placed under UV light to determine the presence/absence of brighteners during the monitoring period.

7.5 Illicit Discharge Removal

When the specific source of an illicit discharge is identified, the Town of Boxford Conservation Commission will exercise its authority as necessary to require its removal. The annual report will include the status of IDDE investigation and removal activities including the following information for each confirmed source:

- The location of the discharge and its source(s)
- A description of the discharge
- The method of discovery
- Date of discovery
- Date of elimination, mitigation or enforcement action OR planned corrective measures and a schedule for completing the illicit discharge removal
- Estimate of the volume of flow removed, if possible.

7.5.1 Confirmatory Outfall Screening

Within one (1) year of removal of all identified illicit discharges within a catchment area, confirmatory outfall or interconnection screening will be conducted. The confirmatory screening will be conducted in dry weather unless System Vulnerability Factors have been identified, in which case both dry weather and wet weather confirmatory screening will be conducted. If confirmatory screening indicates evidence of additional illicit discharges, the catchment will be scheduled for additional investigation.

7.6 Ongoing Screening

Upon completion of all catchment investigations and illicit discharge removal and confirmation (if necessary), each outfall or interconnection will be re-prioritized for screening and scheduled for ongoing screening once every five (5) years. Ongoing screening will consist of dry weather screening and sampling consistent with the procedures described in **Section 6** of this plan. Ongoing wet weather screening and sampling will also be conducted at outfalls where wet weather screening was required due to System Vulnerability Factors and will be conducted in accordance with the procedures described in **Section 7.3**. All sampling results will be reported in the annual report.

8 Training

Annual IDDE training will be made available to all employees involved in the IDDE program, including those within the DPW and the members of the Stormwater Advisory Committee. The training will be coordinated and appropriate records maintained by the DPW. This training will at a minimum include information on how to identify illicit discharges and may also include additional training specific to the functions of particular personnel and their function within the framework of the IDDE program. Training records will be maintained in **Appendix E**. The frequency and type of training will be included in the annual report.

9 Progress Reporting

The progress and success of the IDDE program will be evaluated on an annual basis. The evaluation will be documented in the annual report prepared by the DPW Superintendent and will include, as appropriate, the following indicators of program progress:

- Number of illicit discharges identified and removed
- Number and percent of total outfall catchments served by the MS4 evaluated using the catchment investigation procedure
- Number of dry weather outfall inspections/screenings
- Number of wet weather outfall inspections/sampling events
- Number of enforcement notices issued
- All dry weather and wet weather screening and sampling results
- Number of employees trained annually.

The success of the IDDE program will be measured by the IDDE activities completed within the required permit timelines. The annual report will be submitted to the MassDEP and EPA.

Appendix A

Legal Authority (IDDE Bylaw or Ordinance)

Appendix B

Storm System Mapping

Appendix C

Field Forms, Sample Bottle Labels, and Chain of Custody Forms

Appendix D

Water Quality Analysis Instructions, User's Manuals and Standard Operating Procedures

Appendix E

IDDE Employee Training Record

Illicit Discharge Detection and Elimination (IDDE)
Employee Training Record

Town of Boxford, Massachusetts

Date of Training: **6/8/2021**

Duration of Training: **apx 1 hours**

Name Please Print Clearly	**Title**
Chris Olbrot	Superintendent
David Noyes	Foreman
Eric Wendell	Asst. Foreman
David Waterhouse	HEO-1
Mikey Ricker	HEO-1
Josh Flanagan	HEO-1
TJ Bowden	HEO-1
Jake Girard	HEO-1
Brody Flynn	Laborer
Nathaniel Noyes	Summer Help

Appendix F

Source Isolation and Confirmation Methods: Instructions, Manuals, and SOPs