

Illicit Discharge Detection and Elimination (IDDE) Program

University of Connecticut (Avery Point)

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This document is based on a template originally created by Fuss & O'Neill and modified for statewide use with the CTDEEP General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems, effective July 1, 2017.

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1 Introduction

1.1 MS4 Program

The University of Connecticut (Avery Point) has developed an Illicit Discharge Detection and Elimination (IDDE) program to address the requirements of the Connecticut Department of Energy and Environmental Protection (CTDEEP) *General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems*, effective July 1, 2017, hereafter referred to as the “2017 MS4 Permit” or “MS4 Permit.”

The 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/Participation
3. Illicit Discharge Detection and Elimination
4. Construction Site Stormwater Runoff Control
5. Post-Construction Stormwater Management in New Development or Redevelopment
6. Pollution Prevention/Good Housekeeping.

Under Minimum Control Measure 3, the permittee is required to implement an IDDE program to provide the legal authority to prohibit and eliminate illicit discharges to the MS4, find the source of any illicit discharges, eliminate those illicit discharges, and ensure ongoing screening and tracking to prevent and/or eliminate future illicit discharges. The IDDE program must also be recorded in a written (hardcopy or electronic) document and meet the IDDE program requirements specified in the MS4 Permit. This document has been prepared to address this requirement.

1.2 Geographic Scope of IDDE Program

The MS4 Permit requires municipalities to implement the IDDE program within the Urbanized Area (based on 2010 U.S. Census) and those catchment areas of the MS4 with either Directly Connected Impervious Area (DCIA) of greater than 11% or which discharge directly to impaired waters (i.e., “priority” areas).

Figure 1-1 depicts the urbanized area and other areas outside of the urbanized area that, collectively, may be considered priority areas within the University of Connecticut (Avery Point).



Figure 1-1. Urbanized Areas (basins with impervious cover >11% are shaded yellow) and Other Areas Potentially Subject to the MS4 Permit IDDE Program Requirements (“Priority Areas”).

1.3 Illicit Discharges

An “illicit discharge” is any unpermitted discharge to waters of the state that does not consist entirely of stormwater or uncontaminated ground water except: (1) certain allowable non-stormwater discharges when such non-stormwater discharges are not significant contributors of pollution to a discharge from an identified MS4, or (2) discharges authorized under a separate NPDES permit that authorize a discharge to the MS4.

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 sanitary 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 domestic wastewater 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 involve substantial cost and effort, such as disconnecting and reconnecting sanitary sewer laterals or replacing leaking sanitary and/or storm sewer lines. Others, such as improving adherence to proper pet waste management practices through public education and by providing pest waste baggies and receptacles, can be accomplished through relatively low-cost efforts.

Regardless of the intention, when not addressed, illicit discharges can be a significant source of pollutants to surface waters, including metals, toxics, oil, grease, solvents, nutrients, and pathogens.

1.4 Allowable Non-Stormwater Discharges

The following categories of non-stormwater discharges are allowed under the MS4 Permit provided: (1) the permittee controls such non-stormwater discharges to the Maximum Extent Practicable (MEP), as required by the MS4 Permit; (2) such non-stormwater discharges do not contribute to a violation of water quality standards; and (3) such non-stormwater discharges are documented in the Stormwater Management Plan and are not significant contributors of pollutants to any identified MS4:

- Uncontaminated groundwater discharges including, but not limited to, pumped ground water, foundation drains, water from crawl space pumps and footing drains
- Irrigation water including, but not limited to, landscape irrigation and lawn watering runoff
- Residual street wash water associated with sweeping

- Discharges or flows from firefighting activities (except training)
- Naturally occurring discharges such as rising ground waters, uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(20)), springs, diverted stream flows and flows from riparian habitats and wetlands.

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

1.5 Receiving Waters and Impairments

Table 1-1 lists the impaired waters within the boundaries of the University of Connecticut (Avery Point) based on the latest version of the State of Connecticut Integrated Water Quality Report produced by CTDEEP 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

Waterbody Name	Segment ID	Category	Impairment and Stormwater Pollutant of Concern	Approved TMDL
Long Island Sound-Inner Baker Cove	CT-E1_ 013	SA	Shellfish harvest	CT Statewide Bacteria TMDL
Long Island Sound-EB Shore, Thames River Mouth (East) Groton	CT-E3_005	SB	Habitat for Marine Fish, Other Aquatic Life and Wildlife	n/a

Source: State of Connecticut 2018 Integrated Water Quality Report (CTDEEP).

Category 5 Waters – Available data and/or information indicate that one or more designated uses are not being supported and a TMDL is needed.

1.6 IDDE Program Goals, Framework, and Timeline

The objective of the IDDE program is to systematically find and eliminate sources of non-stormwater discharges to the MS4 and implement procedures to prevent such discharges. The program consists of the following major components as outlined in the MS4 Permit:

- Legal authority to prohibit illicit discharges and enforce this prohibition
- Program for citizen reporting of illicit discharges
- Storm system mapping
- Sanitary Sewer Overflow (SSO) elimination
- Assessment and priority ranking of catchments
- Outfall and interconnection screening and sampling
- Catchment investigations
- Identification/confirmation of illicit sources
- Illicit discharge removal
- Follow-up screening
- Employee training.

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

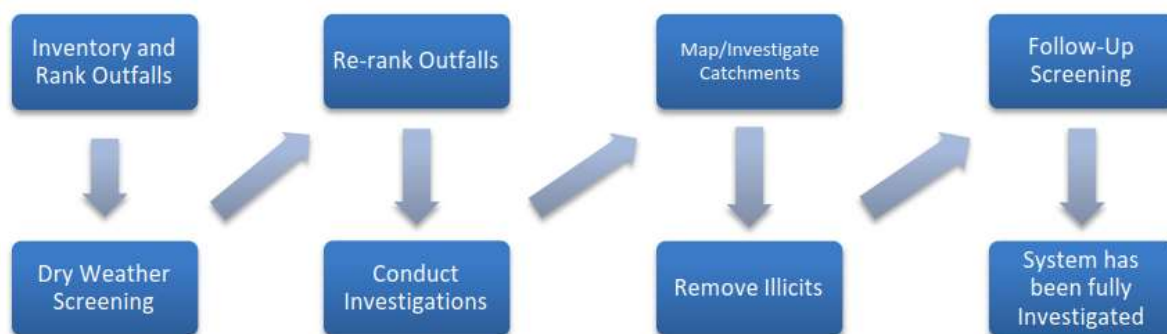


Figure 1-2. IDDE Investigation Procedure Framework

Table 1-2. IDDE Program Implementation Timeline

IDDE Program Requirement	Deadline					
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10
SSO Inventory (5-year look back)	Oct 30, 2017					
Program for Citizen Reporting	Effective Date					
Establish IDDE Legal Authority	July 1, 2018	July 1, 2019				
Written IDDE Program	July 1, 2018	July 1, 2019				
Outfall/Interconnection Inventory		July 1, 2019				
Map All Stormwater Outfalls		July 1, 2019	July 1, 2020			
Initial Assessment and Priority Ranking of Catchments (update annually)		July 1, 2019			July 1, 2022	
Complete Detailed Storm System Mapping			July 1, 2020		July 1, 2022	
Begin Dry Weather Outfall Screening (high and low priority outfalls)	July 1, 2018	July 1, 2019				
Complete Dry Weather Outfall Screening (high and low priority outfalls)					July 1, 2022	
Catchment Investigations – Problem Outfalls (80% and 100% of problem catchments)			July 1, 2020		July 1, 2022	
Catchment Investigations* – all Problem, High and Low Priority Outfalls						July 1, 2027

Deadlines shown in red apply to new MS4 permittees, where they are different than the deadlines for existing 2004 MS4 permittees.

*For existing 2004 MS4 permittees, catchment investigations must begin with three months of finalization of investigation procedure and no later than 15 months from effective date of permit. New MS4 permittees must begin these investigations no later than 2 years and 3 months from effective date of permit.

1.7 IDDE Program Accomplishments – 2004 MS4 Permit

The 2004 MS4 Permit required MS4 communities 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. MS4s were also required to define how confirmed discharges would be eliminated and how the removal would be documented.

The University of Connecticut (Avery Point) was not subject to the 2004 MS4 permit, therefore no mapping or sampling was performed in prior years.

2 Authority and Responsibilities

2.1 Legal Authority

The University of Connecticut (Avery Point) has not adopted an IDDE ordinance, as these topics are covered in trainings for staff at the institution and/or university-wide policies.

2.2 Statement of Responsibilities

The Environmental Compliance team within the Environmental Health and Safety (EHS) group at the University of Connecticut is the lead department responsible for implementing the IDDE program. Other agencies, departments, or personnel with responsibility for aspects of the program include: facilities, public works. The EHS Environmental Compliance team coordinates activities related to the 2017 MS4 permit. Regular communication channels are already in operation amongst the staff involved.

3 Citizen Reporting of Illicit Discharges

The MS4 Permit requires municipalities to develop a program for citizen reporting of illicit discharges. The University of Connecticut (Avery Point) has established a system to allow for citizen reporting which includes an email address or phone number for submitting comments. The reporting system is described on the University of Connecticut (Avery Point) website and in municipal offices, and consists of ##REPORTING MECHANISM AND PROCESS.

The University of Connecticut (Avery Point) will investigate and eliminate any illicit discharges reported by citizens or organizations, provided such a report incorporates at least a time and location of an observed discharge. University of Connecticut (Avery Point) will conduct an inspection of the reported outfalls, manholes or other sites promptly after receiving such a report. The University of Connecticut (Avery Point) will incorporate the reported outfalls into the IDDE program. Citizen reports and the responses to those reports will be included in the Annual Report.

4 Mapping

The University of Connecticut (Avery Point) originally developed mapping of its entire stormwater system as part of its own facilities data management. Due to security concerns, this map is not attached here as an appendix, but is available upon request.

4.1 Outfall and Interconnection Inventory and Mapping

The University of Connecticut (Avery Point) will develop an inventory (spreadsheet or database in a format compatible with Microsoft Excel) and mapping at a minimum scale of 1"=2000' and maximum scale of 1"=100' showing all stormwater outfalls¹ located within and owned or operated by the municipality (or institution for institutional MS4s) and all interconnections² with other MS4s. The map should, if possible, be developed in GIS or comparable digital format (i.e., CAD).

The inventory and map will include the following information for each outfall and interconnection:

- Unique identifier
- Type, material, size (e.g., 24-inch concrete pipe)
- Spatial location (latitude and longitude with a minimum accuracy of +/-30 feet)
- Name, water body ID and Surface Water Quality Classification of the immediate surface water body or wetland to which the stormwater runoff discharges
- If the outfall does not discharge directly to a named water body, the name and water body ID of the nearest named water body to which the outfall eventually discharges
- Name of the watershed, including subregional drainage basin number, in which the discharge is located
- Date of most recent inspection
- Physical condition
- Indicators of potential non-stormwater discharges (including presence or evidence of suspect flow and sensory observations such as odor, color, turbidity, floatables, or oil sheen) as of the most recent inspection.

The inventory and mapping of UConn's stormwater system has been completed. Interconnections with the Town of Mansfield and CT Department of Transportation have not been fully located yet, but it is anticipated that this will be completed before the July 1, 2020 deadline. See Table 4-1.

The inventory will be updated annually to include data collected in connection with dry weather screening and other relevant inspections. An updated inventory and mapping will be provided in each annual report.

¹ **Outfall** means a point source as defined by 40 CFR § 122.2 and in Section 2 of the 2017 MS4 Permit as the point where the MS4 discharges to waters of the state. An outfall does not include open conveyances connecting two separate storm sewers or pipes, tunnels or other conveyances that connect segments of the same stream or other waters of the state and that are used to convey waters of the state. It is strongly recommended that a permittee inspect all accessible portions of the system as part of this process. Culverts longer than a simple road crossing shall be included unless the permittee can confirm that they are free of any connections and simply convey waters of the state.

² **Interconnection** means the point where the permittee's MS4 discharges to another MS4 or other storm sewer system, through which the discharge is conveyed to waters of the state or to another storm sewer system and eventually to a water of the state.

Table 4-1. Summary of MS4 outfalls at the University of Connecticut Avery Point.

Unique ID	Material/size	Location (lat)	Location (long)	Waterbody	Waterbody ID	Surface Water Quality Classification	Subregional drainage basin
OAP6	12 inch PVC	41.31555	-72.06289	Long Island Sound-Inner Baker Cove	CT-E1_013	SA	Long Island Sound
OAP5	12 inch PVC	41.315831	-72.06268	Long Island Sound-Inner Baker Cove	CT-E1_013	SA	Long Island Sound
OAP4	12 inch PVC	41.31744	-72.06224	Long Island Sound-Inner Baker Cove	CT-E1_013	SA	Long Island Sound
OAP2	15 inch PVC	41.318942	-72.06355	Long Island Sound-Inner Baker Cove	CT-E1_013	SA	Long Island Sound
OAP1	inch concrete or	41.318012	-72.06656	Long Island Sound-EB Shore, Thames River Mouth (East) Groton	CT-E3_005	SB	Long Island Sound

4.2 Detailed System Mapping

A detailed storm system map will be developed for, at a minimum, the portions of the municipality within “priority” areas. The detailed mapping is intended to facilitate the identification of key infrastructure, factors influencing proper system operation, and the potential for illicit discharges.

The mapping may be produced by hand or computer-aided methods (e.g., GIS or CAD). The required scale and detail of the map will be appropriate to facilitate a rapid understanding of the system by the municipality and CTDEEP. The mapping will also serve as a planning tool for the implementation and phasing of the IDDE program and demonstration of the extent of complete and planned investigations and corrections. The mapping will be updated as necessary to reflect newly discovered information and required corrections or modifications.

The following mapping elements are required:

- Outfalls and receiving waters (previously required by the 2004 MS4 Permit)
- Pipes, catch basins, and/or manholes
- Open channel conveyances (swales, ditches, etc.)
- Interconnections with other MS4s and other storm sewer systems
- Municipally owned stormwater treatment structures (e.g., detention and retention basins, infiltration systems, bioretention areas, water quality swales, gross particle separators, oil/water separators, or other proprietary systems)
- Catchment delineations for use in priority rankings, or prioritizing BMP retrofits
- Water bodies identified by name and indication of all use impairments as identified on the most recent State of Connecticut Integrated Water Quality Report.

The following mapping elements are required where available:

- Municipal Sanitary Sewer system (if available)
- Municipal combined sewer system (if applicable).

The following mapping elements are recommended:

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

Detailed system mapping was completed in July 2018.

5 Sanitary Sewer Overflow Inventory

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 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.

Based on a review of available records, no SSOs resulting in discharge to the MS4 are known to have occurred in University of Connecticut (Avery Point) in the five years prior to the effective date of the MS4 Permit (July 1, 2012 – June 30, 2017).

Upon detection of an SSO, the University of Connecticut (Avery Point) 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 University of Connecticut (Avery Point) will provide written notice to CTDEEP within five (5) days of becoming aware of the SSO occurrence.

6 Catchment Assessment and Priority Ranking

The MS4 Permit requires an assessment and priority ranking of catchments in terms of their potential to have illicit discharges and SSOs and the related public health significance. The ranking will determine the priority order for screening of outfalls and interconnections, catchment investigations for evidence of illicit discharges, and provides the basis for determining permit milestones.

6.1 Catchment Delineations

A catchment is the area that drains to an individual outfall or interconnection. Catchments 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 indicated in Section 4.2, catchment delineations will be completed as part of the detailed system mapping.

Larger-scale watershed boundaries available from CTDEEP or local watershed organizations, such as CTDEEP Local Basin boundaries, may be used instead of individual outfall catchment areas to support the initial assessment and priority ranking of catchments. Required updates to the catchment assessment and priority ranking will incorporate refined catchment details as they become available.

6.2 Assessment and Priority Ranking of Catchments

The Environmental Team (Environmental Health and Safety) has completed an initial illicit discharge potential assessment and priority ranking of catchments based on existing information, including the outfall and interconnection inventory and mapping. Also of note is a 2012 illicit discharge assessment performed on the stormwater system of the entire campus, by an outside contractor. Camera inspection as the primary method of investigation. Several cross connections of sink drains were identified and corrected.

An updated assessment and priority ranking will be provided in each annual report thereafter, including a listing of all catchments and the results of the ranking for each catchment. The assessment and priority ranking will be updated annually based on catchment delineations, the results of dry weather screening, and other relevant information.

Catchments associated with outfalls and interconnections will be classified into one of the following categories:

1. **Excluded Catchments:** Catchments with no potential for illicit discharges. 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.
2. **Problem Catchments:** Catchments with known or suspected contributions of illicit discharges based on existing information. This category includes any catchments where previous outfall/interconnection screening indicates likely sewer input. Likely sewer input indicators are any of the following:
 - Olfactory or visual evidence of sewage,
 - Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and bacteria levels greater than the water quality criteria applicable to the receiving water, or
 - Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and detectable levels of chlorine.

Screening and sampling is not required for Problem Catchments. Problem Catchments must be scheduled for catchment investigation. Following the initial ranking of catchments, subsequent rankings shall not add any catchments to the Problem Catchment category.

3. High Priority Catchments: Catchments that have not been classified as Problem Catchments 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 outfall/interconnection screening and catchment characteristics assessment.

Any catchment where outfall/interconnection screening indicates likely sewer input as described under Item 1, Problem Catchments, shall be ranked at the top of the High Priority Catchments category and scheduled for catchment investigation.

4. Low Priority Catchments: Catchments determined by the permittee as low priority based on outfall/interconnection screening (see Section 7) and catchment characteristics assessment (see below).

Catchments will be ranked into the above priority categories (except for excluded catchments, 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 the IDDE program.

- **Poor dry weather receiving water quality** – the following guidelines are recommended to identify waters as having a high illicit discharge potential:
 - Exceeding water quality standards for bacteria
 - Ammonia levels above 0.5 mg/l
 - Surfactants levels greater than or equal to 0.25 mg/l.
- **Culverted streams** – Any river or stream that is culverted for distances greater than a simple roadway crossing may have a high illicit discharge potential.
- **Impaired water bodies** 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 6-1 is a catchment assessment and priority ranking matrix that can be used to document the catchment assessment and priority ranking process.

Table 6-1. Catchment Assessment and Priority Ranking Matrix

Catchment ID	Receiving Water	Frequency of Past Discharge Complaints	Receiving Water Quality ³	Culverted Streams? ⁸	Score	Priority Ranking
Information Source		Municipal Staff	Impaired Waters List	GIS and Storm System Maps		
Scoring Criteria		Frequent = 3 Occasional = 2 None = 0	Poor = 3 Fair = 2 Good = 0	Yes = 3 No = 0		

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 Catchments 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 State of Connecticut Integrated Water Quality Report.

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

⁴ 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
- Medium = Developments 20-40 years old
- Low = Developments less than 20 years old

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.

⁷ Aging septic systems are septic systems 30 years or older in residential areas.

⁸ Any river or stream that is culverted for distance greater than a simple roadway crossing.

Instructions: Complete this catchment assessment and initial priority ranking (or similar spreadsheet) based on existing information described in this section of the written IDDE Program. Numeric scores can be adjusted based on community- and site-specific factors. Other similar scoring or ranking approaches may be used, considering the

7 Outfall and Interconnection Screening and Sampling

The 2017 MS4 Permit requires screening and sampling of outfalls and interconnections from the MS4 in dry and wet weather for evidence of illicit discharges and SSOs, including:

- Baseline outfall and interconnection screening (dry weather)
- Confirmatory screenings (dry and/or wet weather depending on catchment characteristics)
- Follow-up screening (dry and/or wet weather depending on catchment characteristics).

The Environmental Team (Environmental Health and Safety) is responsible for conducting dry and wet weather outfall and interconnection screening and sampling, and has performed this analysis starting in October 2017.

7.1 Dry and Wet Weather Rainfall Criteria

For the purposes of outfall screening and sampling, dry and wet weather conditions are defined as follows:

- **Dry Weather** – dry weather screening and sampling shall proceed when no more than 0.1 inches of rainfall has occurred in the previous 24-hour period.
- **Wet Weather** – wet weather screening and sampling shall 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. Sampling during the initial period of discharge (“first flush”) will be avoided. To the extent feasible, sampling should occur during the spring (March through June) when groundwater levels are relatively high.

Note that wet weather criteria for impaired waters outfall monitoring pursuant to Section 6(i) of the MS4 Permit are different than the above wet weather criteria for outfall screening and sampling.

For purposes of determining dry and wet weather conditions, precipitation data from Avery Point Ag Farm will be used. If Avery Point Ag Farm is not available or not reporting current weather data, then data from Willimantic CT will be used as a back-up.

The remainder of this section is focused on dry weather screening and sampling. Wet weather screening and sampling is discussed further in the context of catchment investigations, including confirmatory and followup screening in Section 8.

7.2 Dry Weather Screening/Sampling

Dry weather flow is a common indicator of potential illicit connections. The 2017 MS4 Permit requires all outfalls/interconnections (excluding Problem and Excluded Catchments) to be screened (i.e., visually inspected) for the presence of dry weather flow. Dry weather outfall screening and sampling may take place when no more than 0.1 inches of rainfall has occurred in the previous 24-hour period.

7.2.1 General Procedure

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

1. Identify outfall(s) to be screened/sampled based on outfall inventory and initial catchment priority ranking.
2. Acquire the necessary staff, mapping, and field equipment (see **Table 7-1** 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 an outfall is inaccessible or submerged, proceed to the first accessible upstream manhole or structure for the observation and sampling and report the location with the screening results. If an interconnection is inaccessible or submerged, perform screening at the first accessible location within the permittee's system upgradient of the interconnection.
5. If flow is observed, sample and test the flow following the procedures described in the following sections.
6. If no flow is observed, but evidence illicit discharges 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.
7. Input results from screening and sampling into spreadsheet/database. Include pertinent information in the outfall/interconnection inventory and priority ranking.
8. Include all screening data in the annual report.

7.2.2 Field Equipment

Table 7-1 lists field equipment commonly used for dry weather outfall screening and sampling.

Table 7-1. Field Equipment – Dry Weather Outfall Screening and Sampling

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

7.2.3 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 parameters³ listed in **Table 7-2**. 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 7-2**)
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 the laboratory
9. Dispose of used test strips and test kit ampules properly
10. Decontaminate all testing personnel and equipment

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 7-2** lists various field test kits and field instruments that can be used for outfall sampling associated with the 2017 MS4 Permit parameters, other than indicator bacteria and any pollutants of concern. Analytical 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 7-2. Outfall Screening 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 N1-8 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	Hach CN-66F
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: <i>E. coli</i> (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 7-3** 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 7-3. Required Analytical Methods, Detection Limits, Hold Times, and Preservatives

Analyte or Parameter	Analytical Method	Detection Limit	Max. Hold Time	Preservative
Ammonia	EPA: 350.2, SM: 4500-NH ₃ C	0.05 mg/L	28 days	Cool ≤6°C, H ₂ SO 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: <i>E.coli</i> (freshwater) <i>Enterococcus</i> (saltwater)	<i>E.coli</i> EPA: 1603 SM: 9221B, 9221F, 9223 B Other: Colilert®, Colilert-18® <i>Enterococcus</i> EPA: 1600 SM: 9230 C Other: Enterolert®	<i>E.coli</i> EPA: 1 cfu/100mL SM: 2 MPN/100mL Other: 1 MPN/100mL <i>Enterococcus</i> EPA: 1 cfu/100mL SM: 1 MPN/100mL Other: 1 MPN/100mL	6 hours	Cool ≤6°C, 0.0008% Na ₂ S ₂ O ₃ (sodium thiosulfate)
Total Phosphorus (Pollutant of Concern)	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 ₂ SO ₄ to pH <2
Total Nitrogen (Pollutant of Concern) (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 ₂ SO ₄ to pH <2

EPA = EPA Methods SM = Standard Methods

7.3 Interpreting Outfall Sampling Results

Outfall analytical data can be used to help identify the major type or source of discharge. **Table 7-4** 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 7-4. Benchmark Field Measurements for Select Parameters

Analyte or Parameter	Benchmark
Ammonia	>0.5 mg/L
Conductivity	>2,000 μ S/cm
Surfactants	>0.25 mg/L
Chlorine	>0.02 mg/L (detectable levels per the 2017 MS4 Permit)
Indicator Bacteria <i>E.coli</i> (freshwater)	<i>E.coli</i> : 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 for designated swimming areas, 410 colonies per 100 ml for non-designated swimming areas, and 576 colonies per 100 ml for all other uses.
<i>Enterococcus</i> (saltwater)	
	<i>Enterococcus</i> : the geometric mean of the five most recent samples taken during the same bathing season shall not exceed 35 colonies per 100 ml and no single sample taken during the bathing season shall exceed 104 colonies per 100 ml for designated swimming areas and 500 colonies per 100 ml for all other uses.

Catchments are considered highly likely to contain illicit discharges from sanitary sources when either of the following combinations of sampling results is detected:

- Ammonia \geq 0.5 mg/L, surfactants \geq 0.25 mg/L, and bacteria levels greater than the water quality criteria applicable to the receiving water, or
- Ammonia \geq 0.5 mg/L, surfactants \geq 0.25 mg/L, and detectable levels of chlorine.

Catchments with outfall screening results that meet the above criteria shall be ranked at the top of the High Priority Catchments category for investigation.

8 Catchment Investigations

Once stormwater outfalls with evidence of illicit discharges have been identified, various methods can be used to investigate the source of the potential discharge within the outfall catchment area. Common catchment investigation techniques include, but are not limited to:

- Review of maps, historic plans, and records
- Manhole inspection
- Dry and wet weather sampling
- Video inspection
- Smoke testing
- Dye testing.

This section outlines a systematic procedure to investigate outfall catchments and identify the source(s) of potential illicit discharges. Information and data collected as part of the catchment investigations will be reported in each annual report.

8.1 System Vulnerability Factors

The Environmental Team (Environmental Health and Safety) will review relevant mapping and historic plans and records to identify areas within the catchment with higher potential for illicit connections. The following information will be reviewed:

- Plans related to the construction of the drainage network
- Prior work on the storm drains
- Health Department or other municipal data on septic system failures or required upgrades
- Records related to septic system breakouts, SSOs, and sanitary sewer surcharges

Based on the review of this information, no **System Vulnerability Factors (SVFs)** were identified for the UConn Avery Point system.

8.2 Dry Weather Investigation (Manhole Inspections)

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

The Environmental Team (Environmental Health and Safety) 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 and confirm or identify potential system vulnerability factors. 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 and inspecting key junction manholes along the way.

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 7**. Additional indicator sampling may assist in determining potential sources.

3. Where sampling results or visual or olfactory evidence indicate potential illicit discharges, the area draining to the junction manhole will be flagged for further upstream manhole investigation and/or isolation and confirmation of sources.
4. Subsequent key junction manhole inspections will proceed until the location of suspected illicit discharges can be isolated to a pipe segment between two manholes.
5. If no evidence of an illicit discharge is found, catchment investigations will be considered complete upon completion of key junction manhole sampling.

8.3 Wet Weather Investigation (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 Environmental Team (Environmental Health and Safety) will be responsible for implementing the wet weather outfall sampling program and making updates as necessary.

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 (refer to **Table 7-3** and **Table 7-4**).
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.
 - a. 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.
 - b. Sampling during the initial period of discharge (“first flush”) will be avoided.
 - c. To the extent feasible, sampling should occur during the spring (March through June) when groundwater levels are relatively high. Refer to **Section 7.1** for information on weather tracking.
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 8.4**.
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.

8.4 Illicit Discharge Removal

When the specific source of an illicit discharge is identified, the University of Connecticut (Avery Point) 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
- Estimate of the volume of flow removed.

8.4.1 Confirmatory Outfall Screening

Within one (1) year of removal of all identified illicit discharges and SSO sources 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. Confirmatory screening is not required in catchments where no illicit discharges or System Vulnerability Factors have been identified and no previous screening indicated suspicious flows.

8.5 Follow-up Screening

Upon completion of all catchment investigations and illicit discharge removal and confirmation (if necessary), each outfall or interconnection will be scheduled for follow-up screening within five (5) years, or sooner based on the catchment's illicit discharge priority. Ongoing screening will consist of dry weather screening and sampling consistent with the procedures described in **Section 7** of this document. 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 8.1**. All sampling results will be reported in the annual report.

8.6 Illicit Discharge Prevention Procedures

The University of Connecticut (Avery Point) will implement the following mechanisms and procedures to assist in the prevention of illicit discharges and SSOs:

- Spill response and prevention procedures including identification of spills, reporting procedures, containment procedures, and documentation.
- Reporting hotlines and training of public employees involved in the IDDE program on way to identify potential illicit discharges.

9 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 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.

10 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:

- Measures that demonstrate efforts to locate illicit discharges
- Number of illicit discharges identified and removed
- Percent and area in acres of the catchment area 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

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

UCONN MS4 MONITORING PROJECT FIELD CHECKLIST

- Clipboard with field sheet
- Tote
- Field book
- YSI temperature/conductivity/salinity meter
- Sample bottles [500 mL qty. 10]
- Whirlpaks
- Cooler with ice packs
- Sampling pole
- Manhole cover hook
- Gloves
- Tape for labelling bottles
- Sharpie
- Partner

UCONN MS4 MONITORING PROJECT FIELD SHEET

Name:	
Date:	
Dry (D) or Wet (W):	

[illegible]

Appendix B

IDDE Employee Training Record Form

**Illicit Discharge Detection and Elimination (IDDE) Program
Employee Training Record**

University of Connecticut (Avery Point), Connecticut

Date of Training: _____

Duration of Training: _____

Name	Title	Signature