Illicit Discharge Detection and Elimination (IDDE) Plan

Town of Uxbridge

June 30, 2018
Revised Through June 30, 2021

Table of Contents

Illicit Discharge Detection and Elimination Plan
Central Massachusetts Regional Stormwater Coalition

Tables

Figures

Appendices

1 Introduction

1.1 MS4 Program

This Illicit Discharge Detection and Elimination (IDDE) Plan has been developed by the Town of Uxbridge 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 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 to avoid the costs of a sewer connection fee and service, 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 sanitary sewer 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, such as funding and designing a project to reconnect sanitary sewer laterals. 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 Town of Uxbridge'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

Town of Uxbridge, Massachusetts

Water Body Name	Segment ID	Category	Impairment(s)	Associated Approved TMDL
Blackstone River	51-04 & 51-05	5	Bacteria, Phosphorus, Solids, etc.	N/A
Mumford River	51-14	5	Phosphorus, Solids, etc.	N/A
West River	51-12	5	Chloride, Solids, etc.	N/A

Category 4a Waters – impaired water bodies with a completed Total Maximum Daily Load (TMDL).
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.

1.5 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

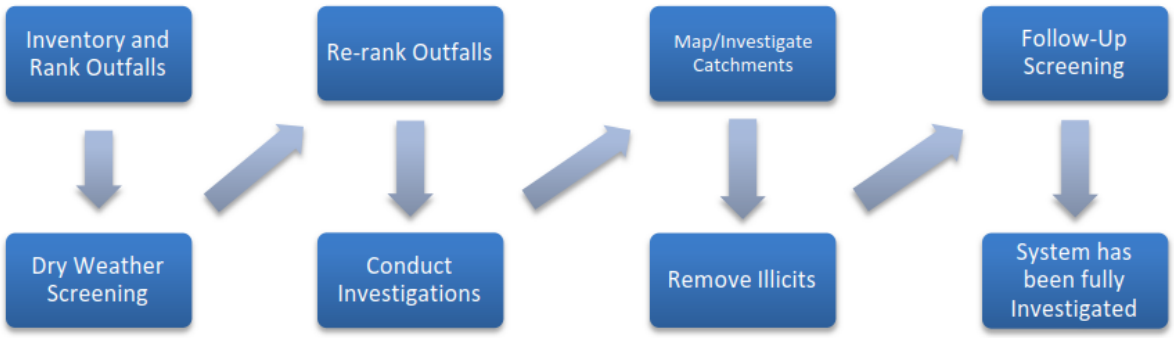


Table 1-2. IDDE Program Implementation Timeline

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					
SSO Inventory	X					
Written Catchment Investigation Procedure		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 Uxbridge 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 (within Stormwater Bylaw)

- 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:

- SSO inventory
- 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 Uxbridge has adopted a Stormwater Bylaw (Adopted November 10, 2015 Town Meeting). A copy of the Stormwater Bylaw is provided in **Appendix A**. The Stormwater Bylaw provides the Town of Uxbridge 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 Uxbridge will review its current Stormwater Bylaw and related land use regulations and policies for consistency with the 2016 MS4 Permit.

2.2 Statement of Responsibilities

The Planning Board is the lead municipal agency or department responsible for implementing the IDDE program pursuant to the provisions of the Stormwater Bylaw. The Department of Public Works is the lead municipal agency responsible for outfall investigations and remediation. Other agencies or departments with responsibility for aspects of the program include:

- Highway Department – Stormwater system.
- Sewer Department – Sewer system.
- Building Inspector and/or Code Enforcement Officer – Building within town and possible enforcement of the Stormwater Bylaw.
- Licensed Plumbing Inspector – Plumbing systems.

- Health Department – Health inspections including but not limited to septic system and restaurants.
- Conservation Agent – Wetland permitting and site construction.
- Conservation Commission – Wetland permitting and site construction.
- Planning Board – Stormwater Bylaw and Regulations. Site plan and subdivision permitting and construction.
- Board of Selectmen – Oversight of Town. Possible involvement in negotiations/fines to remove illicit discharges.
- Town Administrator and/or Mayor - Oversight of Town. Possible involvement in negotiations/fines to remove illicit discharges.

All the above offices should respond to complaints, investigate potential violations and take/recommend/coordinate appropriate actions as part of their duties.

3 Stormwater System Mapping

The Town of Uxbridge 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 Department of Public Works is responsible for updating the stormwater system mapping pursuant to the 2016 MS4 Permit. The Town of Uxbridge 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 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
- 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.

The Town of Uxbridge 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)
- Interconnections with other MS4s and other storm sewer systems
- Municipally owned stormwater treatment structures

3.2 Phase II Mapping

Phase II mapping must be completed within ten (10) years of the effective date of the permit (July 1, 2027) 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.
- Municipal Sanitary Sewer system (if available)
- Municipal combined sewer system (if applicable).

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

- Outfall spatial location (latitude and longitude with a minimum accuracy of +/-30 feet)
- Pipes
- Manholes
- Catch basins
- Municipal Sanitary Sewer system

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

3.3 Additional Recommended Mapping Elements

Although not a requirement of the 2016 MS4 Permit, the Town of Uxbridge has included the following recommended elements in its storm system mapping:

- Storm sewer material, size (pipe diameter), age
- Sanitary sewer system material, size (pipe diameter), age

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 Uxbridge has completed an inventory of SSOs that have discharged to the MS4 within the five (5) years prior to the effective date of the 2016 MS4 Permit, based on review of available documentation pertaining to SSOs (**Table 4-1**). The inventory includes all SSOs that occurred during wet or dry weather resulting from inadequate conveyance capacities or where interconnectivity of the storm and sanitary sewer infrastructure allows for transfer of flow between systems.

Upon detection of an SSO, the Town of Uxbridge will eliminate it as expeditiously as possible and take interim measures to minimize the discharge of pollutants to and from its MS4 until the SSO is eliminated. Upon becoming aware of an SSO to the MS4, the Town of Uxbridge will provide oral notice to EPA within 24 hours and written notice to EPA and MassDEP within five (5) days of becoming aware of the SSO occurrence.

The inventory in **Table 4-1** will be updated by the Department of Public Works when new SSOs are detected. The SSO inventory will be included in the annual report, including the status of mitigation and corrective measures to address each identified SSO.

Table 4-1. SSO Inventory

Town of Uxbridge, Massachusetts
Revision Date: June 14, 2019

SSO Location[1]	Discharge Statement[2]	Date[3]	Time Start[3]	Time End[3]	Estimated Volume[4]	Description[5]	Mitigation Completed[6]	Mitigation Planned[7]
11 & 13 S. Main St.	Contained within building	6/25/16	1:15	2:00	1500 Gal.	Damaged sewer pipe backed up into building	Commercial properties closed & tenants relocated. 6/25/19. Removed blockage. 6/27/19.	
99 Hartford Ave East	Contained within building	1/4/19	8:00am	9:30am	<50 Gal.	Inverted siphon blocked. Sewage backed up into laundry room of building.	Removed blockage. Increased inspection frequency. 1/5/19.	
338 N. Main Street	Discharge entered catch basins (owned by MassDOT) in the vicinity of the SSO.	3/16/21	12pm	1-55pm	1000 Gal.	Downstream blockage created an overflow from a smh.	Removed blockage. Monitored to confirm would not happen again.	

[1] Location (approximate street crossing/address and receiving water, if any)
[2] A clear statement of whether the discharge entered a surface water directly or entered the MS4
[3] Date(s) and time(s) of each known SSO occurrence (i.e., beginning and end of any known discharge)
[4] Estimated volume(s) of the occurrence
[5] Description of the occurrence indicating known or suspected cause(s)
[6] Mitigation and corrective measures completed with dates implemented
[7] Mitigation and corrective measures planned with implementation schedules

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

[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.

- 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

- **Density of generating sites** – Generating sites are those places, including institutional, municipal, commercial, or industrial sites, with a potential to generate pollutants that could contribute to illicit discharges. Examples of these sites include, but are not limited to, car dealers; car washes; gas stations; garden centers; and industrial manufacturing areas.

- **Age of development and infrastructure** – Industrial areas greater than 40 years old and areas where the sanitary sewer system is more than 40 years old will probably have a high illicit discharge potential. Developments 20 years or younger will probably have a low illicit discharge potential.

- **Sewer conversion** – Contributing catchment areas that were once serviced by septic systems, but have been converted to sewer connections may have a high illicit discharge potential.

- **Historic combined sewer systems** – Contributing areas that were once serviced by a combined sewer system, but have been separated may have a high illicit discharge potential.

- **Surrounding density of aging septic systems** – Septic systems thirty years or older in residential land use areas are prone to have failures and may have a high illicit discharge potential.

- **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 a sample format for an outfall inventory and priority ranking matrix.

Table 5-1. Outfall Inventory and Priority Ranking Matrix

Town of Uxbridge, Massachusetts
Revision Date: ##DATE OF LAST UPDATE

Outfall ID	Receiving Water	Previous Screening Results Indicate Likely Sewer Input? [1]	Discharging to Area of Concern to Public Health? [2]	Frequency of Past Discharge Complaints	Receiving Water Quality [3]	Density of Generating Sites [4]	Age of Development/ Infrastructure [5]	Historic Combined Sewers or Septic? [6]	Aging Septic? [7]	Culverted Streams? [8]	Additional Characteristics	Score	Priority Ranking
Information Source		Outfall inspections and sample results	GIS Maps	Town Staff	Impaired Waters List	Land Use/GIS Maps, Aerial Photography	Land Use Information, Visual Observation	Town Staff, GIS Maps	Land Use, Town Staff	GIS and Storm System Maps	Other		
Scoring Criteria		Yes = 3 (Problem Outfall) No = 0	Yes = 3 No = 0	Frequent = 3 Occasional = 2 None = 0	Poor = 20 Fair = 15 Good = 0	High = 3 Medium = 2 Low = 1	High = 3 Medium = 2 Low = 1	Yes = 3 No = 0	Yes = 3 No = 0	Yes = 3 No = 0	TBD		
Sample 1	XYZ River	3	0	2	0	2	1	0	0	3	None	11	Problem
Sample 2	XYZ Lake	0	3	0	3	1	2	0	3	3	None	15	High Priority
Sample 3	XYZ Stream	0	0	2	0	1	1	0	0	0	None	4	Low Priority

Scoring Criteria:

[1] Previous screening results indicate likely sewer 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) (Used 15 for fair to scueue numbers as water quality impairments for Blackstone, Mumford and West Rivers necessitate them being categorized as High Priority)
- Good = No water quality impairments

[4] Generating sites are institutional, municipal, commercial, or industrial sites with a potential to contribute to illicit discharges (e.g., car dealers, car washes, gas stations, garden centers, industrial manufacturing, etc.)

[5] Age of development and infrastructure:

- High = Industrial areas greater than 40 years old and areas where the sanitary sewer system is more than 40 years old – (Use 82 USGS for Industrial, sewer system not older than 40 years so n/a)
- Medium = Developments 20-40 years old – (Use 2001 Orthophoto)
- Low = Developments less than 20 years old – (Remaining parcels)

[6] Areas once served by combined sewers and but have been separated, or areas once served by septic systems but have been converted to sanitary sewers. (no combined sewer, use areas that got sewer from 1979 to 1991 and were on the 1982 usgs, 1996 was title v)

[7] Aging septic systems are septic systems 30 years or older in residential areas. – (Use 1995 Orthophoto)

[8] Any river or stream that is culverted for distance greater than a simple roadway crossing. (In the

NPDES MS4 Outfall Inventory

NewPeopleID	Reg.	Rec. Water	Previous Screening Indicate Likely Sewer Input; Yes=3, No=0	Discharge to Area of Public Health Concern; Yes=3, No=0	Frequency of Past Discharge Complaints; Freq=3, Occ=2, None=0	Receiving Water Quality Poor=20, Fair=15, Good=0	Density of Generating Sites High=3, Med=2, Low=1	Development/Infrastructure Age High=3, Med=2, Low=1	Historic Combined Sewers/Septic Yes=3, No=0	Aging Septic? Yes3, No=0	Culverted Streams Yes=3, No=0	Score	Priority Ranking
OF-234	Y	Mumford River	0	3	0	15	1	3	3	3	0	28	High Priority
OF-107	Y	Blackstone River	0	3	0	15	3	3	3	0	0	27	High Priority
OF-108	Y	Blackstone River	0	3	0	15	3	3	3	0	0	27	High Priority
OF-193	Y	Mumford River	0	0	0	15	3	3	3	0	3	27	High Priority
OF-122	Y	Blackstone River	0	0	0	15	3	2	3	3	0	26	High Priority
OF-355	Y	Mumford River	0	0	0	15	1	3	3	3	0	25	High Priority
OF-1	Y	Mumford River	0	0	0	15	3	3	3	0	0	24	High Priority
OF-109	Y	Blackstone River	0	0	0	15	3	3	3	0	0	24	High Priority
OF-119	Y	Blackstone River	0	0	0	15	1	2	3	3	0	24	High Priority
OF-189	Y	Mumford River	0	0	0	15	3	3	3	0	0	24	High Priority
OF-190	Y	Mumford River	0	0	0	15	3	3	3	0	0	24	High Priority
OF-191	Y	Mumford River	0	0	0	15	3	3	3	0	0	24	High Priority
OF-192	Y	Mumford River	0	0	0	15	3	3	3	0	0	24	High Priority
OF-197	Y	Mumford River	0	0	0	15	3	3	3	0	0	24	High Priority
OF-212	Y	West River	0	0	0	15	1	2	3	3	0	24	High Priority
OF-213	Y	West River	0	0	0	15	3	3	3	0	0	24	High Priority
OF-22	Y	Blackstone River	0	0	0	15	1	2	3	3	0	24	High Priority
OF-333	Y	Mumford River	0	0	0	15	3	3	3	0	0	24	High Priority
OF-334	Y	Mumford River	0	0	0	15	3	3	3	0	0	24	High Priority
OF-38	Y	Mumford River	0	0	0	15	3	3	3	0	0	24	High Priority
OF-40	Y	Mumford River	0	0	0	15	3	3	3	0	0	24	High Priority
OF-56	Y	West River	0	0	0	15	3	3	3	0	0	24	High Priority
OF-57	Y	West River	0	0	0	15	3	3	3	0	0	24	High Priority
OF-58	Y	West River	0	0	0	15	3	3	3	0	0	24	High Priority
OF-68	Y	West River	0	0	0	15	1	2	3	3	0	24	High Priority
OF-82	Y	Blackstone River	0	0	0	15	3	3	3	0	0	24	High Priority
OF-84	Y	Blackstone River	0	0	0	15	3	3	3	0	0	24	High Priority
OF-18	Y	Blackstone River	0	3	0	15	3	2	0	0	0	23	High Priority
OF-25	Y	Mumford River	0	0	0	15	2	3	3	0	0	23	High Priority
OF-27	Y	Mumford River	0	0	0	15	2	3	3	0	0	23	High Priority
OF-359	Y	Blackstone River	0	0	0	15	2	3	3	0	0	23	High Priority
OF-105	Y	West River	0	0	0	15	1	3	3	0	0	22	High Priority
OF-218	Y	Blackstone River	0	0	0	15	2	2	3	0	0	22	High Priority
OF-228	Y	Mumford River	0	0	0	15	1	3	3	0	0	22	High Priority
OF-229	Y	Mumford River	0	0	0	15	1	3	3	0	0	22	High Priority
OF-232	Y	Mumford River	0	0	0	15	1	3	3	0	0	22	High Priority
OF-238	Y	Mumford River	0	0	0	15	1	3	3	0	0	22	High Priority
OF-240	Y	Mumford River	0	0	0	15	1	3	3	0	0	22	High Priority
OF-241	Y	Mumford River	0	0	0	15	1	3	3	0	0	22	High Priority
OF-249	Y	Blackstone River	0	0	0	15	1	3	3	0	0	22	High Priority
OF-55	Y	Blackstone River	0	0	0	15	2	2	3	0	0	22	High Priority
OF-60	Y	West River	0	0	0	15	3	1	3	0	0	22	High Priority
OF-61	Y	West River	0	0	0	15	3	1	3	0	0	22	High Priority
OF-89	Y	Blackstone River	0	0	0	15	2	2	0	3	0	22	High Priority
OF-10	Y	West River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-113	Y	West River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-116	Y	West River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-118	Y	West River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-120	Y	Blackstone River	0	0	0	15	1	2	3	0	0	21	High Priority
OF-121	Y	Blackstone River	0	0	0	15	1	2	3	0	0	21	High Priority
OF-123	Y	West River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-124	Y	West River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-138	Y	West River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-211	Y	West River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-217	Y	Blackstone River	0	0	0	15	1	2	3	0	0	21	High Priority
OF-23	Y	Blackstone River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-230	Y	Mumford River	0	0	0	15	1	2	3	0	0	21	High Priority
OF-233	Y	Mumford River	0	0	0	15	1	2	3	0	0	21	High Priority
OF-235	Y	Mumford River	0	0	0	15	1	2	3	0	0	21	High Priority
OF-236	Y	Mumford River	0	0	0	15	1	2	3	0	0	21	High Priority
OF-237	Y	Mumford River	0	0	0	15	1	2	3	0	0	21	High Priority
OF-3	Y	West River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-322	Y	Blackstone River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-42	Y	Mumford River	0	0	0	15	1	2	3	0	0	21	High Priority
OF-5	Y	Blackstone River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-53	Y	Blackstone River	0	0	0	15	1	2	3	0	0	21	High Priority
OF-6	Y	Blackstone River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-7	Y	West River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-74	Y	West River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-75	Y	West River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-77	Y	West River	0	0	0	15	1	2	0	3	0	21	High Priority

OF-78	Y	West River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-79	Y	West River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-8	Y	West River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-80	Y	Blackstone River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-81	Y	West River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-85	Y	Blackstone River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-86	Y	Blackstone River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-9	Y	West River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-93	Y	Blackstone River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-94	Y	Blackstone River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-95	Y	Blackstone River	0	0	0	15	1	2	0	3	0	21	High Priority
OF-117	Y	West River	0	0	0	15	1	1	0	3	0	20	High Priority
OF-207	Y	Blackstone River	0	0	0	15	1	1	3	0	0	20	High Priority
OF-231	Y	West River	0	0	0	15	1	1	0	3	0	20	High Priority
OF-335	Y	West River	0	0	0	15	1	1	3	0	0	20	High Priority
OF-357	Y	Blackstone River	0	0	0	15	1	1	0	3	0	20	High Priority
OF-4	Y	West River	0	0	0	15	3	2	0	0	0	20	High Priority
OF-76	Y	West River	0	0	0	15	1	1	0	3	0	20	High Priority
OF-101	Y	West River	0	0	0	15	3	1	0	0	0	19	High Priority
OF-100	Y	West River	0	0	0	15	2	1	0	0	0	18	High Priority
OF-204	Y	Mumford River	0	0	0	15	2	1	0	0	0	18	High Priority
OF-214	Y	Blackstone River	0	0	0	15	1	2	0	0	0	18	High Priority
OF-215	Y	Blackstone River	0	0	0	15	1	2	0	0	0	18	High Priority
OF-216	Y	Blackstone River	0	0	0	15	1	2	0	0	0	18	High Priority
OF-247	Y	Blackstone River	0	0	0	15	1	2	0	0	0	18	High Priority
OF-324	Y	Blackstone River	0	0	0	15	1	2	0	0	0	18	High Priority
OF-352	Y	Blackstone River	0	0	0	15	1	2	0	0	0	18	High Priority
OF-360	Y	Blackstone River	0	0	0	15	1	2	0	0	0	18	High Priority
OF-73	Y	West River	0	0	0	15	1	2	0	0	0	18	High Priority
OF-99	Y	West River	0	0	0	15	2	1	0	0	0	18	High Priority
OF-103	Y	West River	0	0	0	15	1	1	0	0	0	17	High Priority
OF-104	Y	West River	0	0	0	15	1	1	0	0	0	17	High Priority
OF-182	Y	Blackstone River	0	0	0	15	1	1	0	0	0	17	High Priority
OF-184	Y	Blackstone River	0	0	0	15	1	1	0	0	0	17	High Priority
OF-19	Y	Blackstone River	0	0	0	15	1	1	0	0	0	17	High Priority
OF-20	Y	Blackstone River	0	0	0	15	1	1	0	0	0	17	High Priority
OF-21	Y	West River	0	0	0	15	1	1	0	0	0	17	High Priority
OF-239	Y	Mumford River	0	0	0	15	1	1	0	0	0	17	High Priority
OF-30	Y	Mumford River	0	0	0	15	1	1	0	0	0	17	High Priority
OF-300	Y	Blackstone River	0	0	0	15	1	1	0	0	0	17	High Priority
OF-301	Y	Blackstone River	0	0	0	15	1	1	0	0	0	17	High Priority
OF-31	Y	Mumford River	0	0	0	15	1	1	0	0	0	17	High Priority
OF-321	Y	Blackstone River	0	0	0	15	1	1	0	0	0	17	High Priority
OF-328	Y	West River	0	0	0	15	1	1	0	0	0	17	High Priority
OF-336	Y	West River	0	0	0	15	1	1	0	0	0	17	High Priority
OF-51	Y	Blackstone River	0	0	0	15	1	1	0	0	0	17	High Priority
OF-54	Y	Blackstone River	0	0	0	15	1	1	0	0	0	17	High Priority
OF-67	Y	West River	0	0	0	15	1	1	0	0	0	17	High Priority
OF-72	Y	Blackstone River	0	0	0	15	1	1	0	0	0	17	High Priority
OF-83	Y	Blackstone River	0	0	0	15	1	1	0	0	0	17	High Priority
OF-88	Y	Blackstone River	0	0	0	15	1	1	0	0	0	17	High Priority
OF-98	Y	West River	0	0	0	15	1	1	0	0	0	17	High Priority
OF-244	Y	Blackstone Canal	0	3	0	0	3	3	3	0	0	12	Low Priority
OF-245	Y	Blackstone Canal	0	3	0	0	3	3	3	0	0	12	Low Priority
OF-35	Y	Rivulet Brook	0	0	0	0	3	3	3	0	0	9	Low Priority
OF-141	Y	Cold Spring Brook	0	0	0	0	1	2	3	3	0	9	Low Priority
OF-142	Y	Cold Spring Brook	0	0	0	0	1	2	3	3	0	9	Low Priority
OF-208	Y	Cold Spring Brook	0	0	0	0	1	2	3	3	0	9	Low Priority
OF-209	Y	Cold Spring Brook	0	0	0	0	1	2	3	3	0	9	Low Priority
OF-225	Y	Blackstone Canal	0	0	0	0	1	2	3	3	0	9	Low Priority
OF-24	Y	Cold Spring Brook	0	0	0	0	1	2	3	3	0	9	Low Priority
OF-26	Y	Cold Spring Brook	0	0	0	0	1	2	3	3	0	9	Low Priority
OF-284	Y	Cold Spring Brook	0	0	0	0	1	2	3	3	0	9	Low Priority
OF-285	Y	Cold Spring Brook	0	0	0	0	1	2	3	3	0	9	Low Priority
OF-49	Y	Bacon Brook	0	0	0	0	3	3	0	3	0	9	Low Priority
OF-50	Y	Bacon Brook	0	0	0	0	3	3	0	3	0	9	Low Priority
OF-221	Y	Blackstone Canal	0	0	0	0	1	3	0	3	0	7	Low Priority
OF-224	Y	Blackstone Canal	0	0	0	0	1	3	0	3	0	7	Low Priority
OF-254	Y	Drabbletail Brook	0	0	0	0	2	2	3	0	0	7	Low Priority
OF-286	Y	Drabbletail Brook	0	0	0	0	2	2	3	0	0	7	Low Priority
OF-33	Y	Taft Pond	0	0	0	0	1	3	3	0	0	7	Low Priority
OF-337	Y	Rivulet Brook	0	0	0	0	1	3	3	0	0	7	Low Priority
OF-36	Y	Rivulet Brook	0	0	0	0	1	3	3	0	0	7	Low Priority

OF-37	Y	Rivulet Brook	0	0	0	0	1	3	3	0	0	7	Low Priority
OF-47	Y	Ironstone Reservoir	0	0	0	0	1	3	0	3	0	7	Low Priority
OF-111	Y	Hecla Canal	0	0	0	0	1	2	3	0	0	6	Low Priority
OF-146	Y	Cold Spring Brook	0	0	0	0	1	2	0	3	0	6	Low Priority
OF-159	Y	Lackey Pond	0	0	0	0	1	2	0	3	0	6	Low Priority
OF-200	Y	Drabbletail Brook	0	0	0	0	1	2	3	0	0	6	Low Priority
OF-203	Y	Drabbletail Brook	0	0	0	0	1	2	3	0	0	6	Low Priority
OF-220	Y	Blackstone Canal	0	0	0	0	1	2	0	3	0	6	Low Priority
OF-222	Y	Blackstone Canal	0	0	0	0	1	2	0	3	0	6	Low Priority
OF-223	Y	Blackstone Canal	0	0	0	0	1	2	0	3	0	6	Low Priority
OF-253	Y	Drabbletail Brook	0	0	0	0	1	2	3	0	0	6	Low Priority
OF-261	Y	Cold Spring Brook	0	0	0	0	1	2	3	0	0	6	Low Priority
OF-273	Y	Drabbletail Brook	0	0	0	0	1	2	3	0	0	6	Low Priority
OF-274	Y	Farrel Brook	0	0	0	0	1	2	0	3	0	6	Low Priority
OF-276	Y	Cold Spring Brook	0	0	0	0	1	2	0	3	0	6	Low Priority
OF-277	Y	Rivulet Pond	0	0	0	0	1	2	0	3	0	6	Low Priority
OF-279	Y	Rivulet Pond	0	0	0	0	1	2	0	3	0	6	Low Priority
OF-28	Y	Rivulet Pond	0	0	0	0	1	2	3	0	0	6	Low Priority
OF-280	Y	Cold Spring Brook	0	0	0	0	1	2	0	3	0	6	Low Priority
OF-281	Y	Cold Spring Brook	0	0	0	0	1	2	0	3	0	6	Low Priority
OF-282	Y	Cold Spring Brook	0	0	0	0	1	2	0	3	0	6	Low Priority
OF-29	Y	Rivulet Pond	0	0	0	0	1	2	3	0	0	6	Low Priority
OF-91	Y	Still Corner Brook	0	0	0	0	1	2	0	3	0	6	Low Priority
OF-92	Y	Still Corner Brook	0	0	0	0	1	2	0	3	0	6	Low Priority
OF-196	Y	Drabbletail Brook	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-275	Y	Farrel Brook	0	0	0	0	1	1	0	3	0	5	Low Priority
OF-102	Y	Hecla Canal	0	0	0	0	3	1	0	0	0	4	Low Priority
OF-43	Y	Ironstone Reservoir	0	0	0	0	2	2	0	0	0	4	Low Priority
OF-179	Y	Cold Spring Brook	0	0	0	0	1	2	0	0	0	3	Low Priority
OF-180	Y	Cold Spring Brook	0	0	0	0	1	2	0	0	0	3	Low Priority
OF-186	Y	Drabbletail Brook	0	0	0	0	1	2	0	0	0	3	Low Priority
OF-205	Y	Drabbletail Brook	0	0	0	0	2	1	0	0	0	3	Low Priority
OF-206	Y	Drabbletail Brook	0	0	0	0	2	1	0	0	0	3	Low Priority
OF-219	Y	Blackstone Canal	0	0	0	0	1	2	0	0	0	3	Low Priority
OF-259	Y	Cold Spring Brook	0	0	0	0	1	2	0	0	0	3	Low Priority
OF-260	Y	Cold Spring Brook	0	0	0	0	1	2	0	0	0	3	Low Priority
OF-262	Y	Drabbletail Brook	0	0	0	0	1	2	0	0	0	3	Low Priority
OF-263	Y	Drabbletail Brook	0	0	0	0	1	2	0	0	0	3	Low Priority
OF-264	Y	Drabbletail Brook	0	0	0	0	1	2	0	0	0	3	Low Priority
OF-265	Y	Drabbletail Brook	0	0	0	0	1	2	0	0	0	3	Low Priority
OF-266	Y	Drabbletail Brook	0	0	0	0	1	2	0	0	0	3	Low Priority
OF-267	Y	Drabbletail Brook	0	0	0	0	1	2	0	0	0	3	Low Priority
OF-268	Y	Drabbletail Brook	0	0	0	0	1	2	0	0	0	3	Low Priority
OF-269	Y	Drabbletail Brook	0	0	0	0	1	2	0	0	0	3	Low Priority
OF-270	Y	Drabbletail Brook	0	0	0	0	1	2	0	0	0	3	Low Priority
OF-271	Y	Drabbletail Brook	0	0	0	0	1	2	0	0	0	3	Low Priority
OF-272	Y	Drabbletail Brook	0	0	0	0	1	2	0	0	0	3	Low Priority
OF-283	Y	Drabbletail Brook	0	0	0	0	2	1	0	0	0	3	Low Priority
OF-44	Y	Ironstone Reservoir	0	0	0	0	2	1	0	0	0	3	Low Priority
OF-45	Y	Ironstone Reservoir	0	0	0	0	2	1	0	0	0	3	Low Priority
OF-106	Y	Hecla Canal	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-11	Y	Whitin Pond	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-13	Y	Whitin Pond	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-139	Y	Cold spring brook	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-150	Y	Taft Pond	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-151	Y	Taft Pond	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-176	Y	Happy Hollow Brook	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-183	Y	Drabbletail Brook	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-185	Y	Drabbletail Brook	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-188	Y	Drabbletail Brook	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-194	Y	Drabbletail Brook	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-198	Y	Drabbletail Brook	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-2	Y	Whitin Pond	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-201	Y	Drabbletail Brook	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-202	Y	Drabbletail Brook	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-250	Y	Whitin Pond	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-287	Y	Dunleavey Pond	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-289	Y	Dunleavey Brook	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-290	Y	Dunleavey Pond	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-291	Y	Dunleavey Brook	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-293	Y	Lackey Pond	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-326	Y	Dunleavey Brook	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-327	Y	Farrel Brook	0	0	0	0	1	1	0	0	0	2	Low Priority

OF-329	Y	Drabbletail Brook	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-338	Y	Taft Pond	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-339	Y	Taft Pond	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-340	Y	Taft Pond	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-341	Y	Drabbletail Brook	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-342	Y	Taft Pond	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-343	Y	Taft Pond	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-349	Y	Still Corner Brook	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-350	Y	Still Corner Brook	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-351	Y	Still Corner Brook	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-96	Y	Still Corner Brook	0	0	0	0	1	1	0	0	0	2	Low Priority
OF-97	Y	Still Corner Brook	0	0	0	0	1	1	0	0	0	2	Low Priority
IC-MH-105	Y	Blackstone River	0	0	0	15	0	0	0	0	0	15	High Priority
IC-MH-578	Y	Blackstone River-Inv.	0	0	0	15	3	3	3	0	0	24	High Priority
IC-CB-507	Y	Blackstone River	0	0	0	15	0	0	0	0	0	15	High Priority
IC-CB-1006	Y	Blackstone River	0	0	0	15	0	0	0	0	0	15	High Priority
IC-MH-421	Y	Rivulet Brook-Inv.	0	0	0	0	3	3	3	0	0	9	Low Priority

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 Department of Public Works 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 the National Weather Service. If the National Weather Service is not available or not reporting current weather data, then the Accuweather will be used as a back-up.

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.

Previous outfall screening/sampling conducted under the 2013 MS4 Permit may be used to satisfy the dry weather outfall/screening requirements of the 2016 MS4 Permit only if the previous screening and sampling was substantially equivalent to that required by the 2016 MS4 Permit, including the list of analytes outlined in Section 2.3.4.7.b.iii.4 of the 2016 permit.

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

Equipment	Use/Notes
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 an approved local laboratory.
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**.

[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 sanitary wastewater), and **optical brighteners** (indicative of laundry detergents).

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
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.

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

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 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 Uxbridge 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 completed within three (3) years of the effective date of the permit).

Outfalls/interconnections where relevant information was found indicating sewer input to the MS4 or sampling results indicating sewer input are highly likely to contain illicit discharges from sanitary 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.

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.

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

7.1 System Vulnerability Factors

The Department of Public Works 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
  (See all related subdivision and road improvement plans and as-built plans)
- Plans related to the construction of the sewer network
  (See all related subdivision, road improvement and sewer as-built plans)
- Prior work on storm drains or sewer lines
  (See plans referenced above)
- Board of Health or other municipal data on septic system failures or required upgrades
  (See Board of Health Records)
- Complaint records related to SSOs and sanitary sewer surcharges
  (See SSO compilation list available with DPW)
- Septic system breakouts.
  (See Board of Health Records)

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

- History of SSOs, including, but not limited to, those resulting from wet weather, high water table, or fat/oil/grease blockages
- Common or twin-invert manholes serving storm and sanitary sewer alignments
- Common trench construction serving both storm and sanitary sewer alignments
- Crossings of storm and sanitary sewer alignments where the sanitary system is shallower than the storm drain system
- Sanitary sewer alignments known or suspected to have been constructed with an underdrain system
- Inadequate sanitary sewer level of service (LOS) resulting in regular surcharging, customer back-ups, or frequent customer complaints
- Areas formerly served by combined sewer systems
- Sanitary sewer infrastructure defects such as leaking service laterals, cracked, broken, or offset sanitary infrastructure, directly piped connections between storm drain and sanitary sewer infrastructure, or other vulnerability factors identified through Inflow/Infiltration Analyses, Sanitary Sewer Evaluation Surveys, or other infrastructure investigations
- Sewer pump/lift stations, siphons, or known sanitary sewer restrictions where power/equipment failures or blockages could readily result in SSOs
- Any sanitary sewer and 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)

- 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 catchment (see **Table 7-1**), 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 Uxbridge, Massachusetts
Revision Date:

Outfall ID	Receiving Water	1 History of SSOs	2 Common or Twin Invert Manholes	3 Common Trench Construction	4 Storm/Sanitary Crossings (Sanitary Above)	5 Sanitary Lines with Underdrains	6 Inadequate Sanitary Level of Service	7 Areas Formerly Served by Combined Sewers	8 Sanitary Infrastructure Defects	9 SSO Potential In Event of System Failures	10 Sanitary and Storm Drain Infrastructure >40 years Old	11 Septic with Poor Soils or Water Table Separation	12 History of BOH Actions Addressing Septic Failure
Sample 1	XYZ River	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No

Presence/Absence Evaluation Criteria:

1. History of SSOs, including, but not limited to, those resulting from wet weather, high water table, or fat/oil/grease blockages
2. Common or twin-invert manholes serving storm and sanitary sewer alignments
3. Common trench construction serving both storm and sanitary sewer alignments
4. Crossings of storm and sanitary sewer alignments where the sanitary system is shallower than the storm drain system
5. Sanitary sewer alignments known or suspected to have been constructed with an underdrain system
6. Inadequate sanitary sewer level of service (LOS) resulting in regular surcharging, customer back-ups, or frequent customer complaints
7. Areas formerly served by combined sewer systems
8. Sanitary sewer infrastructure defects such as leaking service laterals, cracked, broken, or offset sanitary infrastructure, directly piped connections between storm drain and sanitary sewer infrastructure, or other vulnerability factors identified through Inflow/Infiltration Analyses, Sanitary Sewer Evaluation Surveys, or other infrastructure investigations
9. Sewer pump/lift stations, siphons, or known sanitary sewer restrictions where power/equipment failures or blockages could readily result in SSOs
10. Any sanitary sewer and storm drain infrastructure greater than 40 years old
11. 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)
12. 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 Uxbridge 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 or SSOs.

The Department of Public Works 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 flows, conductivity to detect tidal backwater, etc.).

3. Where sampling results or visual or olfactory evidence indicate potential illicit discharges or SSOs, 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 or SSOs 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 Department of Public Works 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 sanitary 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, although minimum storm event intensities that are likely to trigger sanitary sewer interconnections are preferred. 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
- Dye Testing
- CCTV/Video Inspections
- Optical Brightener Monitoring
- IDDE Canines

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 Department of Public Works will notify property owners in the affected area. Smoke testing notification will include Facebook posting and hanging notifications for single family homes, businesses and building lobbies for multi-family dwellings.

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 drain lines and noting the emergence of smoke from sanitary 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 sanitary sewer lines can also be performed. Unlike storm drain smoke tests, buildings that do not emit smoke during sanitary 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, 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 local public health staff 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 sanitary 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 and sanitary 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 or wastewater treatment. Optical brightener monitoring can be done in two ways. The most common, and least expensive, methodology 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. A second methodology uses handheld fluorometers to detect optical brighteners in water sample collected from outfalls or ambient surface waters. Use of a fluorometer, while more quantitative, is typically more costly and is not as effective at isolating intermittent discharges as other source isolation techniques.

7.4.6 IDDE Canines

Dogs specifically trained to smell human related sewage are becoming a cost-effective way to isolate and identify sources of illicit discharges. While not widespread at the moment, the use of IDDE canines is growing as is their accuracy. The use of IDDE canines is not recommended as a standalone practice for source identification; rather it is recommended as a tool to supplement other conventional methods, such as dye testing, in order to fully verify sources of illicit discharges.

7.5 Illicit Discharge Removal

When the specific source of an illicit discharge is identified, the Town of Uxbridge 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.

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. This training will at a minimum include information on how to identify illicit discharges and SSOs 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 and will include the following indicators of program progress:

- Number of SSOs and 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
- Estimate of the volume of sewage removed, as applicable
- Number of employees trained annually.

The success of the IDDE program will be measured by the IDDE activities completed within the required permit timelines.

Appendix A

Legal Authority (IDDE Bylaw or Ordinance)

Appendix B

Storm System Mapping

TOWN OF UXBRIDGE
DEPARTMENT OF PUBLIC WORKS
147 HECLA STREET
UXBRIDGE, MA 01569

MS4 OUTFALL OVERVIEW MAPPING

JUNE 6, 2019
SCALE: 1" = 3000'

Appendix C

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

BETA Group Inc. Stormwater Inventory Outfall Screening/Sampling Form

Municipality Name:

General Data

Outfall ID:

Inspection Date: | Inspection Time

Inspector:

Weather: Clear | Cloudy | Rain | Snow

Able to Access: Yes | No

Outfall Environmental Inspection

Surrounding Area: Residential | Commercial | Industrial | Municipal | Open Space | Unknown

Outfall Flowing To: Bay | Lake | Land | Marsh | Pond | River | Stream | Wetland

Structure Under Water: Yes | No

Outfall Flow Amount: Drip | Moderate | None | Substantial | Trickle

Outfall Flow Clarity: Clear | Cloudy | None | Opaque

Outfall Flow Color:

Sediment: Yes | No

Scouring: Yes | No

Algae Growth: Yes | No

Stressed Vegetation: Yes | No

Staining: Yes | No

Floatables: Yes | No

Oil Sheen: Yes | No

Odor: None | Sewer | Eggs | Fuel | Laundry | Sewage

Turbidity: Yes | No

Outfall Sampling

Sampling Required? Yes | No

Sampling Performed? Yes | No

Structure Where Sampling Was Performed: Outfall | MH | CB | Other

Structure ID If Not Outfall:

Ammonia Reading: | Salinity Reading: | Temperature Reading

Chlorine Reading: | pH Reading:

Conductivity Readin | Surfactant Reading

Sample Bottle Label

Company _____

Sample ID _____

Location _____

Collected by _____

Date _____

Analysis _____

Comments _____

_____

SAMPLE

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME/LOCATION																				
CLIENT																					
REPORT TO:																					
INVOICE TO:																					
DATE	TIME	COMP	GRAB	SAMPLE I.D.	AQUEOUS	SOIL	OTHER	NO. OF CONTAINERS	PRESERVATIVE	TESTS**											REMARKS

Sampled by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time

Laboratory Remarks:
Temp. received: _____
Cooled ☐

Special Instructions:
List Specific Detection Limit Requirements:

Turnaround (Business Days)_____

**Netlab subcontracts the following tests: Radiologicals, Radon, Asbestos, UCMRs, Perchlorate, Bromate, Bromide, Sieve, Salmonella, Carbamates

Appendix D

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

IDDE Outfall Investigation and Sampling Checklists

Southeast Regional Services Group (SERSG)

June 2019

FUSS & O'NEILL

1550 Main Street, Suite 400
Springfield, MA 01103

Table of Contents

IDDE Outfall Investigation and Sampling Checklists
SERSG

1 Introduction

These checklists and instructions were prepared to guide members of the Southeast Regional Services Group (SERSG) in outfall investigation and sampling as part of an illicit discharge detection and elimination (IDDE) program. The IDDE program is a requirement under the 2016 Massachusetts Small MS4 General Permit. It is assumed that outfalls and catchments have already been prioritized and ranked based on criteria detailed in Section 2.3.4.7 of the permit.

These checklists and instructions were created to aid in the following stormwater outfall investigations:

- Dry weather Outfall Screening
- Dry weather Outfall Sampling
- Post Screening/Sampling Procedures
- Catchment Investigation

The purpose of dry weather outfall screening is to identify potential illicit connections through inspection and sampling during times when stormwater should not be an influence. Outfalls are inspected and those that have flow during dry weather are sampled for pollutants that are commonly attributed to illicit discharges. An illicit discharge is any discharge to a MS4 that is not composed entirely of stormwater. Sources of illicit discharges may include illegal floor drain connections, broken sanitary lines, cross-connections, sanitary sewer overflows, and grass clippings, pet waste, or other material dumped into catch basins.

Southeastern Regional Services Group

SERSG established 1993

FUSS & O'NEILL

2 Equipment Checklist

Outfall Screening/Sampling Equipment Checklist

Equipment needed for both screening and sampling:

- ☐ Clipboard
- ☐ Field Sheets/ Tablet
- ☐ Pens/Pencils/Permanent Markers
- ☐ Dry Erase Board and Markers
- ☐ Measuring Tape
- ☐ Flashlight/Headlamp with Batteries
- ☐ Digital Camera (or phone with a camera)
- ☐ GPS Receiver (or phone with a GPS app.)
- ☐ Manhole Cover Assisted Opener, Pry Bar, Pick, and/or Manhole Lifter
- ☐ Small Mallet or Hammer
- ☐ Appropriate footwear (Boots and/or Waders)
- ☐ Reflective Vest
- ☐ Traffic Cones
- ☐ Poison Ivy Scrub

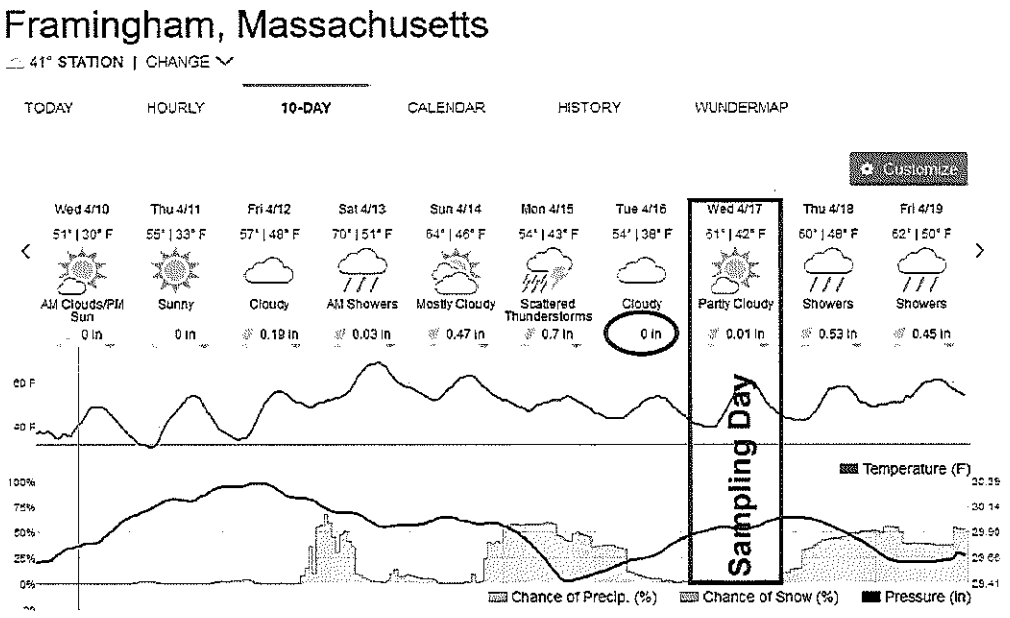
Equipment needed for sampling:

- ☐ Sampling Pole
- ☐ Utility Knife
- ☐ Zip ties/Duct Tape
- ☐ Safety Glasses
- ☐ Nitrile Gloves
- ☐ Hand Sanitizer
- ☐ Chain of Custody Forms
- ☐ Cooler with Ice
- ☐ Water Quality Sonde (if needed/available for conductivity, temperature and pH)
- ☐ Water Quality Meter (if needed/available for ammonia, surfactants and/or chlorine)
- ☐ Test Kits (if needed/available for ammonia and surfactants)
- ☐ Labels for sample bottles
- ☐ Sample bottles (bring some extras; bacteria bottles need to be sterile)
- ☐ Sand bags (for damming low flows)

3 Preparation and Weather Tracking

3.1 Preparation: 1 Week Prior to Screening

- Look at the extended forecast for a day that will meet dry weather criteria **< 0.1 inch of rain in the past 24 hours and no significant snow melt.**
    - Get weather data from Weather Underground or similar weather resource https://www.wunderground.com
    - Enter your town/city in the search bar. Hourly forecasts with rain totals and historical rainfall data are provided.

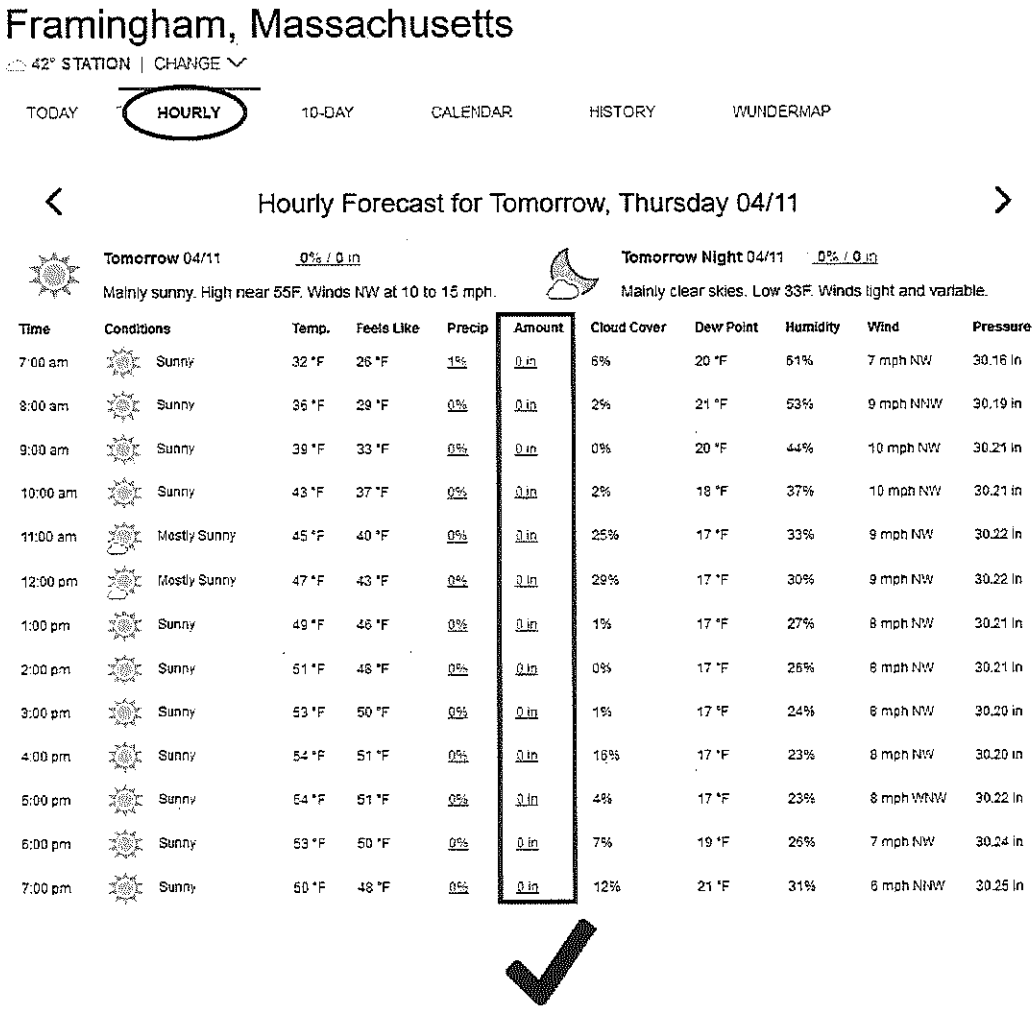


- Acquire all required field equipment. See the Outfall Screening Equipment Checklist (**Section 2**).

3 Preparation and Weather Tracking

3.2 Preparation: 1 Day Prior to Screening

- Verify that dry weather criteria will be met for the following day: **< 0.1 inch of rain in the past 24 hours and no significant snow melt.**
- Identify outfalls to be screened based on initial outfall inventory and priority ranking. Plan a route to minimize driving time.
- Gather all required field equipment. See the Outfall Screening Equipment Checklist (section **2**).



Framingham, Massachusetts

42° STATION | CHANGE

TODAY | HOURLY | 10-DAY | CALENDAR | HISTORY | WUNDERMAP

Hourly Forecast for Tomorrow, Thursday 04/11

Tomorrow 04/11 0% / 0 in
Mainly sunny. High near 55F. Winds NW at 10 to 15 mph.

Tomorrow Night 04/11 0% / 0 in
Mainly clear skies. Low 33F. Winds light and variable.

Time	Conditions	Temp.	Feels Like	Precip	Amount	Cloud Cover	Dew Point	Humidity	Wind	Pressure
7:00 am	Sunny	32 °F	26 °F	1%	0 in	6%	20 °F	61%	7 mph NW	30.16 in
8:00 am	Sunny	36 °F	29 °F	0%	0 in	2%	21 °F	53%	9 mph NNW	30.19 in
9:00 am	Sunny	39 °F	33 °F	0%	0 in	0%	20 °F	44%	10 mph NW	30.21 in
10:00 am	Sunny	43 °F	37 °F	0%	0 in	2%	18 °F	37%	10 mph NW	30.21 in
11:00 am	Mostly Sunny	45 °F	40 °F	0%	0 in	25%	17 °F	33%	9 mph NW	30.22 in
12:00 pm	Mostly Sunny	47 °F	43 °F	0%	0 in	29%	17 °F	30%	9 mph NW	30.22 in
1:00 pm	Sunny	49 °F	46 °F	0%	0 in	1%	17 °F	27%	8 mph NW	30.21 in
2:00 pm	Sunny	51 °F	48 °F	0%	0 in	0%	17 °F	25%	8 mph NW	30.21 in
3:00 pm	Sunny	53 °F	50 °F	0%	0 in	1%	17 °F	24%	8 mph NW	30.20 in
4:00 pm	Sunny	54 °F	51 °F	0%	0 in	16%	17 °F	23%	8 mph NW	30.20 in
5:00 pm	Sunny	54 °F	51 °F	0%	0 in	4%	17 °F	23%	8 mph WNW	30.22 in
6:00 pm	Sunny	53 °F	50 °F	0%	0 in	7%	19 °F	26%	7 mph NW	30.24 in
7:00 pm	Sunny	50 °F	48 °F	0%	0 in	12%	21 °F	31%	6 mph NNW	30.25 in

4 Outfall Screening

4.1 Screening Procedure: Day of Screening

- Navigate to the outfall to be screened.
- Take a photograph of the outfall. Good photos include context. Write the outfall ID on the dry-erase board and include it in the picture.
- If the outfall is inundated:
  - conduct visual screening at the first non-influenced upstream structure (catch basin or drainage manhole).
  - Take a photo of both the inundated outfall and the upstream structure.
  - Note the type of upstream structure and the coordinates on the field form.

Example of a photo that includes surrounding context.

Example of an inundated outfall: the water from the waterbody is backing up into the structure.

4 Outfall Screening

4.1 Screening Procedure: Day of Screening

- Begin the outfall inspection. Fill out the outfall screening form (paper or digital).

This is the unique outfall identifier.

Select Dry Weather Screening.

If screening at an upstream structure, note unique identifier for that structure here.

If practical, park vehicle so as to create a safe working environment

Fill out all physical characteristics for outfall. Fill this section out for the outfall even if screening at an upstream structure.

Obtain Lat. and Long. with phone or GPS.

Outfall/Catchment Screening Form

CMRSWC

FUSS & O'NEILL

Catchment ID: _____ **Town:** _____

Inspector: _____ **Date/Time:** _____

Street Name: _____

Last rainfall event (date and amount): _____

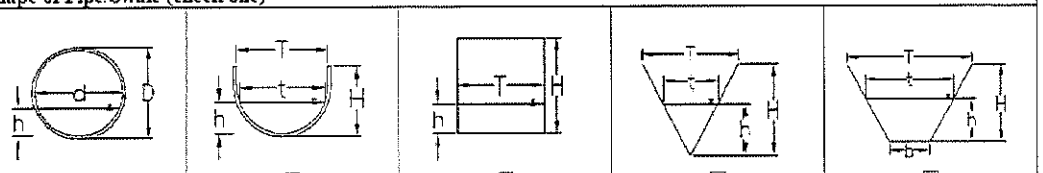
Type of Sampling Event ☐ Dry Weather Screening ☐ Wet Weather Sampling

Location: ☐ Outfall ☐ Manhole ☐ Catch Basin ☐ Interconnection

Is outfall submerged/inundated ? ☐ Yes ☐ No If YES screen/sample at 1st non-influenced structure: ☐ MH ☐ CB

Location ID: **Latitude:** **Longitude:**

Shape of Pipe/Swale (check one)



Rounded Pipe	Rounded Swale	Rectangular Pipe/Swale	Triangular Swale	Trapezoidal Swale
☐	☐	☐	☐	☐

Outfall Material:
- ☐ Concrete
- ☐ HDPE
- ☐ Corrugated Metal Pipe (CMP)
- ☐ Ductile Iron
- ☐ Clay
- ☐ PVC
- ☐ Other

Outfall/Manhole/Catchbasin Condition:
- ☐ Good ☐ Fair
- ☐ Poor ☐ Crumbling

Pipe Measurements:
- Inner Dia. (in): d =
- Outer Dia. (in.): D =
- Pipe Width (in.): W =
- Pipe Height (in.): H =
- Flow Depth (in.): h =

Swale Measurements:
- Swale Width (in): T =
- Flow Width (in.): t =
- Swale Height (in.): H =
- Flow Depth (in.): h =
- Bottom Width (in.): b =

4 Outfall Screening

4.1 Screening Procedure: Day of Screening

- Look for and record visual/olfactory evidence of pollutants in flowing outfalls.

- If no flow is observed but evidence of flow exists (outfall is damp or there is visual/olfactory evidence of illicit discharge), mark the outfall to be revisited during dry weather within one week of the initial observation to conduct a second screening and sample any observed flow.

Select all applicable boxes.

Sampling is covered in section 5.

Evidence of Flow: ☐ Yes ☐ No If Yes, Description of Flow: ☐ Damp ☐ Trickle ☐ Moderate ☐ High

Visual Evidence of Illicit Discharge
Visual Inspection: ☐ None ☐ Floatables ☐ Pet Waste ☐ Oily Sheen ☐ Sanitary Waste ☐ Algae ☐ Foam

Olfactory Evidence of Illicit Discharge
Olfactory Inspection: ☐ None ☐ Sewage Smell ☐ Musty ☐ Rotten Eggs ☐ Ammonia ☐ Petroleum

Samples Taken and Sampling Results

Temp.	Conductivity	Salinity	Chlorine
Ammonia	Surfactants	Bacteria	Pollutant of Concern

4.2 Post-Screening Procedures

- Schedule any revisits to outfalls based on initial screening.
  - If the outfall was "Damp" then it must be revisited within 7 days

- Store field forms in a designated space. Forms must be included in your Annual Report.

- Review the data and update ranking/prioritization of outfalls. Outfalls that show visual or olfactory signs of illicit discharge should be ranked as "High" priority.

Likely Sewer Input Indicators

- 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
- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and detectable levels of chlorine

5 Outfall Sampling

5.1 Preparation: 1 Week Prior to Sampling

- As with outfall screening, look at the extended forecast for a day that will meet dry-weather criteria. **See section 2.1 for criteria and options to obtain weather data.**
- Identify which parameters will be measured in the field and which will be sent to the laboratory for analysis. Bacteria and all pollutants of concern EM6ld be taken to a lab for analysis.
- Ensure you have all required field test kits or instrumentation for parameters that will be measured in the field.
- Make arrangements with a laboratory for sample analysis and to obtain sample bottles with proper preservatives. Nearby laboratory options include:

Con-test Analytical Laboratory
39 Spruce St, East Longmeadow, MA, 01028 SE2 SB3
(413) 525-2332

RI Analytical Laboratories
131 Coolidge St Suite #105, Hudson, MA 01749
(978) 568-0041

Hub Testing Laboratory
95 Beaver St, Waltham, MA, 02453
(781) 893-8330

Sampling Parameters and Analysis Methods

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

Slide 11

SF2 Other lab options in MA?
Sarah Frazar, 2019-03-15

SB3 These are what came up through a google search. Spectrum is owned by Eurofins which has a lab in Waltham but it looks like they may do other types of sampling. Not sure if can deliver SW samples to them?
Stefan Bengtson, 2019-04-12

EM6 Erik Mas, 2019-04-23

5 Outfall Sampling

5.2 Preparation: 1 Day Prior to Sampling

- Verify that dry weather criteria will be met for the following day: **< 0.1 inch of rain in the past 24 hours and no significant snow melt.**

- Call the laboratory to remind them you will be dropping off samples the next day.

- Identify outfalls to be sampled. Map out a route for the following day. When creating the route remember that **bacteria samples have a hold time of 6 hours from sample collection**. It is **critically important** that your chosen testing laboratory is nearby to maximize your sampling time and deliver samples within 6 hours.

- Gather all required field equipment. See the Outfall Screening/Sampling Equipment Checklist (**Section 2**).

5 Outfall Sampling

5.3 Sampling Procedure: Day of Sampling

- Navigate to the outfall to be sampled and follow the outfall screening procedures in **Section 3.1**.
- If the outfall (or upstream structure in the case of outfall inundation) is flowing, prepare to collect samples. Take the following precautions:
    - Do not eat, drink or smoke or chew tobacco during sample collection
    - Park vehicle away from sampling area and do not leave the vehicle running to reduce risk of contaminating samples
    - Wear gloves when collecting and handling samples
    - When collecting the sample, do not breathe in the direction of the sample bottle
    - If using a sampling pole, triple rinse the bottle holder with distilled water then in the water to be sampled (Skip this step for bacteria sampling). Follow the same procedure for field meters
        - When using a sampling pole, sample bottles should be attached directly to the bottle holder and all bottles should be clean, free of contamination, and in the case of bacteria, sterile.
    - Do not touch the inside of sample bottles or sample bottle caps
    - Do not enter an upstream structure to collect a sample. Use a sampling pole.

5 Outfall Sampling

5.3 Sampling Procedure: Day of Sampling

- Collect samples in the following manner:
  - Make sure all proper PPE is in use (ie nitrile gloves, safety glasses, etc.)
  - Fill out information on sample bottle labels. Place labels on proper bottles
  - Collect bacteria samples first, followed by any additional parameters.
  - If possible, collect samples from the flow directly into the sample bottles. Use a sampling pole if it is unsafe or not possible to directly collect the sample. In cases where flow is particularly light, sandbagging may be necessary to accumulate enough water to collect a sample.
  - Place all laboratory samples (bacteria and pollutants of concern) on ice in a cooler.
  - Use test strips, test kits and/or field meters to measure all other parameters. Record the results on the bottom of the field form.

Enter values for parameters measured in the field. For Bacteria and Pollutants of concern note "Laboratory Analysis"

Samples Taken and Sampling Results			
Temp. 21.2 °C	Conductivity	Salinity	Chlorine
Ammonia	Surfactants	Bacteria Laboratory Analysis	Pollutant of Concern Laboratory Analysis

5 Outfall Sampling

5.4 Post Sampling Procedures

- Schedule any revisits to outfalls.
  - If the outfall was "Damp" then it must be revisited within 7 days.

- Store field forms, laboratory data and copies of Chains of Custody together in a designated space.

- Review the data and update ranking/prioritization of outfalls. Outfalls that show visual or olfactory signs of illicit discharge or that exceed the benchmark criteria for any parameters should be ranked as "High" priority.

- For outfalls with evidence of an illicit discharge, begin source isolation and identification procedures outlined in the written IDDE Program Plan.

Likely Sewer Input Indicators

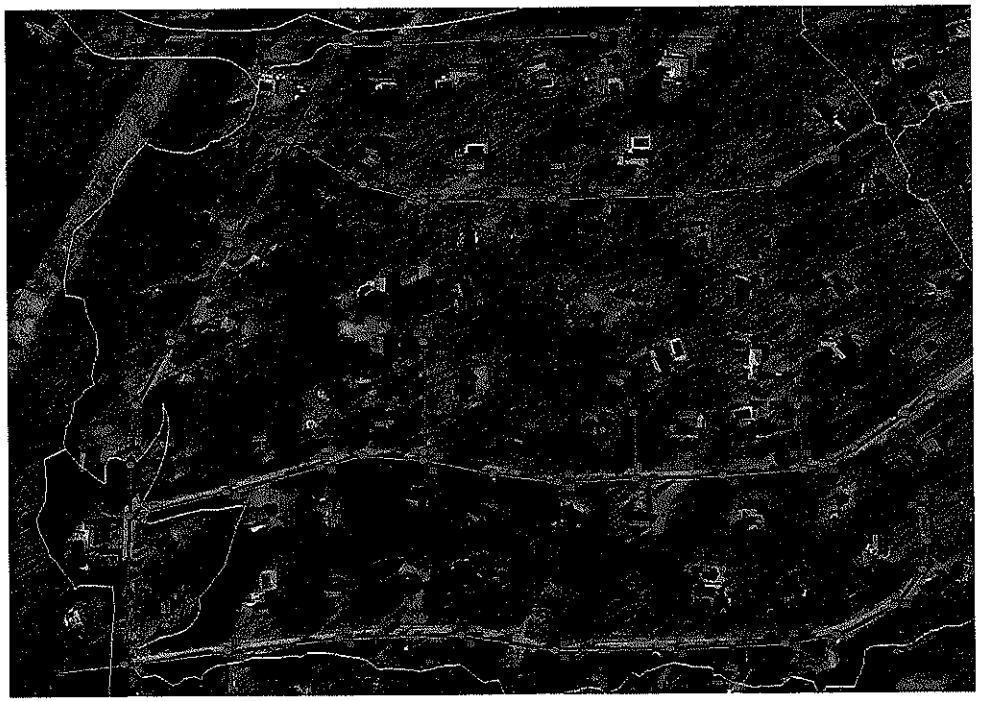
- Olfactory or visual evidence of sewage
- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and bacteria levels greater than the water quality criteria applicable to the receiving water
- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and detectable levels of chlorine

Analyte or Parameter	IDDE Benchmark Criteria
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: 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 Catchment Investigation Procedure

For all Problem and High/Low Priority catchments:

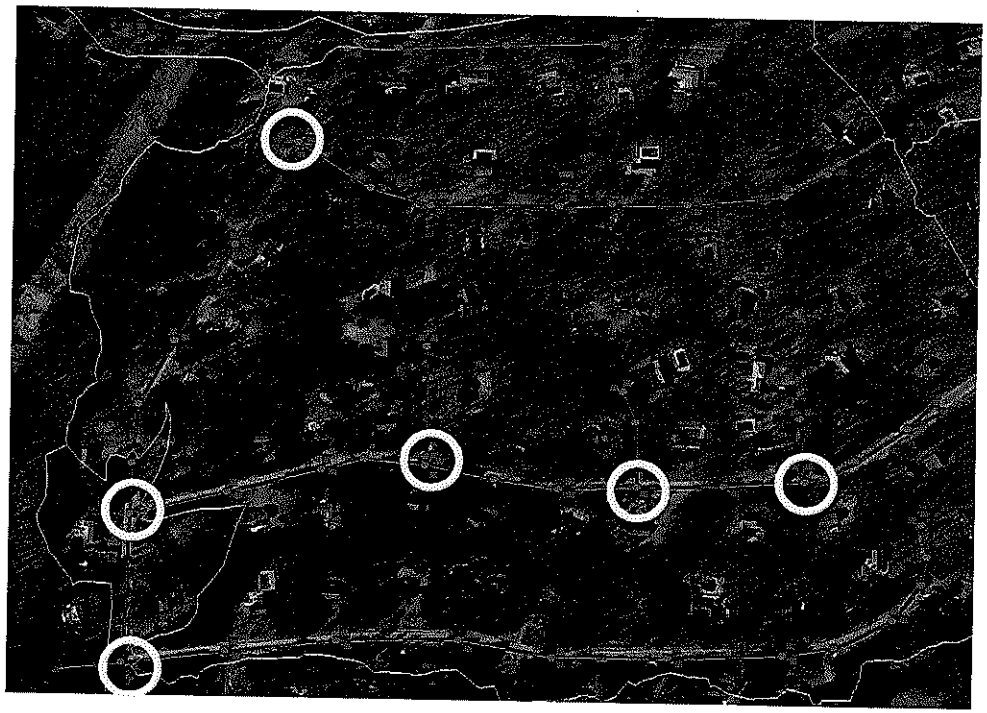
- Identify Key Junction Manholes in the catchment
- Inspect Key Junction Manholes/Catch Basins and sample any observed flow
- If sampling results indicate a potential illicit discharge, continue inspection and sampling of junction structures to isolate pipe segment where illicit discharge originates
- Conduct source identification procedures such as smoke/dye testing or video inspection of pipe segment
- Identify/locate source of discharge
- Eliminate discharge
- Perform Follow-up inspection and sampling to confirm removal of illicit discharge



6 Catchment Investigation Procedure

6.1 Identify Key Junction Manholes

For all Problem and High/Low Priority catchments:

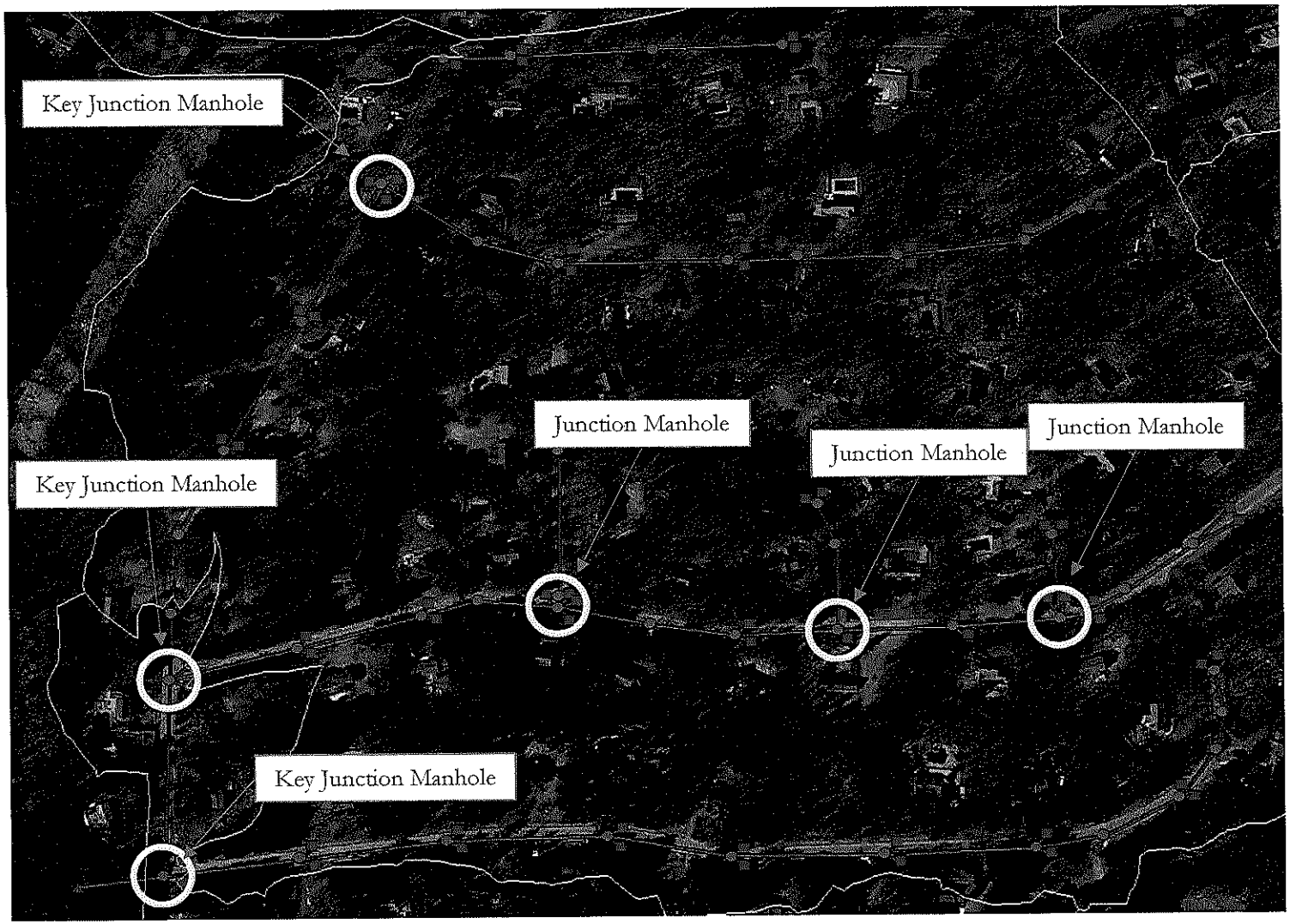


Junction Manhole - For the purposes of this permit, a junction manhole is a manhole or structure with two or more inlets accepting flow from two or more MS4 alignments. Manholes with inlets solely from private storm drains, individual catch basins, or both are not considered junction manholes for these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

Key Junction Manhole - For the purposes of this permit, 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.

6 Catchment Investigation Procedure

6.1 Identify Key Junction Manholes



6 Catchment Investigation Procedure

6.2 Inspect/Sample Key Junction Manholes

Catchment ID often times will default to the outfall ID.

Manhole Inspection Form

Catchment ID Example	Date/Time
Structure ID MH-131	Last Rain Date/Amount
Location Description Street and house or pole #	
Inspector	

CMRSWC

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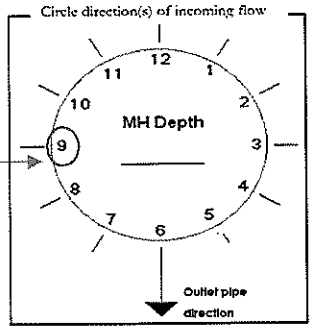
Circle location of all pipes entering structure and fill out corresponding table. The "Six" position is always the outlet of the structure

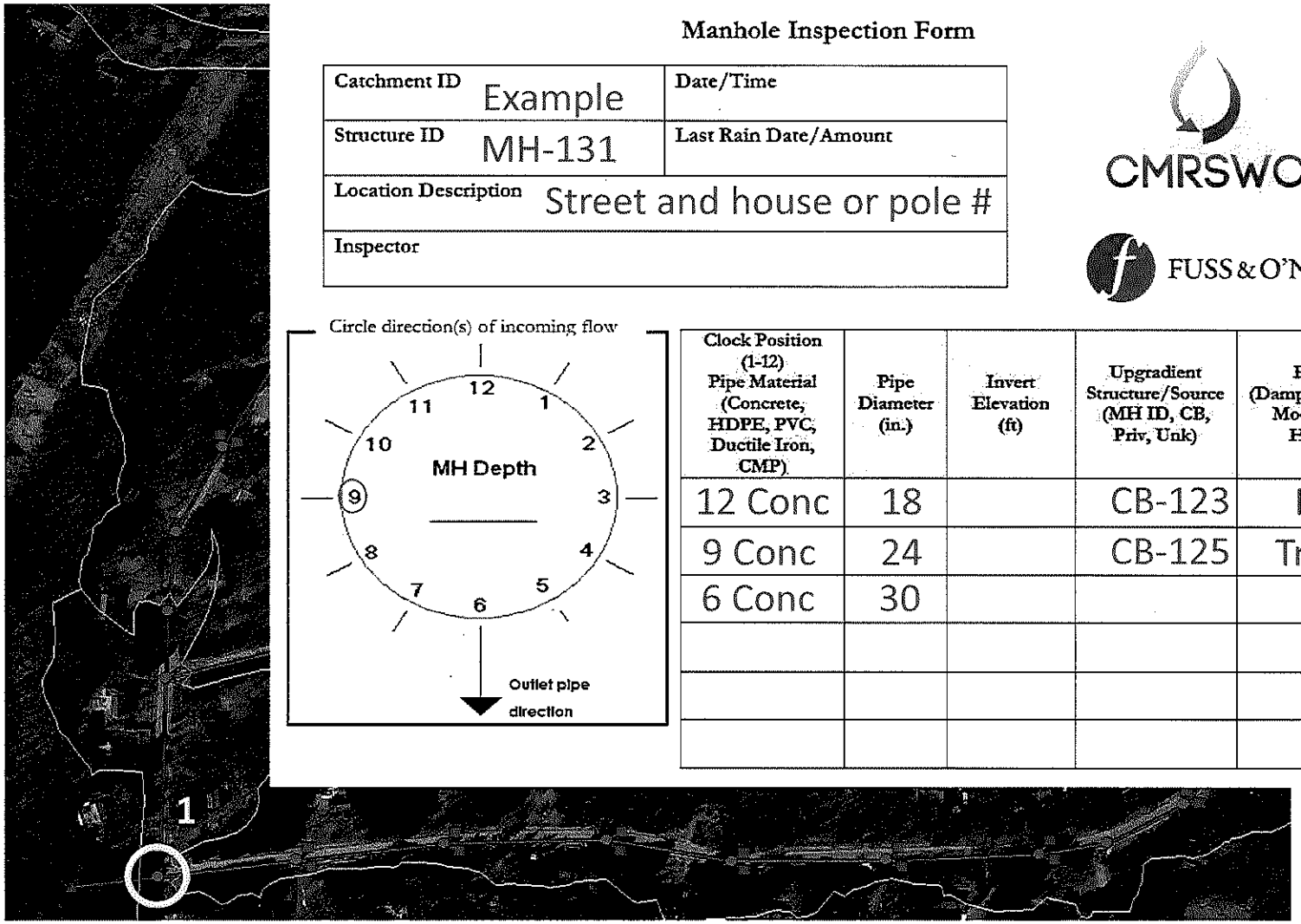


Clock Position (1-12) Pipe Material (Concrete, HDPE, PVC, Ductile Iron, CMP)	Pipe Diameter (in.)	Invert Elevation (ft)	Upgradient Structure/Source (MH ID, CB, Priv, Unk)	Flow (Damp, Trickle, Moderate, High)
12 Conc	18		CB-123	Dry
9 Conc	24		CB-125	Trickle
6 Conc	30			

Fill in table with all pertinent information about the position, material, elevation or depth of invert, information on any upgradient structures and presence of flow

6 Catchment Investigation Procedure

6.2 Inspect/Sample Key Junction Manholes



Manhole Inspection Form

Catchment ID: Example	Date/Time
Structure ID: MH-131	Last Rain Date/Amount
Location Description: Street and house or pole #	
Inspector	

CMRSWC

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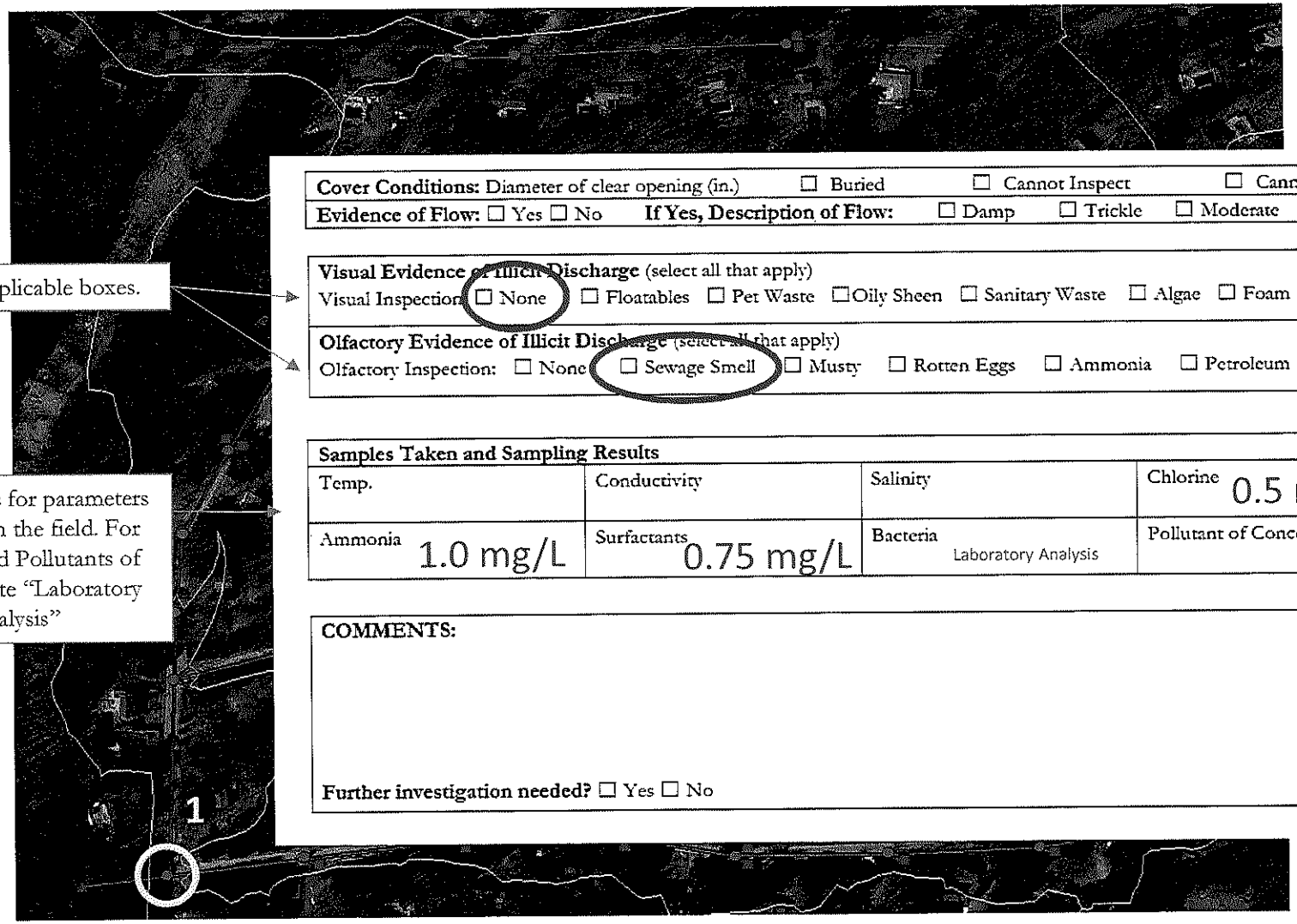
Circle direction(s) of incoming flow

Clock Position (1-12) Pipe Material (Concrete, HDPE, PVC, Ductile Iron, CMP)	Pipe Diameter (in.)	Invert Elevation (ft)	Upgradient Structure/Source (MH ID, CB, Priv, Unk)	Flow (Damp, Trickle, Moderate, High)
12 Conc	18		CB-123	Dry
9 Conc	24		CB-125	Trickle
6 Conc	30			

6 Catchment Investigation Procedure

6.2 Inspect/Sample Key Junction Manholes



Cover Conditions: Diameter of clear opening (in.) ☐ Buried ☐ Cannot Inspect ☐ Cannot Locate

Evidence of Flow: ☐ Yes ☐ No **If Yes, Description of Flow:** ☐ Damp ☐ Trickle ☐ Moderate ☐ High

Select all applicable boxes.

Visual Evidence of Illicit Discharge (select all that apply)

Visual Inspection: ☐ None ☐ Floatables ☐ Pet Waste ☐ Oily Sheen ☐ Sanitary Waste ☐ Algae ☐ Foam

Olfactory Evidence of Illicit Discharge (select all that apply)

Olfactory Inspection: ☐ None ☐ Sewage Smell ☐ Musty ☐ Rotten Eggs ☐ Ammonia ☐ Petroleum

Enter values for parameters measured in the field. For Bacteria and Pollutants of concern note "Laboratory Analysis"

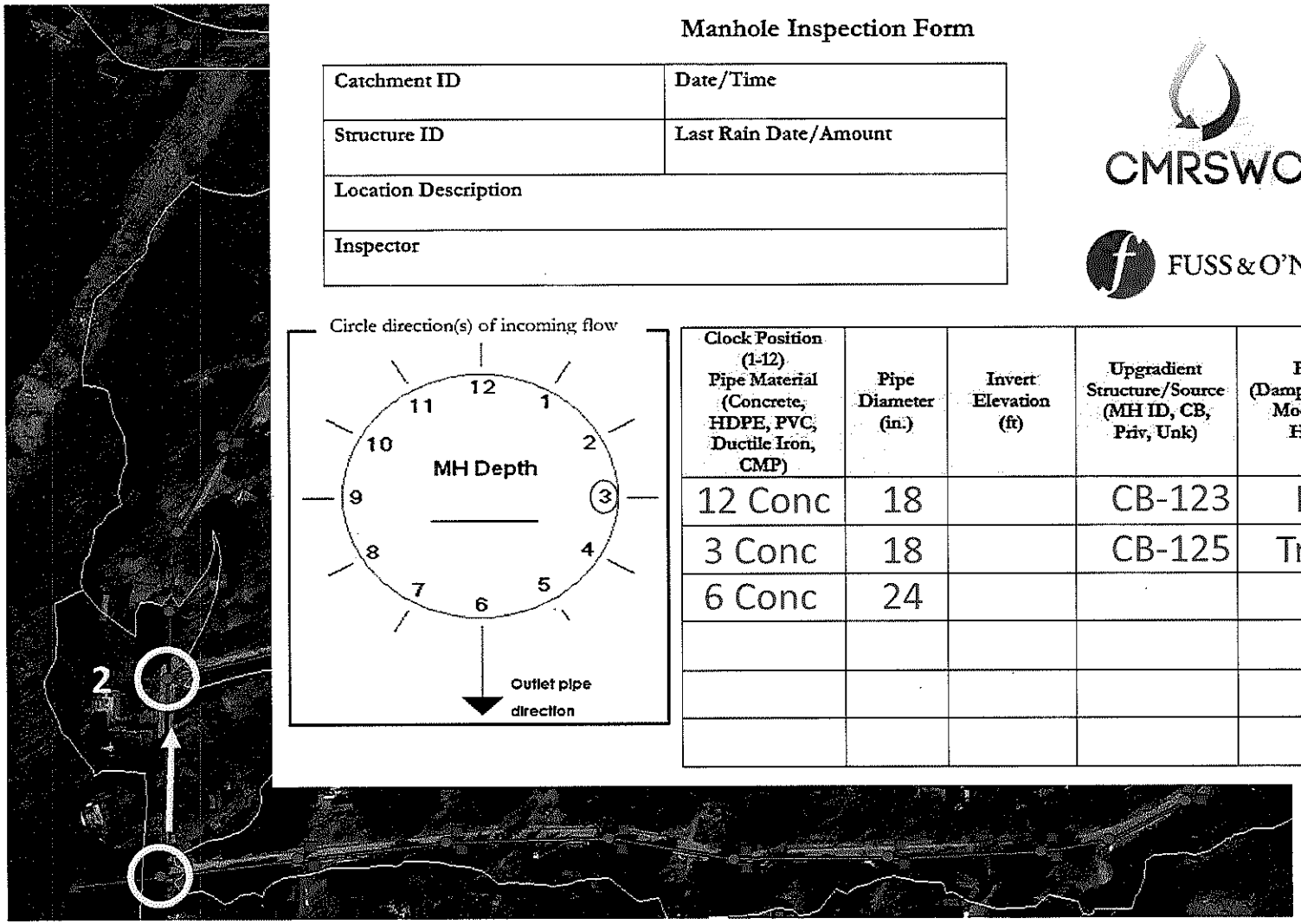
Samples Taken and Sampling Results			
Temp.	Conductivity	Salinity	Chlorine 0.5 mg/L
Ammonia 1.0 mg/L	Surfactants 0.75 mg/L	Bacteria Laboratory Analysis	Pollutant of Concern

COMMENTS:

Further investigation needed? ☐ Yes ☐ No

6 Catchment Investigation Procedure

6.2 Inspect/Sample Key Junction Manholes



Manhole Inspection Form

Catchment ID	Date/Time
Structure ID	Last Rain Date/Amount
Location Description	
Inspector	

CMRSWC

FUSS & O'NEILL

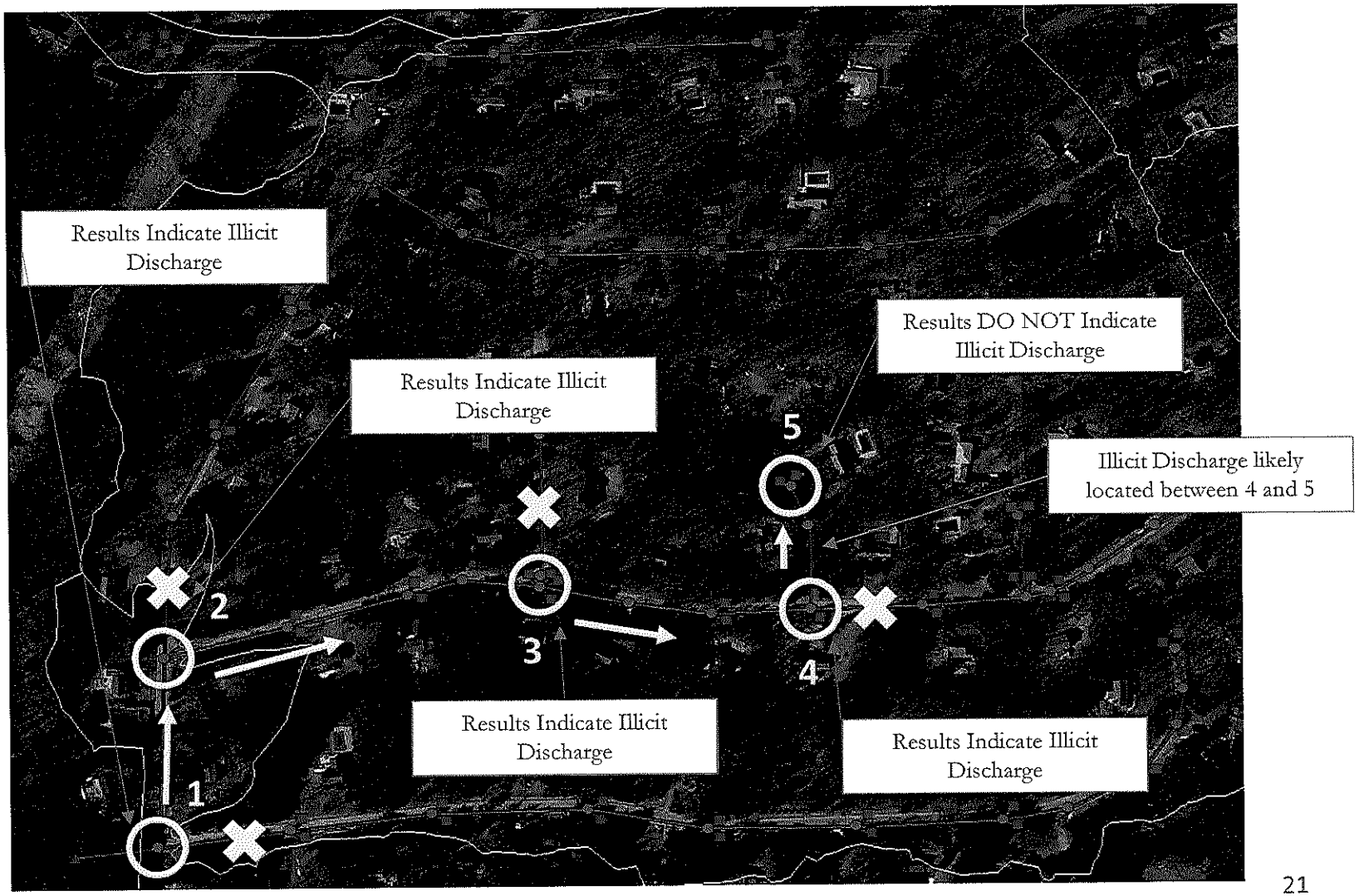
Circle direction(s) of incoming flow

Clock Position (1-12) Pipe Material (Concrete, HDPE, PVC, Ductile Iron, CMP)	Pipe Diameter (in.)	Invert Elevation (ft)	Upgradient Structure/Source (MH ID, CB, Priv, Unk)	Flow (Damp, Trickle, Moderate, High)
12 Conc	18		CB-123	Dry
3 Conc	18		CB-125	Trickle
6 Conc	24			

6 Catchment Investigation Procedure

6.3 Source Isolation

- Systematically inspect and sample structures in order to isolate the potential illicit discharge to a specific pipe segment.



7 Appendix 1: Outfall Screening Form

Outfall/Catchment Screening Form

Southeastern Regional Services Group

FUSS & O'NEILL

Catchment ID: _____ **Town:** _____

Inspector: _____ **Date/Time:** _____

Street Name: _____

Last rainfall event (date and amount): _____

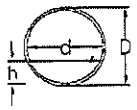
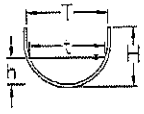
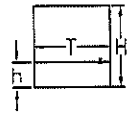
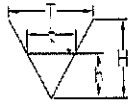
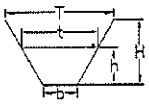
Type of Sampling Event: ☐ Dry Weather Screening ☐ Dry Weather Sampling ☐ Wet Weather Sampling

Location: ☐ Outfall ☐ Manhole ☐ Catch Basin ☐ Interconnection

Is outfall submerged/inundated? ☐ Yes ☐ No IF YES screen/sample at 1st non-influenced structure: ☐ MH ☐ CB

Structure ID: **Latitude:** **Longitude:**

Shape of Pipe/Swale (check one)

 ☐	 ☐	 ☐	 ☐	 ☐
Rounded Pipe	**Rounded Swale**	**Rectangular Pipe/Swale**	**Triangular Swale**	**Trapezoidal Swale**

Outfall Material:	**Pipe Measurements:**	**Swale Measurements:**
☐Concrete ☐HDPE ☐Corrugated Metal Pipe ☐ Ductile Iron ☐ Clay ☐ PVC ☐ Other **Outfall/Manhole/Catchbasin Condition:** ☐ Good ☐ Fair ☐ Poor ☐Crumbling	Inner Dia. (in): d = Outer Dia. (in.): D = Pipe Width (in.): W = Pipe Height (in.): H = Flow Depth (in.): h =	Swale Width (in): T = Flow Width (in.): t = Swale Height (in.): H = Flow Depth (in.): h = Bottom Width (in.): b =

Evidence of Flow: ☐ Yes ☐ No **If Yes, Description of Flow:** ☐ Damp ☐ Trickle ☐ Moderate ☐ High

Visual Evidence of Illicit Discharge

Visual Inspection: ☐ None ☐ Floatables ☐ Pet Waste ☐Oily Sheen ☐ Sanitary Waste ☐ Algae ☐ Foam

Olfactory Evidence of Illicit Discharge

Olfactory Inspection: ☐ None ☐ Sewage Smell ☐ Musty ☐ Rotten Eggs ☐ Ammonia ☐ Petroleum

Samples Taken and Sampling Results

Temp.	Conductivity	Salinity	Chlorine
Ammonia	Surfactants	Bacteria	Pollutant of Concern

7 Appendix 2: Manhole Screening Form

Manhole Inspection Form

Catchment ID	Date/Time
Structure ID	Last Rain Date/Amount
Location Description	
Inspector	

Southeastern Regional Services Group

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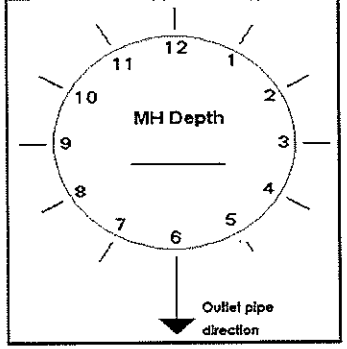
Circle direction(s) of incoming flow



Clock Position (1-12) Pipe Material (Concrete, HDPE, PVC, Ductile Iron, CMP)	Pipe Diameter (in.)	Invert Elevation (ft)	Upgradient Structure/Source (MH ID, CB, Priv, Unk)	Flow (Damp, Trickle, Moderate, High)

Cover Conditions: Diameter of clear opening (in.) ☐ Buried ☐ Cannot Inspect ☐ Cannot Locate

Evidence of Flow: ☐ Yes ☐ No **If Yes, Description of Flow:** ☐ Damp ☐ Trickle ☐ Moderate ☐ High

Visual Evidence of Illicit Discharge (select all that apply)

Visual Inspection: ☐ None ☐ Floatables ☐ Per Waste ☐ Oily Sheen ☐ Sanitary Waste ☐ Algae ☐ Foam

Olfactory Evidence of Illicit Discharge (select all that apply)

Olfactory Inspection: ☐ None ☐ Sewage Smell ☐ Musty ☐ Rotten Eggs ☐ Ammonia ☐ Petroleum

Samples Taken and Sampling Results

Temp.	Conductivity	Salinity	Chlorine
Ammonia	Surfactants	Bacteria	Pollutant of Concern

COMMENTS:

Further investigation needed? ☐ Yes ☐ No

Outfall/Catchment Screening Form

Southeastern Regional Services Group

SERSG established 1993

FUSS & O'NEILL

Catchment ID: _____ **Town:** _____

Inspector: _____ **Date/Time:** _____

Street Name: _____

Last rainfall event (date and amount): _____

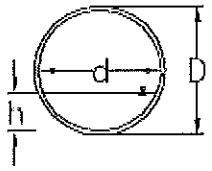
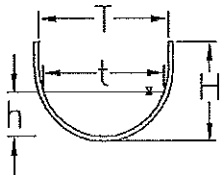
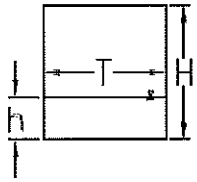
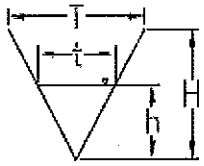
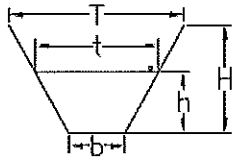
Type of Sampling Event: ☐ Dry Weather Screening ☐ Dry Weather Sampling ☐ Wet Weather Sampling

Location: ☐ Outfall ☐ Manhole ☐ Catch Basin ☐ Interconnection

Is outfall submerged/inundated? ☐ Yes ☐ No If YES screen/sample at 1st non-influenced structure: ☐ MH ☐ CB

Structure ID: **Latitude:** **Longitude:**

Shape of Pipe/Swale (check one)

 ☐	 ☐	 ☐	 ☐	 ☐
Rounded Pipe	**Rounded Swale**	**Rectangular Pipe/Swale**	**Triangular Swale**	**Trapezoidal Swale**

Outfall Material:
☐ Concrete
☐ HDPE
☐ Corrugated Metal Pipe
☐ Ductile Iron
☐ Clay
☐ PVC
☐ Other

Outfall/Manhole/Catchbasin Condition:
☐ Good ☐ Fair
☐ Poor ☐ Crumbling

Pipe Measurements:

Inner Dia. (in): d =

Outer Dia. (in.): D =

Pipe Width (in.): W =

Pipe Height (in.): H =

Flow Depth (in.): h =

Swale Measurements:

Swale Width (in): T =

Flow Width (in.): t =

Swale Height (in.): H =

Flow Depth (in.): h =

Bottom Width (in.): b =

Evidence of Flow: ☐ Yes ☐ No **If Yes, Description of Flow:** ☐ Damp ☐ Trickle ☐ Moderate ☐ High

Visual Evidence of Illicit Discharge

Visual Inspection: ☐ None ☐ Floatables ☐ Pet Waste ☐ Oily Sheen ☐ Sanitary Waste ☐ Algae ☐ Foam

Olfactory Evidence of Illicit Discharge

Olfactory Inspection: ☐ None ☐ Sewage Smell ☐ Musty ☐ Rotten Eggs ☐ Ammonia ☐ Petroleum

Samples Taken and Sampling Results

Temp.	Conductivity	Salinity	Chlorine
Ammonia	Surfactants	Bacteria	Pollutant of Concern

Appendix E

IDDE Employee Training Record

Illicit Discharge Detection and Elimination (IDDE)
Employee Training Record

Town of Uxbridge, Massachusetts

Date of Training: _____

Duration of Training: _____

Name	Title	Signature

Appendix F

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

SOP 10: LOCATING ILLICIT DISCHARGES

Introduction

An "illicit discharge" is any discharge to an engineered storm drain system that is not composed entirely of stormwater unless the discharge is defined as an allowable non-stormwater discharge under the 2003 Massachusetts MS4 Permit. Illicit discharges may enter the engineered storm drain system through direct or indirect connections, such as: cross-connections of sewer services to engineered storm drain systems; leaking septic systems; intentional discharge of pollutants to catch basins; combined sewer overflows; connected floor drains; and sump pumps connected to the system (under some circumstances). Illicit discharges can contribute high levels of pollutants, such as heavy metals, toxics, oil, grease, solvents, nutrients, and pathogens to receiving streams.

Illicit discharges can be located by several methods, including routine dry weather outfall inspections and catch basin inspections, which are described in detail in SOP 1, "Dry Weather Outfall Inspection" and SOP 3, "Catch Basin Inspection and Cleaning", respectively, as well as from citizen reports.

This SOP assumes that the municipality has legal authority (i.e., a bylaw or ordinance) in place, per the requirements of the 2003 Massachusetts MS4 Permit, to prohibit the connection of non-stormwater discharges into the storm drain system. The authority or department for addressing illicit discharge reports would be clearly identified in the municipality's legal authority. In Massachusetts, this is typically a combination of the Board of Health, the Department of Public Works (or Highway Department), and the local sanitary sewer department or commission. In some communities, the Conservation Commission may also play a role. This SOP refers to "appropriate authority" generically to reflect differences in how municipalities have identified these roles.

Identifying Illicit Discharges

The following are often indicators of an illicit discharge from stormwater outfall:

1. Foam: indicator of upstream vehicle washing activities, or an illicit discharge.
2. Oil sheen: result of a leak or spill.
3. Cloudiness: indicator of suspended solids such as dust, ash, powdered chemicals and ground up materials.
4. Color or odor: Indicator of raw materials, chemicals, or sewage.
5. Excessive sediment: indicator of disturbed earth of other unpaved areas lacking adequate erosion control measures.
6. Sanitary waste and optical enhancers (fluorescent dyes added to laundry detergent): indicator of the cross-connection of a sewer service.
7. Orange staining: indicator of high mineral concentrations.

Both bacteria and petroleum can create a sheen on the water surface. The source of the sheen can be differentiated by disturbing it, such as with a pole. A sheen caused by oil will remain intact and move in

a swirl pattern; a sheen caused by bacteria will separate and appear "blocky". Bacterial sheen is not a pollutant but should be noted.

Citizen Call in Reports

Reports by residents and other users of a water body can be effective tools in identifying the presence of illicit discharges. Many communities have set up phone hotlines for this purpose, or have provided guidance to local police departments and dispatch centers to manage data reported in this manner. Municipal employees and the general public should receive education to help identify the signs of illicit discharges and should be informed how to report such incidents.

When a call is received about a suspected illicit discharge, the attached IDDE Incident Tracking Sheet shall be used to document appropriate information. Subsequent steps for taking action to trace, document, and eliminate the illicit discharge are described in the following sections.

Potential illicit discharges reported by citizens should be reviewed on an annual basis to locate patterns of illicit discharges, identify high-priority catchments, and evaluate the call-in inspection program.

Tracing Illicit Discharges

Whenever an illicit discharge is suspected, regardless of how it was identified, the attached IDDE Incident Tracking Sheet should be utilized. The Incident Tracking Sheet shall be provided to the appropriate authority (i.e., Board of Health, Department of Public Works, etc.), which shall promptly investigate the reported incident.

If the presence of an illicit discharge is confirmed by the authority, but its source is unidentified, additional procedures to determine the source of the illicit discharge should be completed.

1. Review and consider information collected when illicit discharge was initially identified, for example, the time of day and the weather conditions for the previous 72 hours. Also consider and review past reports or investigations of similar illicit discharges in the area.
2. Obtain storm drain mapping for the area of the reported illicit discharge. If possible, use a tracking system that can be linked to your system map, such as GIS.
3. Document current conditions at the location of the observed illicit discharge point, including odors, water appearance, estimated flow, presence of floatables, and other pertinent information. Photograph relevant evidence.
4. If there continues to be evidence of the illicit discharge, collect water quality data using the methods described in SOP 13, "Water Quality Screening in the Field". This may include using field test kits or instrumentation, or collecting analytical samples for full laboratory analysis.
5. Move upstream from the point of observation to identify the source of the discharge, using the system mapping to determine infrastructure, tributary pipes, and drainage areas that contribute. At each point, survey the general area and surrounding properties to identify potential sources of the illicit discharge. Document observations at each point on the IDDE Incident Tracking Sheet as well as with photographs.
6. Continue this process until the illicit discharge is no longer observed, which will define the boundaries of the likely source. For example if the illicit discharge is present in catch basin 137

but not the next upstream catch basin, 138, the source of the illicit discharge is between these two structures.

If the source of the illicit discharge could not be determined by this survey, consider using dye testing, smoke testing, or closed-circuit television inspection (CCTV) to locate the illicit discharge.

Dye Testing

Dye testing is used to confirm a suspected illicit connection to a storm drain system. Prior to testing, permission to access the site should be obtained. Dye is discharged into the suspected fixture, and nearby storm drain structures and sanitary sewer manholes observed for presence of the dye. Each fixture, such as sinks, toilets, and sump pumps, should be tested separately. A third-party contractor may be required to perform this testing activity.

Smoke Testing

Smoke testing is a useful method of locating the source of illicit discharges when there is no obvious potential source. Smoke testing is an appropriate tracing technique for short sections of pipe and for pipes with small diameters. Smoke added to the storm drain system will emerge in connected locations. A third-party contractor may be required to perform this testing activity.

Closed Circuit Television Inspection (CCTV)

Televised video inspection can be used to locate illicit connections and infiltration from sanitary sewers. In CCTV, cameras are used to record the interior of the storm drain pipes. They can be manually pushed with a stiff cable or guided remotely on treads or wheels. A third-party contractor may be required to perform this testing activity.

If the source is located, follow steps for removing the illicit discharge. Document repairs, new sanitary sewer connections, and other corrective actions required to accomplish this objective. If the source still cannot be located, add the pipe segment to a future inspection program.

This process is demonstrated visually on the last page of this SOP.

Removing Illicit Discharges

Proper removal of an illicit discharge will ensure it does not recur. Refer to Table SOP 10-1, attached for, for examples of the notification process.

In any scenario, conduct a follow up inspection to confirm that the illicit discharge has been removed. Suspend access to the storm drain system if an "imminent and substantial danger" exists or if there is a threat of serious physical harm to humans or the environment.

Attachments

1. Illicit Discharge Incident Tracking Sheet

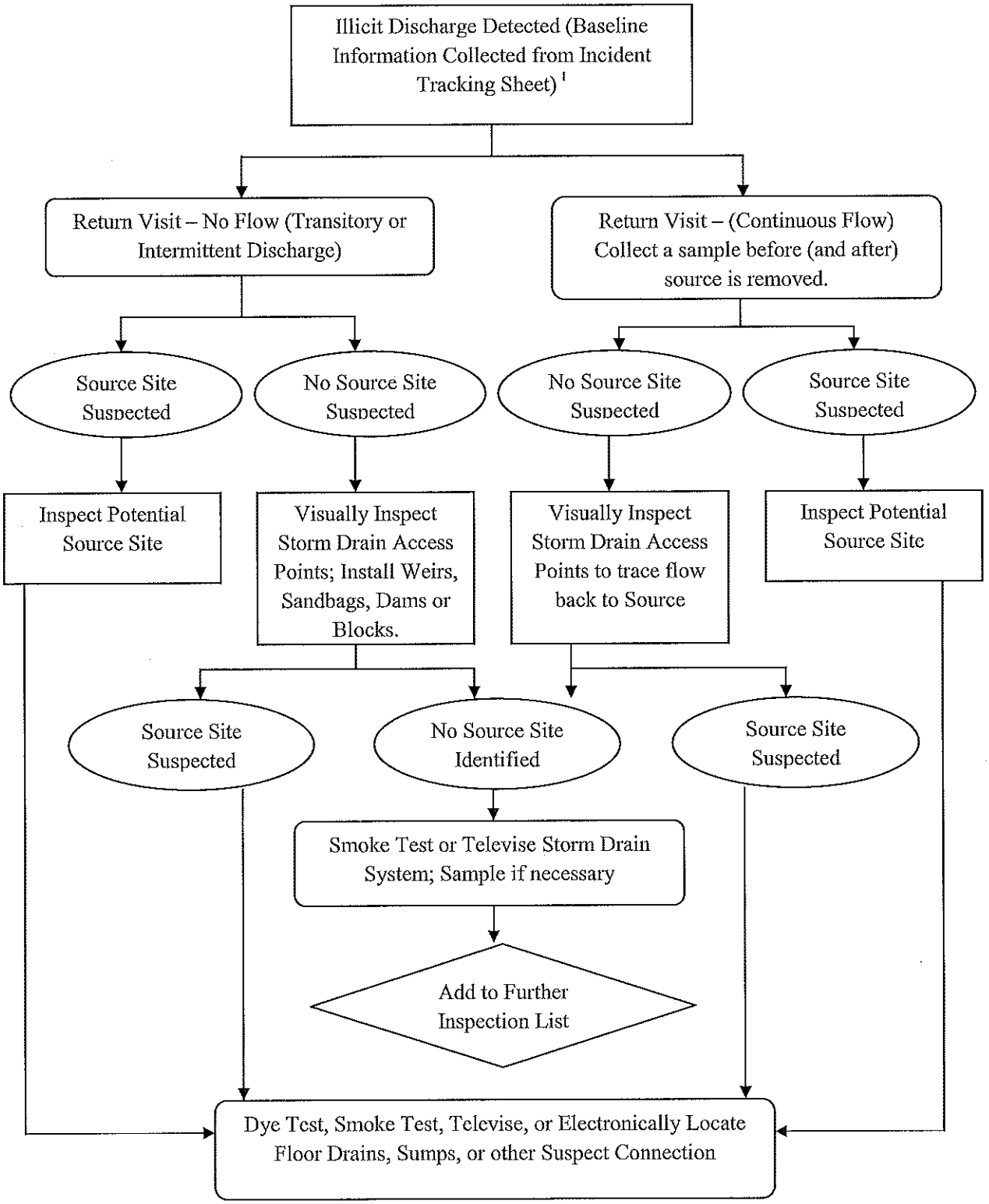
Related Standard Operating Procedures

1. SOP 1: Dry Weather Outfall Inspection
2. SOP 2: Wet Weather Outfall Inspection
3. SOP 3: Catch Basin Inspection
4. SOP 13: Using Field Test Kits For Outfall Screening
5. SOP 15: Private Drainage Connections

Table SOP 10-1

Notification and Removal Procedures for Illicit Discharges into the Municipal Separate Storm Sewer System

Financially Responsible	Source Identified	Enforcement Authority	Procedure to Follow
Private Property Owner	One-time illicit discharge (e.g. spill, dumping, etc.)	Ordinance enforcement authority (e.g. Code Enforcement Officer)	• Contact Owner • Issue Notice of Violation • Issue fine
Private Property Owner	Intermittent or continuous illicit discharge from legal connection	Ordinance enforcement authority (e.g. Code Enforcement Officer)	• Contact Owner • Issue Notice of Violation • Determine schedule for removal • Confirm removal
Private Property Owner	Intermittent or continuous illicit discharge from illegal connection or indirect (e.g. infiltration or failed septic)	Plumbing Inspector or ordinance enforcement authority	• Notify Plumbing Inspector or ordinance enforcement authority
Municipal	Intermittent or continuous illicit discharge from illegal connection or indirect (e.g. failed sewer line)	Ordinance enforcement authority (e.g. Code Enforcement Officer)	• Issue work order • Schedule removal • Remove connection • Confirm removal
Exempt 3rd Party	Any	USEPA	• Notify exempt third party and USEPA of illicit discharge


Illicit Discharge Detected (Baseline Information Collected from Incident Tracking Sheet)
Return Visit – No Flow (Transitory or Intermittent Discharge)
Return Visit – (Continuous Flow) Collect a sample before (and after) source is removed.
Source Site Suspected
No Source Site Suspected
No Source Site Suspected
Source Site Suspected
Inspect Potential Source Site
Visually Inspect Storm Drain Access Points; Install Weirs, Sandbags, Dams or Blocks.
Visually Inspect Storm Drain Access Points to trace flow back to Source
Inspect Potential Source Site
Source Site Suspected
No Source Site Identified
Source Site Suspected
Smoke Test or Televise Storm Drain System; Sample if necessary
Add to Further Inspection List
Dye Test, Smoke Test, Televise, or Electronically Locate Floor Drains, Sumps, or other Suspect Connection

[1] – *Guidelines and Standard Operating Procedures: Illicit Discharge Detection and Elimination and Pollution Prevention/Good Housekeeping for Stormwater Phase II Communities in New Hampshire,* New Hampshire Estuary Project, 2006, p. 25, Figure 2-1.

Illicit Discharge Incident Tracking Sheet

Incident ID:			
Responder Information (for Citizen-Reported issues)			
Call Taken By:	Call Date:		
Call Time:	Precipitation (inches) in past 24-48 hours:		
Observer Information			
Date and Time of Observation:	Observed During Regular Maintenance or Inspections? ☐ Yes ☐ No		
Caller Contact Information (optional) or Municipal Employee Information:			
Observation Location: (complete one or more below)			
Latitude and Longitude:			
Stream Address or Outfall #:			
Closest Street Address:			
Nearby Landmark:			
Primary Location Description	**Secondary Location Description:**		
☐Stream Corridor (In or adjacent to stream)	☐Outfall	☐In-stream Flow	☐Along Banks
☐Upland Area (Land not adjacent to stream)	☐Near Storm Drain	☐Near other water source (stormwater pond, wetland, ect.):	
Narrative description of location:			
Upland Problem Indicator Description			
☐Dumping	☐Oil/Solvents/Chemicals	☐Sewage	
☐Detergent, suds, etc.	☐Other:_____		
Stream Corridor Problem Indicator Description			
Odor	☐None	☐Sewage	☐Rancid/Sour ☐Petroleum (gas)
	☐Sulfide (rotten eggs); natural gas	☐Other: Describe in "Narrative" section	
Appearance	☐"Normal"	☐Oil Sheen	☐Cloudy ☐Foam
	☐Optical enhancers	☐ Discolored	
	☐Other: Describe in "Narrative" section		
Floatables	☐None	☐Sewage (toilet paper, etc)	☐Algae ☐Trash or debris
	☐Other: Describe in "Narrative" section		
Narrative description of problem indicators:			
Suspected Source (name, personal or vehicle description, license plate #, address, etc.):			

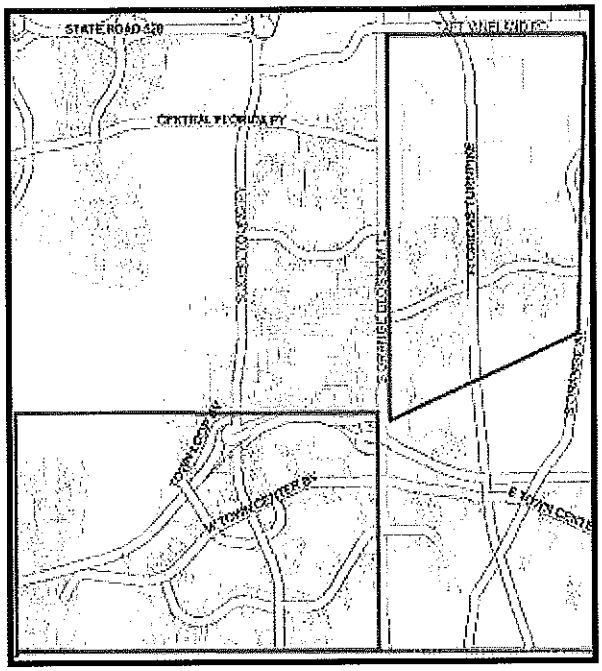
CMRSWC

SMOKE TESTING STANDARD OPERATING PROCEDURE

Based on the Smoke Testing conducted in #58166 SMOKE TESTING in Southern Service Area

AREA SELECTION

This may be a result of specific project in the design phase or the result of areas connected to the existing project.



In the case of Project #58166, subareas to the master pump station were tested due to issues during and immediately following rain events. SCADA provided the list of pump stations with excessive run times which pumped to the MPS in question. These pump stations were collected and mapped for location. In addition to the stations with excessive run times, several other subareas were tested in order to Smoke the entire region.

Once the area is selected, the OCUD Project Manager will coordinate with GIS. GIS will provide a total count of manholes and linear footage of gravity mains based on GIS data and assets. These quantities will be shared for pricing. GIS will also provide quarter sections maps with customization including house addresses and aerials (shaded 50%). These quarter sections should be plotted immediately prior to smoke testing so the most current information is included and provided to the Contractor.

Project timing is also significant. Smoke will not be evident in areas that are saturated. The optimal scheduling for smoke testing is during the dry season. The purpose of testing is to locate not only surface features including illegal connections and broken cleanouts but also issues in the sanitary sewer main, laterals and manholes. In addition, criteria should be developed to determine how long after a rain event that smoke testing may commence.

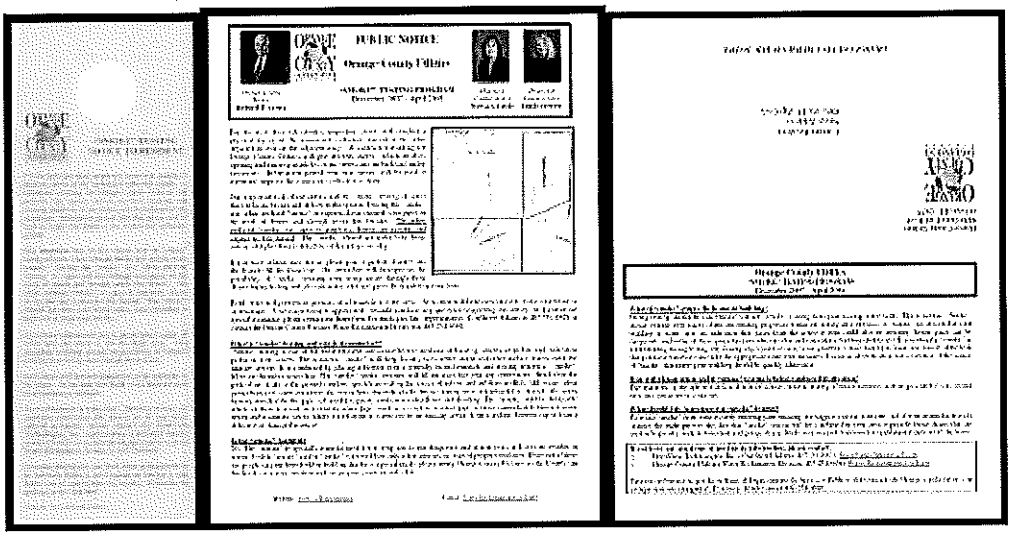
NOTIFICATIONS

This is a critical function of the testing program. OCU customers, General Public, Utilities Water Reclamation, Director's office, Commissioners Office, 911, Fire Department and Utilities Dispatch need to know the purpose, location, dates, procedure and status reports.

- ☐ Director's approval of Public Notification flyer/mailer and door hanger,
- ☐ Commissioners office notification and briefing,
- ☐ Fire Department and 911 contacts and notification,
- ☐ Residents received the public notice as a mass mailing prior to smoke testing
- ☐ Door hangers were hung at each residence 2-4 days prior to smoke testing specific subdivision

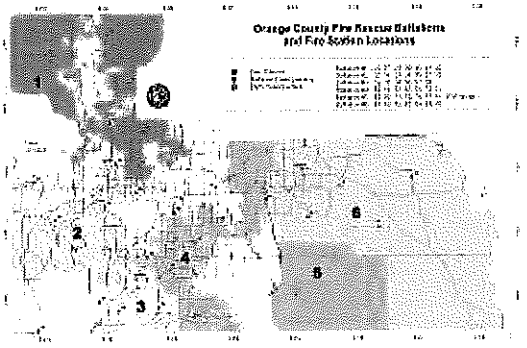
- ☐ Provide Variable Message boards strategically placed throughout testing including major streets into the area and entrances into subdivisions
- ☐ Weekly updates were sent to the Fire Department, 911, Utilities and Testing Company
- ☐ Notification of all parties of project completion

1. The OCUD Project Manager must have the Public Notification flyer / mailer and door hanger approved through the Director's office using the PIO request form and PIO checklist unless an approved template is being utilized.



2. The OCUD Project Manger will contact the Commissioners office and notify the Commissioners that there will be smoke testing in their District. Commissioners need to be notified or briefed prior to the public notification flyers / mailers being sent to the public.

3. The OCUD Project Manger shall provide initial notification to Orange County Fire Rescue and locate the Assistant Chiefs commanding the Fire Stations of the affected area. This may cover several areas depending on the total area to be smoke tested. However, the City of Orlando may also be providing fire service for the area, and coordination is required.

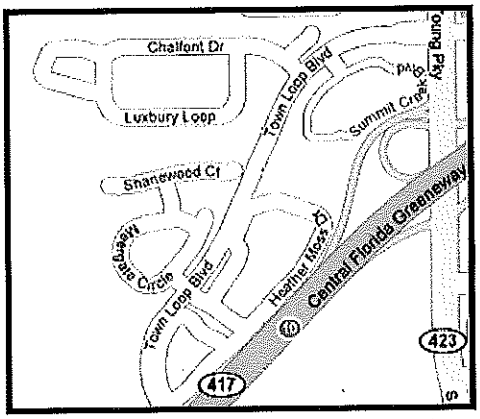


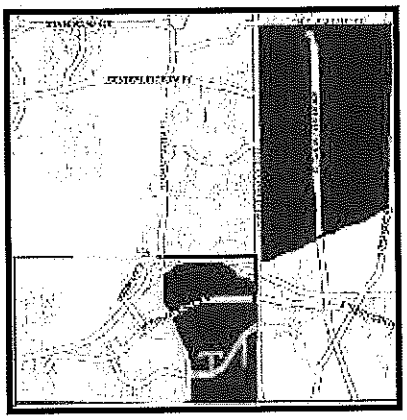
4. The Contractor or OCU shall provide a mass mailing to all residents in the smoke testing area approximately two (2) weeks prior to project start. The Project Manager shall determine if the mailers shall be handled in-house or by the Contractor. The Project Manager will provide residents names and addresses by coordinating with GIS. GIS can export all the information in an excel table for an easy mail merge. Please request customers billing address be provided in addition to the home owner data so that renters are included in the notification process. Note that Customer service's reverse dialing system may also be utilized and a printed note can be placed on Customers Bills, to supplement the public notification flyer / mailer.

5. The Contractor will hang door hangers approximately 2-4 days prior to Testing specific streets.

6. The Contractor shall provide Variable Message Boards (VMB) strategically placed throughout testing including major streets into the area and entrances into subdivisions. Project 58166 covered 75 miles of sanitary sewer (400,000 LF) and 7,300 residents over a 2 month period. The Contractor constantly relocated the three (3) VMB to cover the areas being smoked.

7. The Project Manager shall provide weekly updates to the Fire Department, 911, Water Reclamation contacts, Utilities Dispatch and Testing Company. Work for the upcoming week as well as total progress shall be provided by the Contractor and this information shall be conveyed to all parties on a weekly basis and sent the Friday before the upcoming week by the Project Manager. This included an overall progress map of the entire project progress, narrative describing the week look ahead and a map showing all street names to be tested the following week. The Project Manager is the sole point of contact for all Public Safety and Utilities Departments.





Green = complete
Yellow = In Progress
Red = not started

8. Provide Notification to all parties that the smoke testing is complete. The Fire Department will call immediately if they haven't received the weekly update.

OCUD DOCUMENTATION COLLECTION

The OCUD Project Manager will provide the Consultant or Contractor with the following information to provide a quote.

- ☐ Proposed smoke testing area map,
- ☐ One set of quarter section maps for the purpose of bidding
- ☐ Total Linear Footage of Sanitary Sewer,
- ☐ Total number of Manholes,
- ☐ Total number of Resident Addresses & spreadsheet for Mailers and door hanger count,
- ☐ Requirements for Variable Message Boards,
- ☐ Requirements for the door hanger and 2 page mailer including sizes, color, etc.
- ☐ Three (3) color sets of quarter section maps to the Contractor plotted at the time of smoke testing.
- ☐ Coordination with Water Reclamation for Manhole locates just prior to smoke testing (several manholes were found to be paved over or located in the R-O-W)
- ☐ Coordination with Construction and Water Reclamation during smoke testing for an emergency contact / standby personal to make emergency repairs if required and provide sewer cleaning if line is blocked.

SMOKE TESTING SCOPE OF SERVICES.

Procedures

- ☐ Approved Public Notification Mass Mailers. The Contractor shall mail out to all the residences and businesses in the proposed project area, the approved Smoke Testing public notification flyer / mailers, as a mass mailing approximately 2 weeks before the overall project starts. The mailer shall only be the approved Orange County Utilities smoke testing public notification flyer / mailer and shall be provided by the Project Manager for each project.

- ☐ Door Hangers. The Contractor shall place door hangers on all residences and business 2-4 days prior to smoke testing at those specific addresses. Door hangers shall be an ongoing process throughout the project and shall be limited to the area provided in the look ahead schedule. Door Hangers shall not be placed for areas which will not be tested within 4 days.

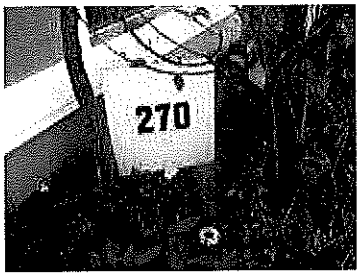
- ☐ Smoke Test Setup. The contractor will setup on every other manhole and smoke test no more than 400 ft both directions from setup (Total of 800 LF). This distance shall not be exceeded unless written authorization and field verification is given by the verifying that distances greater than a 400 ft radius are providing acceptable results. The Contractor shall be responsible for Maintenance of Traffic and relocation of variable message boards throughout the duration of the project.

- ☐ Smoke Testing Crew. The smoke testing Contractor shall provide at minimum a crew of four (4) people. One member to man the machine, two (2) to walk and one supervisor. The supervisor will assist in all functions but with primary effort on data collection, logging, determination of smoke testing schedule and tracking.

☐ Smoke Testing. Smoke will be turned on and remain on throughout the entire time of testing including the walkthrough for identification of defect locations with flags as well as during the taking digital pictures for each flagged and numbered defect.

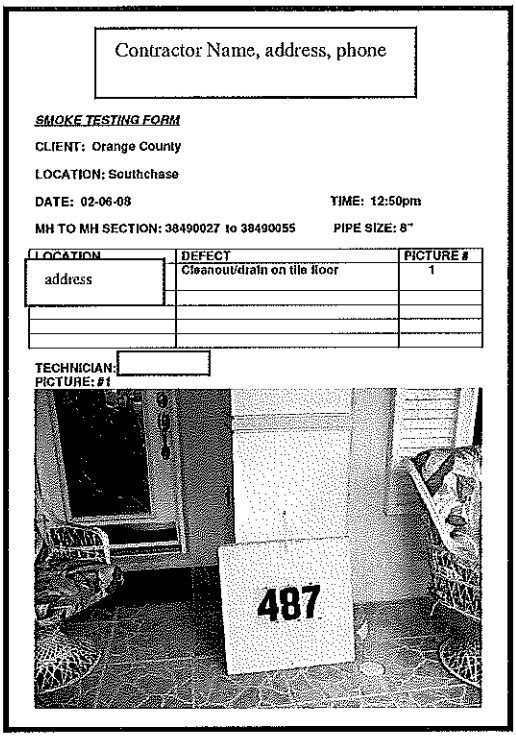
☐ Identification of Defects. The walk through for locating of defects will not begin until smoke is highly visible with a smoke plume emanating from the plumbing vents of houses at the end of the setup location (maximum 400 ft radius) from the smoke testing machine. A colored locate flag will dropped at the location of the defect and will be left for the homeowner to remove. Walkers shall traverse not only the sidewalk but between all homes and in back yards looking for illegal connections including patio, pool drains and roof drain connections.

☐ Defect Pictures. Once the area has been flagged the Smoke Testing Contractor will snap a digital picture (not less than 2 Megapixel with time and date stamp on the digital photograph) showing the smoke billowing from the defect, flag, unique number, and physical features at or near the defect. Pictures without smoke plume from the located defect or missing visible unique number are unacceptable. The contractor will provide a self standing sign (sandwich board) at each defect with minimum 4" tall numbers physically located at each defect part of the picture. Numbering shall be consecutive, unique number per defect, clearly visible in the picture and noted on the report, record drawings and summary spreadsheet.



☐ Defect Reporting. The report for each defect shall be a MS Word document containing the following information: Contractor letterhead, name of smoke tester, date, time, address of defect, description of defect, manhole to manhole OCU identification, digital photograph, priority rating of defect, Total Drainage Area estimation, quarter section number, footage smoked and map for exact location of defect. Note the map may be of an entire street with multiple defects shown. Weekly reports shall be provided to the Project Manager in digital form as well as 2 hard copies. The Project Manager shall provide one copy to Water Reclamation.

- Common description of defects include: broken cleanout, broken cleanout cap, missing cleanout cap, manhole lid, roof leader, drain connection, AC connection, smoke under sidewalk or driveway, etc
- Common priority ratings and Total Drainage Area estimations include: Priority 1 (illegal connections, direct impact, large drainage area), Priority 2 – High Impact (low lying area, down spouts near cleanout, etc), Priority 3 – Moderate Impact (small impact but potential inflow), Priority 4 - Insignificant (None, no impact).



Contractor Name, address, phone

SMOKE TESTING FORM

CLIENT: Orange County

LOCATION: Southchase

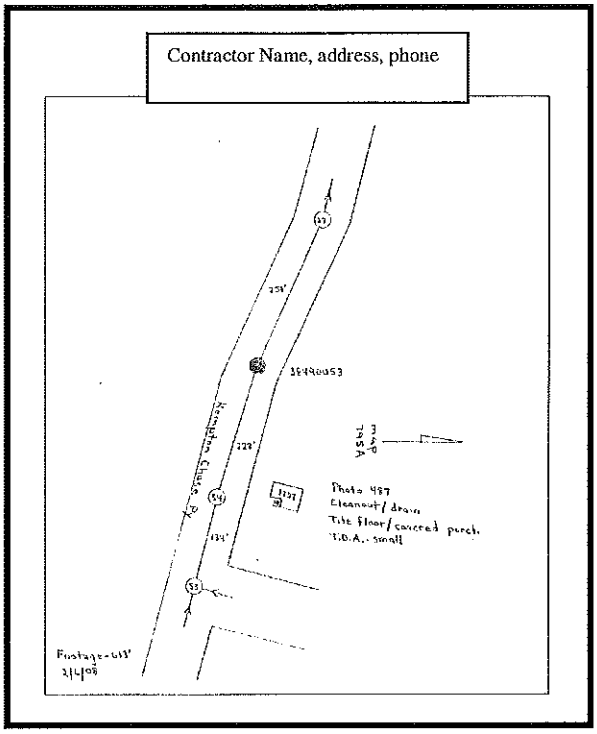
DATE: 02-06-08 TIME: 12:50pm

MH TO MH SECTION: 38490027 to 38490055 PIPE SIZE: 8"

LOCATION	DEFECT	PICTURE #
address	Cleanout/drain on tile floor	1

TECHNICIAN:

PICTURE: #1



Contractor Name, address, phone

☐ Record Drawings and Summary. The Contractor shall return on set of the quarter section maps showing all the defects for the project to the Project Manager. In addition, the Contractor shall provide an Excel table listing the defect number, priority, total drainage area estimation, location, address, and description of defect. The spreadsheet shall be provided each week with the reports and shall be cumulative with a final summary of all defects at the end of the project.

Defect / Pic #	Priority	Total Drainage Area	TDA Notes	Location	Address	Notes
45	1	large	MH ditch			MH #22 in ditch
46	3	small				cleanout
47	3	small				cleanout
48	3	small				MH #11 Below Grade
49	3	small				cleanout
50	4	nil				Broken C.O.
51	2	low area				Broken C.O.

☐ Project Coordination. The Contractor shall provide a one week look-ahead schedule and coordinate with the Project Manger the exact locations of Smoke Testing for the upcoming week. This information will be transmitted to the Fire Rescue Department by the Project Manager.

REQUEST FOR QUOTES (RFQ)

The RFP will contain the following bid items based on the scope of services as well as minimum details for the smoke testing procedure:

☐ Cost per foot for smoke testing LF
☐ Cost for mailer and door hanger LS

- ☐ Cost for variable message boards Per Month
- ☐ Final Report, Excel Summary and Record DWGS LS
- ☐ Acknowledgements of Contractor Responsibilities and Scope of Services
    - o Responsible for all MOT including traffic control, barricades, flagmen, traffic cones, police, etc
    - o Providing all flags, equipment, chemicals, water, fuel and all appurtenances to be included in the per foot cost
    - o Responsible for protecting the public from open manholes
    - o Responsible for any special permits or licenses
    - o Coordination with Schools and high traffic roads for testing on weekends only
    - o Providing a phone number for information and point of contact onsite during testing for the public

UTILITY INSPECTOR

As with any project, there are several procedural errors or shortcuts that can be made which will detrimentally affect the outcome. The inspector will verify the procedures are being followed by the Contractor including, running the smoke the entire time, effectiveness of the walkers, verify backyards and side yards are being investigated, speaking with the public and documentation. The project schedule shall be coordinated by the Project Manager with Construction to verify the specifications are being adhered.

In 58166, we provided a full time inspector as well as a part time representative from Water Reclamation. Both Utilities representatives were looking for defects, calling in critical defects to be repaired immediately, speaking with the public about the project and directly responding to customer calls to the Smoke Tester PIO as well as the Water Reclamation hotline. In addition, we corrected several issues with the smoke tester procedures. The first was the duration of the smoke. The walkers were leaving before the smoke had reached the end of the area to be tested and were missing vital defects. There is a time lag from when the machine is started until the smoke fills the volume of the gravity collection system, laterals, house plumbing and reaches the final point of the testing area. The coordination between the Contractor in charge of running the smoke test machine and the walkers was not efficient. In one instance, they ran out of smoke and the walkers continued looking for defects even though no smoke was in the system. Finally, the machine was being turned off immediately after the flagging was finished. In some instances, the defect (broken later under a sidewalk, manhole shifted cone section or deep cleanout) were not readily apparent without the presence of smoke. The defect pictures must show smoke to identify the specific defect and show proof that there is an issue.

GPS COORDINATES

In 58166, the Prime Contractor shot GPS coordinates of each defect as well as took coordinates for every manhole and lift station in the testing area. This task was a full time position and required the Contractor to provide the GPS Trimble equipment. The need to locate both the existing facilities as well as the defects is a coordination effort by the Project Manager with both GIS and Water Reclamation. In addition, the GPS Technology is not normally a service provided by Smoke Testers, so the additional cost for a sub will have to be evaluated by the Project Manager and the need for the Utility.

DATA ANALYSIS

The Project Engineer is responsible for analyzing the defects found during smoke testing, verifying priority, and creating a column on the summary spreadsheet for responsibility. Illegal connects or cleanout issues at the home are the responsibility of the homeowner to repair. The cleanouts at the R-O-W line, defects found under sidewalks or driveway aprons, manholes, etc are the responsibility of Utilities to repair. The Project Manager will sort the summary spreadsheet by responsibility and priority. This information shall be coordinated through both Water Reclamation for scheduling of repairs as well as with the Water Reclamation Environmental Compliance section for residential compliance and verification of repairs. The project manager shall ensure that the digital data is filed on the digital network under the appropriate sequence number.

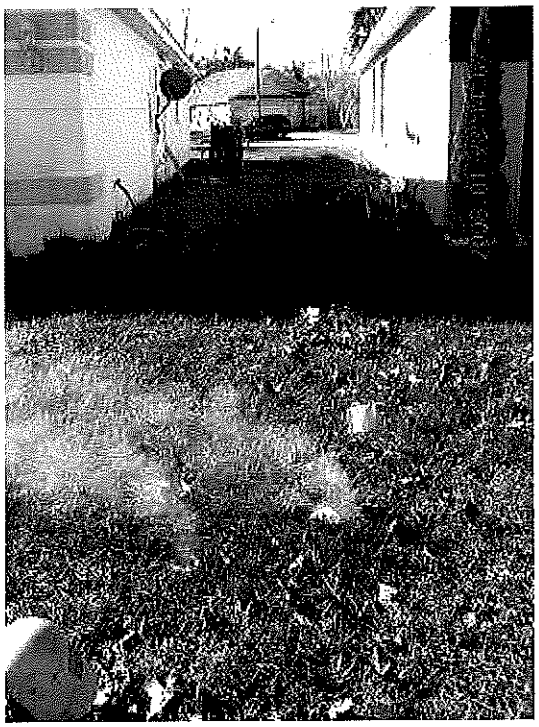
PROJECT CLOSEOUT

The Project Manager shall have a closeout meeting and pass all the information including spreadsheet, record drawings and Final Report with pictures to Water Reclamation. Water Reclamation will schedule repairs that are the responsibility of the Utility and coordinate the compliance action with homeowners responsible for private property repairs.

The results for #58166

Priority of Defect	Description	ROW / Easement	Private Property	Total	Percent
Priority 1 - Illegal Connections	Direct Connection (Roof Gutters, porch / pool drains, plumbing, etc)	0	20	20	1.6%
Priority 1 - Direct Impact	(Ponds nearby, large depressions, parking lots, MH in drainage)	45	10	55	4.5%
Priority 2 - High Impact	(Low areas, down spouts near cleanout, etc)	527	186	713	58.4%
Priority 3 - Moderate Impact	Small impact but potential inflow	134	221	355	29.1%
Priority 4 - Insignificant	Above grade or high ground, No observable impact	8	70	78	6.4%
Total		**714**	**507**	**1221**	100%

Priority 2 –Impact – Low Areas.
Note swale between houses

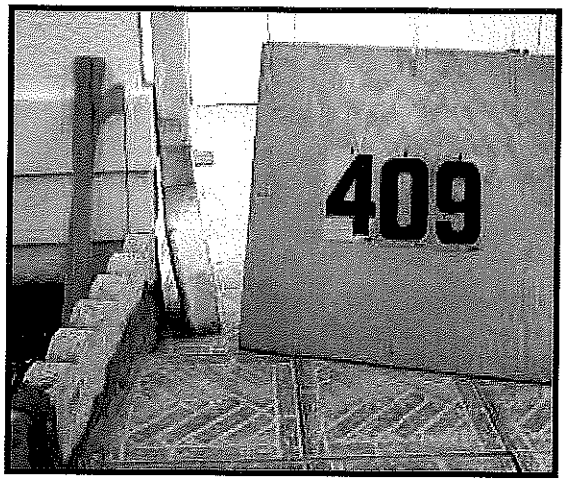


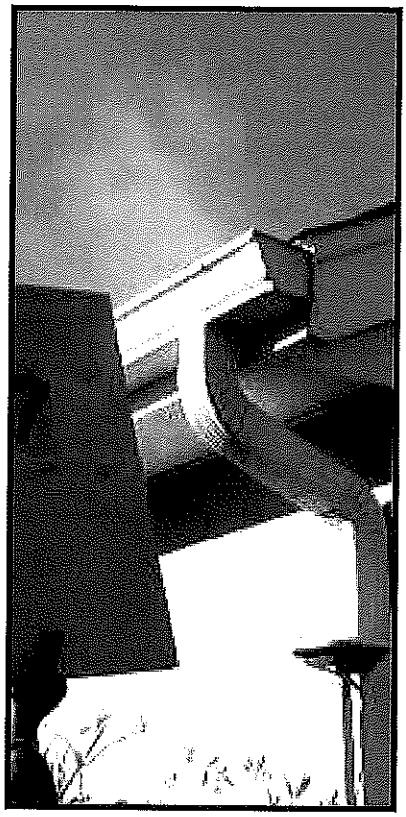
Priority 2 – Impact (Low Area) Note screen on cleanout and swale between houses

Priority 3 – Small Impact
Good drainage to lake. Small impact.

Priority 4 – No Impact – No drainage Area.
Homeowner to repair c/o on house

Priority 1 - Illegal connections





UDOT Dye Test Standard Operating Procedure

Purpose:

UDOT's MS4 permit requires the following:

- UDOT's entire storm drain system must be mapped including all storm drain pipe and other storm water conveyance structures (drains, creek, ditch, retention pond, detention pond, etc.).
- An inventory must be created of floor drains inside UDOT-owned or operated buildings. This inventory must be kept current. UDOT must ensure that all floor drains discharge to the appropriate locations.
- UDOT must develop site maps/diagrams to evaluate stormwater discharges and ensure that only stormwater is allowed into the storm drain system and that the appropriate BMPs are in place to minimize pollutants from entering the storm drain system.

When in doubt of a drainage pattern or ultimate discharge point, a dye test, video test, or smoke test are all tools to aid in making these determinations. Dye testing is an excellent indicator of illicit connections and is conducted by introducing non-toxic dye into sinks, shop drains and other plumbing fixtures. The discovery of dye in the storm drain, rather than the sanitary sewer, conclusively determines that the illicit connection exists. The following procedures are for conducting a dye test.

Test Preparation:

- Review storm drain, sewer maps, and any available as-built/utility drawings to identify lateral sewer connections and how they can be accessed. Print the station map included in the station SWPPP which can be found in Uplan at http://uplan.maps.arcgis.com/home/item.html?id=a647f52268964e7aa890332b6b544be6
- Prepare the following materials prior to the test.
    - Tracing dye in 2 colors in order to alternate between them when testing multiple fixtures. * All dyes must be non-toxic, biodegradable and NSF certified.
    - Outfall/manhole observers
    - Flashlight
    - Cameras
    - Materials to document findings
- Notify the local health department and DWQ (801) 536-4300 of when and where dye testing is occurring so that dye released into the storm drain system or local waterway is not mistaken for a spill or illegal discharge.

Test Procedure:

- Station personnel at the identified manhole, sump, cleanout, outfall or other appropriate locations needed to watch for dye. ***Dye observed in an o/w separator does NOT necessarily mean the fixture is plumbed to the sanitary sewer nor do manholes marked "sewer" necessarily indicate that the line goes to the sanitary sewer.**

- See product guidelines for the amounts of dye needed. If it is a dye that needs dissolving in water before pouring, follow the product instructions for the initial dilution rate.
- Add dye to fixture (floor drain, sink, etc.). Make sure to record the time the dye was added and mark the location on the map for each fixture where dye was added.
- Flush each fixture with 20-30 gallons of water minimum or until dye is observed in a manhole, storm sewer outfall, or other location. The more water flushed will shorten the time it takes for the dye to be observed.
- Watch the sanitary and storm drain discharge points until the dye is observed. Once dye is observed, note the time, and repeat steps at each drain being tested.
- Document all observations.

Test Results

- If dye is observed in the sanitary sewer sump, cleanout, or manhole and *no* dye is observed in the storm drain sump, cleanout, manhole or waterway, then the test is successful. Record the results both on the SWPPP map and in the drain inventory for the station.
- If *any* dye is observed in the storm drain sump, cleanout, manhole, or waterway, retest if necessary to determine which fixture(s) or drains(s) are cross-connected.
- Take the cross-connected fixtures out of service until they are properly connected to the sanitary sewer (upon approval of local authorities) or arrangements are made for containment, collection, and proper disposal of wastewater. Document a timeline of necessary corrections needed, and follow-up dye testing results to document the corrections made.

Helpful Hints

- Locating Missing Dye. The investigation is not complete until the dye is found. Some reasons for dye not appearing include:
    - The building/fixture is actually hooked up to a septic system.
    - The sewer line is clogged.
    - There is a leak in the sewer line or lateral pipe.
- Facility SWPPP map should be marked with numbered drains tested that could correspond to a Dye Test Log which includes:
    - Fixture number;
    - Fixture name or description;
    - Color of dye used;
    - Dye in time;
    - Dye out time;
    - Location of dye observed and other information/notes