



**Illicit Discharge Detection and
Elimination Plan
Westport, Massachusetts**

EPA NPDES Permit Number: MA041174

PREPARED BY:



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ILLICIT DISCHARGE DETECTION AND ELIMINATION PROGRAM TOWN OF Westport, MASSACHUSETTS

1 INTRODUCTION

1.1 MS4 PROGRAM

This Illicit Discharge Detection and Elimination (IDDE) Plan has been developed by the Town of Westport 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 in 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 all waterbodies, including the “impaired waters” within the boundaries of Westport’s urbanized area. The impairments are based on the 2016 Massachusetts Integrated List of Waters produced by MassDEP every two years. This is the current approved list. 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. Within Westport’s urbanized area, the Bread and Cheese Brook, the East Branch of the Westport River, Snell Creek, and Kirby Brook all have bacteria/pathogen impairments, which means that outfalls discharging here will automatically be ranked as a High Priority as discussed in Section 5.

Table 1-1: Waterbodies in Westport, Massachusetts Urbanized Area

Water Body Name	Segment ID	Impaired Waters Category	Impairment(s)	Associated Approved TMDL
North Watuppa Pond	MA 61004	4a	Mercury in Fish Tissue	33880
South Watuppa Pond	MA 61006	3	N/A	N/A
Sawdy Pond	MA 61005	4a	Mercury in Fish Tissue	42407
Bread and Cheese Brook	MA 95-58	4a	Fecal Coliform Enterococcus	36170
East Branch Westport River	MA 95-40	4a	Fecal Coliform Enterococcus	36170
Snell Creek	MA 95-44	4a	Fecal Coliform Enterococcus E. Coli	36170
Kirby Brook	MA 95-82	5	Enterococcus	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.

*TMDL not required (non-pollutant)

1.5 IDDE PROGRAM GOALS, FRAMEWORK, AND TIMELINE

The goals of the IDDE program are to find and eliminate illicit discharges to the 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

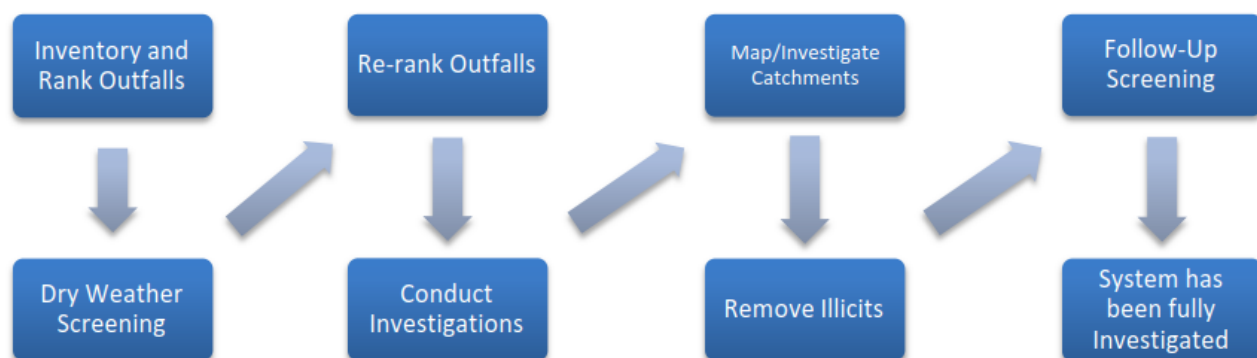
- Inventory and ranking of outfalls
- Dry weather outfall screening
- Catchment investigations
- Identification/confirmation of illicit sources
- Illicit discharge removal
- Follow-up screening
- Employee training

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

Table 1-2: IDDE Program Implementation Timeline

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

Figure 1-1: IDDE Investigation Procedure Framework



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, adoption and enforcement of a regulatory mechanism to prohibit illicit discharges, and identification of 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.

Westport adopted the requirements of the 2003 MS4 Permit, and now the Town is updating for the 2016 Permit requirements. The Town has also been taking steps to address the bacteria/pathogen and nitrogen impairments in its waterbodies by investigating the wastewater and stormwater sources of these pollutants and evaluating other improvements that can be made in conjunction with this IDDE Plan in the Town.

2 IDDE RESPONSIBILITIES

2.1 LEGAL AUTHORITY

The Town of Westport has adopted a Bylaw to define and eliminate illicit discharges. A copy of the Bylaw is provided included on the Town's website (https://www.westport-ma.com/sites/westportma/files/pages/town_by-laws_2018_revised.pdf). Article LXVI of the Town's Bylaws specifically addresses illicit discharges, with the following goals:

- To prevent pollutants from entering Westport's municipal separate storm water /sewer system (MS4);
- To prohibit illicit connections and discharges to the MS4;
- To require the removal of all such illicit connections;
- To comply with state and federal statutes and regulations relating to stormwater discharges; and
- To establish the legal authority to ensure compliance with the provisions of this By-Law through inspection, monitoring, and enforcement.

The Bylaw defines the following terms:

Discharge of Pollutants: The addition from any source of any pollutant or combination of pollutants into the municipal storm drain system or into the waters of the United States or Commonwealth from any source.

Illicit Connection: A surface or subsurface drain or conveyance, which allows an illicit discharge into the municipal storm drain system, including without limitation sewage, process wastewater, or wash water and any connections from indoor drains, sinks, or toilets, regardless of whether said connection was previously allowed, permitted, or approved before the effective date of this By-Law.

Illicit Discharge: Direct or indirect discharge to the municipal storm drain system that is not composed entirely of stormwater, except as exempted herein

The current Bylaw is in compliance with the requirements of the MS4 Permit.

2.2 RESPONSIBLE TEAMS

The Highway Department will be the lead agency in charge of implementing the IDDE Program as stated here and in the stormwater bylaw. The Highway Department will be responsible for administering all aspects of the IDDE Program and will ask for input from other departments.

3 TOWN OF WESTPORT STORMWATER MAPPING

3.1 MAPPING UPDATES

The Town of Westport originally developed mapping of its stormwater system to meet the mapping requirements of the 2003 MS4 Permit. The Town worked with the Buzzards Bay National Estuary Program (BBNEP), who completed an inventory of the Town's stormwater infrastructure through a review of available drainage record drawings. The BBNEP program mapped over 2,600 stormwater discharges across eight different municipalities within the Buzzards Bay, including the Town of Westport. Through this effort, the following has been mapped for Westport:

- Outfalls
- Waterbodies
- Municipal interconnections
- Stormwater manholes
- Catch Basins

The 2016 MS4 Permit requires the storm sewer system map to be updated in two phases as outlined below. The Town of Westport will report on the progress towards completion of the storm sewer system map in each annual report.

3.2 IDDE MAPPING REQUIREMENTS: PHASE I

Phase I of the mapping must be completed within two years of the Permit's effective date, containing the following information:

- Outfalls and their receiving waters (was required by 2003 MS4 Permit);
- Open channel conveyances (swales, ditches, etc.);
- Interconnections with other MS4s and others 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);
- Waterbodies identified by name and indication of all use impairments as identified on the most recent EPA approved Massachusetts Integrated List of waters report pursuant to Clean Water Act section 303(d) and 305(b); and,
- Initial catchment delineations. Any available system data and topographic information may be used to produce initial catchment delineations. For this Permit, a catchment is the area that drains to an individual outfall or interconnection.

Westport's Phase 1 map is included in **Appendix A**.

3.3 IDDE MAPPING REQUIREMENTS: PHASE II

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

- Outfall spatial location (latitude and longitude with a minimum accuracy of +/-30 feet);
- Pipes;
- Manholes;
- Catch basins;
- Refined catchment delineations. Catchment delineations must be updated to reflect information collected during catchment investigations;
- Municipal Sanitary Sewer system (if available);
- Municipal combined sewer system (if applicable).

3.4 NEXT STEPS

The Town is continuing to work with the BBNEP for assistance in collecting field data to update its stormwater system map. The BBNEP will continue to collect system data, including open channel conveyances, treatment structures, catchment delineations, pipe and drainage lines, and refined outfall locations.

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 Westport currently has no publicly owned sanitary sewer system, and therefore there have been no SSOs to report in the past five (5) years as required for reporting by the 2016 MS4 Permit. However, the Town is currently investigating a sewer extension project, which, when constructed, will be required to be tracked for SSOs under the MS4 Permit. The inventory will need to include 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 Westport 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 will provide oral notice to EPA within 24 hours and written notice to EPA and MassDEP within five (5) days.

Upon completion of sewer construction in Westport, the inventory in Table 4-1 will be updated by the Highway Department 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

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

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 RANKING OF OUTFALLS AND INTERCONNECTIONS

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 outfall¹ or interconnection². The catchments for each of the MS4 outfalls will be delineated to define contributing areas for investigation of potential sources of illicit discharges. Catchments will be 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 CLASSIFY AND RANK OUTFALLS

The Town 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 as a part of this Plan. 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 Town of Westport has identified 133 outfalls that must be ranked by illicit discharge risk level. An overview of the ranking as described by the Permit is included in Table 5-1.

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.

Table 5-1: Overview of Outfall Categorization

Category	Description
PROBLEM	Known or suspected illicit discharge. This designation is given to any outfall where non-stormwater discharge is suspected from the dry weather inspections (or prior reports).
HIGH	High potential for illicit discharge / High priority for investigation.
LOW	Low potential for illicit discharge / Low priority for investigation.
EXCLUDED	No potential for illicit discharge / No needed investigation.

5.2.1 Problem Outfalls

Problem outfalls are determined based on currently available outfall information and institutional knowledge about the existence of an illicit discharge. As described by section 2.3.4.7.a.ii of the Permit, Problem outfall indicators include:

- 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.

All Problem outfalls represent an illicit discharge, and therefore must be immediately eliminated. The screening process to confirm an illicit discharge is included in Section 6. If a discharge cannot be eliminated within 60 days, the Town of Westport is required to establish an elimination schedule, as well as record the progress in its annual reports. 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, Westport currently has no Problem outfalls.

5.2.2 High Priority Outfalls

There are currently 34 High Priority outfalls in the Town of Westport. Outfalls that drain to waterbodies impaired for bacteria or pathogens, are near public recreational areas, or are near drinking water wells are considered to have a high priority in the IDDE ranking. This means that these outfalls have a higher likelihood of contributing an illicit discharge. All High priority outfalls must be screened within the first three years of the Permit effective date, following the procedures detailed in Section 6.

5.2.2.1 Low Priority Outfalls

Low priority outfalls are the remaining outfalls with a chance for illicit discharge, but that are not classified as High or Problem outfalls based on the available data. There are currently 12 Low Priority outfalls in the Town. These will be scored along with the High Priority outfalls to

prioritize the screening and sampling process. As with the High Priority outfalls, Low Priority outfalls must also be screened within the first three years of the permit effective date.

5.2.3 Excluded Outfalls

Any outfall with no potential for illicit discharge is considered an Excluded outfall and does not need to be considered as a part of the IDDE Plan. This category includes outfalls leading to roadway drainage in undeveloped areas, athletic field drainage, undeveloped green space or parking without services, or alignments through undeveloped land. Westport has 87 Excluded outfalls; in general, Westport's Excluded outfalls discharge to undeveloped green space. All MS4 outfalls are included in this IDDE Program.

5.3 OUTFALL PRIORITIZATION METHODOLOGY

After categorizing the outfalls as Problem, High, Low, and Excluded based on the criteria above, the outfalls were then priority ranked to determine the order for outfall screenings and investigations. The Permit provides suggested criteria to complete this ranking in Section 2.3.4.7.a.iii:

- Past discharge complaints and reports
- Poor receiving water quality
- Density of generating sites
- Age of development and infrastructure
- Sewer conversion
- Historic combined sewer systems
- Surrounding density of aging septic systems
- Culverted streams
- 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.

Based on the categories above, and information available in Westport, the following information was used to carry out the priority ranking:

- Poor receiving water quality
- Surrounding density of cesspools

Values were assigned to the outfalls for each of the characteristics above using existing available data. For the poor receiving water quality, which is not a quantitative metric but instead is based on which receiving water the outfall discharges, outfalls were assigned a binary "1" or "0" based on whether the receiving water was impaired or not. Density is a calculated value, so the quantitative value was assigned for each outfall. In order to prioritize the outfalls based on these values, the Town aggregated these scores into a single composite score, and then they were ranked from highest to lowest. This illustrated how each outfall scores in terms of priority compared with the other outfalls. Outfalls with high cesspool

density, discharging to impaired waterbodies, rose to the top of the priority ranking using this method, while outfalls with few cesspools in the vicinity, discharging to a non-impaired waterbody, fall to the bottom. A map of the initial outfall priority rankings is included in **Appendix B**. The details of this priority ranking, organized by Problem, High, and Low categories, are included in **Appendix C**.

5.4 SUMMARY

There are no Problem outfalls representing a suspected illicit discharge in Westport currently. If, during subsequent screenings, any outfalls become potential Problem outfalls, they will be investigated within two (2) years, following the steps outlined in Section 8. Within three (3) years of the Permit effective date, the High and Low priority outfalls must be screened. They will be reprioritized with updated data from the screenings, based on the prioritization methodology outlined in Section 5.3; the initial prioritization results are included in **Appendix C**. Table 5-2 outlines these next steps required.

Table 5-2: Outfall Categorization Results and Next Steps

Category (Risk)	Number of Outfalls	Next Steps
PROBLEM	0	Investigate catchment within 2 years; eliminate illicit discharge immediately upon identification.
HIGH	34	Primary dry weather screening, Section 6, within 3 years of Permit.
LOW	12	Secondary dry weather screening, Section 6, within 3 years of Permit.
EXCLUDED	87	No action.

6 DRY WEATHER SCREENING AND SAMPLING

According to the Permit, all outfalls and interconnections (except for Problem and Excluded Outfalls) need to be inspected for the presence of dry weather flow within three (3) years of the Permit effective date. Using the outfall ranking discussed in Section 5, and working from High to Low priority, the Town will screen, and sample where appropriate, all Problem, High and Low priority outfalls before July 2021. The presence of dry weather flow can be a strong indicator of an illicit connection, and this screening is a logical starting point for identifying potential areas of concern.

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 closest National Weather Service Station, located in Westport, MA (KMAWESTP34). If this station is not available or not reporting current weather data, the Town will use the Pine Grove station in Westport, MA (KMAWESTP16) as a backup.

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 D**)
 - 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.

Dry weather flow is a strong indicator of illicit discharges, but it is not the only physical sign of potential illicit connections. Taking careful note of the conditions around the outfall is critical to finding non-stormwater discharges. Illicit discharges can be intermittent or sporadic. Other indicators of past flow may be present even if there is no active dry weather flow at the time of the field visit. Table 6-1 is still a helpful reminder for understanding confusing field observations. This Table, originally adapted from Pitt et al. 1993, was modified for the Town's use in 2019.

Table 6-1: Outfall Observations and Possible Sources

Parameter	Observations	Possible Reason/Source
Odor	Sewage	Stale sanitary wastewater, especially pooled near outfall
	Sulfur (rotten eggs)	Industries discharge sulfide components or organics (meat packers, canneries, dairies, etc.). Also could be petroleum related "high-sulfur" fuels.
	Rancid-sour	Food preparation facilities (restaurants, hotels, etc.)
	Oil and gas	Petroleum refineries or many facilities associated with vehicle maintenance or petroleum product storage
	Chlorine	Residential pool, or drinking water, likely not recurrent
Color	Yellow	Chemical plants, textile and tanning plants
	Brown	Meat packers, printing plants, metal works, stone and concrete, fertilizers, and petroleum refining facilities.
	Green	Chemical plants, textile facilities
	Red	Metal packers, metal works
	Gray	Dairies, and sewage
Turbidity	Cloudy	Sanitary wastewater, concrete or stone operations, fertilizer facilities, and automotive dealers

	Opaque	Food processors, lumber mills, metal operations, pigment plants
Floatable Matter	Oil sheen, grease	Petroleum refineries or storage facilities and vehicle service facilities, and restaurants
	Sewage	Sanitary wastewater
	Soap/bubbles	Sanitary wastewater
Deposits and Stains	Sediment	Construction site erosion
	Oily	Sanitary wastewater
Vegetation	Excessive Growth	Food product facilities, fertilizers, farming agricultural use.
	Inhibited growth, stressed vegetation	High stormwater flows, beverage facilities, printing plants, metal product facilities, drug manufacturing, petroleum facilities, vehicle service facilities and automobile dealers
Damage to Outfall Structures	Concrete cracking	Industrial flows, chemicals
	Concrete spalling	
	Peeling paint	
	Metal corrosion	

6.2.2 Field Equipment

Table 6-2 lists field equipment commonly used for dry weather outfall screening and sampling.

Table 6-2: Field Equipment – Dry Weather Outfall Screening and Sampling

Category	Item	Note
Recordkeeping	Clipboard/Tablet	Recording screening results
	Inspection Sheets/Procedures	For inspection and sampling results
	Chain of Custody Forms	For laboratory submittal
	Pencils/Permanent Markers	For screening results, field notes, COCs, and sample labels
	Camera	For documenting current outfall condition
PPE/Field Gear	Reflective Vest	Safety and Visibility
	Nitrile Gloves and Work Gloves	Safety while working with sampling jars, and environmental conditions
	Safety glasses	
	Safety Boots and Rubber boots	Safety working on uneven surfaces and entering shallow water
	Long pants/sleeves	Protection from environmental conditions such as brush, insects, and poisonous plants
	Insect/plant Repellant and Sunscreen	
	Hand Sanitizer	Decontamination in the field

Outfall Screening Tools	Tape Measure	Measuring the outfall, distances, and depth of flow
	Flashlight with batteries	For looking in outfalls, manholes, and catch basins
	GPS Receiver	Recording location of outfalls and other infrastructure
	Cones	Safety around screening site if adjacent to road way
	Pry Bar, Pick, Shovel	For opening manholes or catch basins
	Hammer	
	Utility Knife	Miscellaneous field requirements
	Machete/Clippers	Accessing overgrown infrastructure
Sampling	Cooler with Ice	Laboratory sample submittals
	Field Test Kits	Field screening of samples
	Rinse Water/Calibration standards	Cleaning equipment and calibration
	Sample Jar Labels	Proper sample recording
	Sample containers	Laboratory sampling
	Water Quality Meters	Field analysis
	Sand bags	For sampling if there is low-flow

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 parameters³ listed in Table 6-6. All analyses except for indicator bacteria and pollutants of concern can be completed in the field. In Westport, Fecal Coliform (Bread & Cheese Brook, East Branch of the Westport River, Snell Creek), Enterococcus (Bread & Cheese Brook, East Branch of the Westport River, Snell Creek, Kirby Brook), and E. coli (Snell Creek) are all included in TMDLs and water quality impairments. The indicator bacteria for sampling is dependent on the type of waterbody that the outfall is discharging to. Outfalls discharging to freshwater are sampled for E. coli, and outfalls discharging to saltwater or brackish water are sampled for enterococcus. These are summarized in Table 6-3.

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 6-3: Waterbody Types and Indicator Bacteria

Water Body Name	Segment ID	Waterbody Type	Indicator Bacteria	Pollutant(s) of Concern to Sample ¹
North Watuppa Pond	MA 61004	Freshwater lake	E. coli	n/a
South Watuppa Pond	MA 61006	Freshwater lake	E. coli	n/a
Sawdy Pond	MA 61005	Freshwater lake	E. coli	n/a
Bread and Cheese Brook	MA 95-58	River	E. coli	Fecal Coliform Enterococcus
East Branch Westport River	MA 95-40	River	E. coli	Fecal Coliform Enterococcus
Snell Creek	MA 95-44	River	E. coli	Fecal Coliform Enterococcus E. coli
Kirby Brook	MA 95-82	River	E. coli	Enterococcus

¹Based on MS4 Permit Appendix F Table F.8.

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 D** 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 D**) for laboratory samples.
8. Coordinate laboratory pick-up or deliver samples directly to selected 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. The location of observation and sampling will be recorded with the results.

Table 6-4 summarizes the sampling needs for parameters to be analyzed in the field. The threshold indicator value is included in the permit as an indicator of a potential illicit connection.

Table 6-4: Field Sampling Analyses

Field Sampling & Analysis				
Sampling Parameter	Sampling Container	Volume	Method	Threshold Indicator
Ammonia	Glass or plastic	Enough volume to submerge probe/strip	WQ Meter/Test Kit	0.5 mg/L
Chlorine			WQ Meter	0.02 mg/L
Conductivity			WQ Meter	--
Salinity			WQ Meter	--
Surfactants			WQ Meter/Test Kit	0.25 mg/L
Water Temperature			WQ Meter	--

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 6-5 lists various field test kits and field instruments that can be used for outfall sampling associated with the 2016 MS4 Permit parameters, other than indicator bacteria and any pollutants of concern. Analytic procedures and user's manuals for field test kits and field instrumentation are provided in **Appendix D**.

Table 6-5: 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

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. Westport must also sample for pollutants of concern, which are Fecal Coliform, Enterococcus, and E. coli.

Table 6-6 lists analytical methods, detection limits, hold times, and preservatives for laboratory analysis of dry weather sampling parameters. Although all parameters are included in this table, it should be noted that laboratory analysis is not required for ammonia, surfactants, chlorine, temperature, specific conductance, and salinity, if field instrumentation or test kits in Table 6-5 are used.

Table 6-6: Required Analytical Methods⁴

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
E. coli (Freshwater)	EPA 1603; SM 9221B, 9221F, 9223B	1 cfu/100 mL; 2 MPN/100 mL	6 hours	Cool ≤ 10°C, 0.0008% Na ₂ S ₂ O ₃
Enterococcus (Salt or brackish water)	EPA: 1600 SM: 9230 C Other: Enterolert®	EPA: 1 cfu/100mL SM: 1 MPN/100mL Other: 1 MPN/100mL	8 hours	Cool ≤10°C, 0.0008% Na ₂ S ₂ O ₃
Pollutants of Concern				
Fecal Coliform	EPA: 1680, 1681	1 cfu/100 mL; 2 MPN/100 mL	6 hours	Cool ≤ 6°C

SM = Standard Methods

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

6.3 INTERPRETING OUTFALL SAMPLING RESULTS

Based on the results collected, the Town will determine if there are potential illicit connections from sanitary sources. An illicit sanitary source is likely if outfall sample results include the following values:

- Ammonia ≥ 0.5 mg/L
- Surfactants ≥ 0.25 mg/L, AND
- Bacteria for Water Bodies Classified as A or B
 - E.coli > 235 cfu/mL
 - Enterococci > 61 cfu/mL
- Bacteria for Water Bodies Classified as SA or SB
 - Enterococci > 104 cfu/mL

Or

- Ammonia ≥ 0.5 mg/L
- Surfactants ≥ 0.25 mg/L, AND
- Detectable levels of chlorine (> 0.2 mg/L)

Additionally, if conductivity is measured above 2,000 $\mu\text{S}/\text{cm}$, this indicates potential for an illicit connection.

Based on the dry weather screening results, the Town will continue to update its ranking and further investigate potential connections through catchment investigations.

6.4 FOLLOW-UP RANKING OF OUTFALLS AND INTERCONNECTIONS

The Town of Westport 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, and they will be completed within three (3) years of the effective date of the permit (July 1, 2021).

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.

Catchments are investigated in order of priority, with catchments draining to Problem Outfalls investigated first, followed by High Priority and then Low Priority Outfalls. Within each category the catchments are investigated in the order they are ranked. Work can be ongoing in multiple catchments simultaneously to expedite the process. Table 7-1 provides a schedule for completion of catchment investigations.

Table 7-1: IDDE Schedule for Completion of Catchment Investigations

Parameter	Start	Complete
Problem Catchments	No later than 2 years from permit effective date	Within 7 years of permit effective date
Catchments with likely sewer input identified at outfall ¹	No permit requirement	Within 7 years of permit effective date
All Catchments	No permit requirement	Within 10 years of permit effective date

¹Likely 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.

All data collected as part of the catchment investigations will be recorded and reported in each annual report.

7.1 SYSTEM VULNERABILITY FACTORS

The Highway Department 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, where applicable:

- Plans related to the construction of the drainage network
- Plans related to the construction of the sewer drainage network
- Prior work on storm drains or sewer lines

- Board of Health or other municipal data on septic systems
- Complaint records related to SSOs
- Septic system breakouts

Items pertaining to the sewer drainage network are not applicable currently, due to the lack of public sewer in Westport. However, as plans to install public sewer are constructed, these items will become a critical part of this evaluation. 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 than 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 than poor owner maintenance).

A SVF inventory will be documented for each catchment (see Table 7-2), retained as part of this IDDE Plan, and included in the annual report.

Table 7-2: Outfall Catchment System Vulnerability Factor (SVF) Inventory

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:**
- 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 than 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 than poor owner maintenance)

7.2 DRY WEATHER MANHOLE INSPECTIONS

The Town of Westport 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 Highway Department 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 D**.
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 DPW will be responsible for implementing the wet weather outfall sampling program and making updates as necessary.

These 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 are all options that Westport can rely on. However, sandbagging, smoke testing, dye testing, and CCTV inspections will be utilized first if necessary. Any homeowners or businesses that will be impacted by these investigations will be notified prior to starting.

These methods are described in the sections below. Public notification is an important aspect of a detailed source investigation program. Prior to dye testing or CCTV inspections, the DPW will notify property owners in the affected area.

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 placed 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. It is important to inform local residents and business owners before dye testing is performed. Police, fire, and local public health staff should also be notified prior to testing in preparation for 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 Inspections

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.

7.5 ILLICIT DISCHARGE REMOVAL

When the specific source of an illicit discharge is identified, Westport will exercise its authority as necessary to require its removal within 60 days. 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 held for 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. The frequency and type of employee training will be included in the Annual Report, and a training sign in sheet is in **Appendix E**.

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:

- Annual trends in 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
- Annual trends in 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.

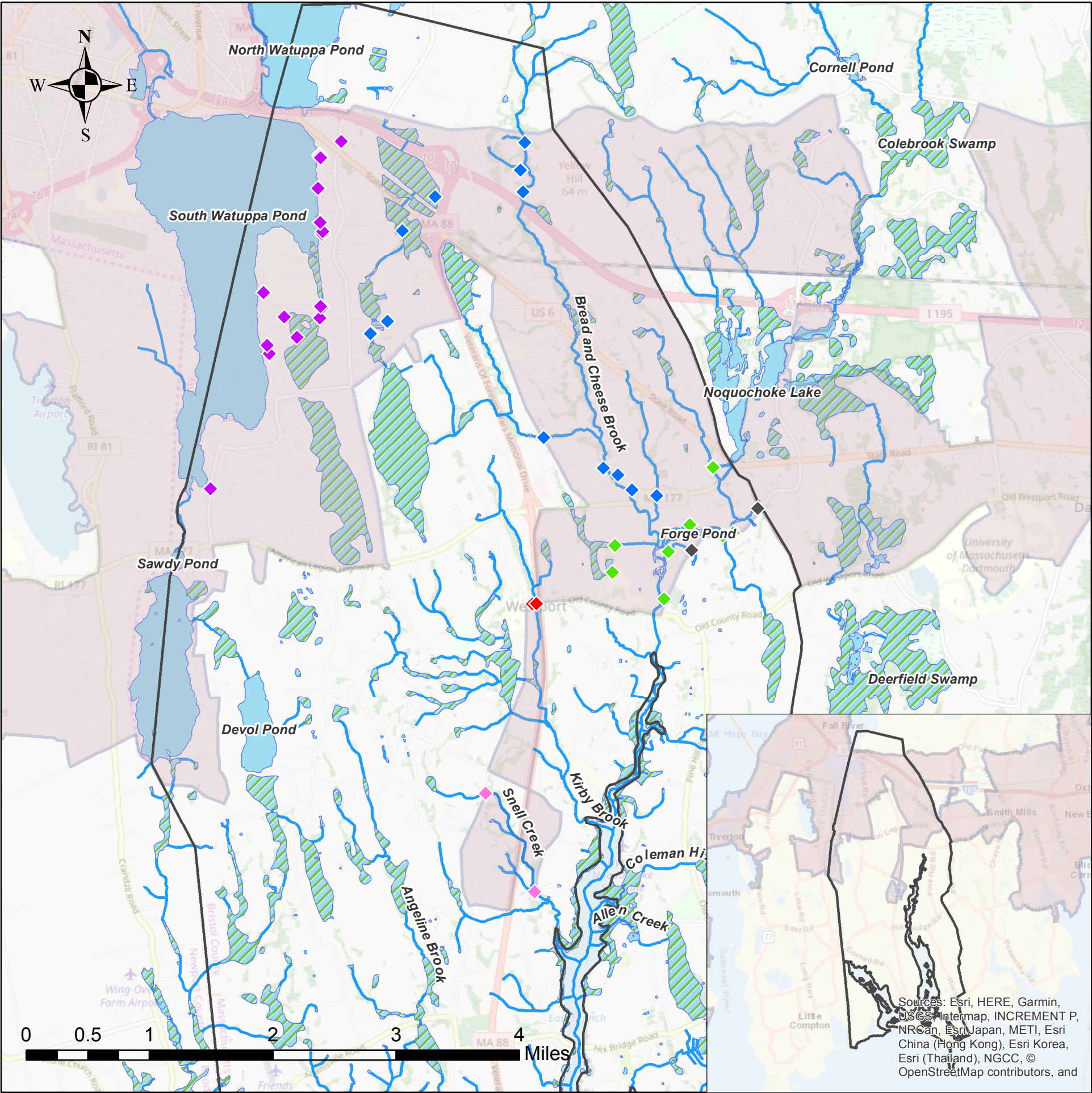
10 REFERENCES

General Permits for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts. United States Environmental Protection Agency issued April 4, 2016.

Illicit Discharge Detection and Elimination (IDDE) Plan Template. Central Massachusetts Regional Stormwater Coalition, June 30, 2016.

Massachusetts Year 2014 Integrated List of Waters, Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d) of the Clean Water Act. Massachusetts Department of Environmental Protection, December 2015.

APPENDIX A. STORM SYSTEM MAP



Town of Westport, MA Outfall Discharge Map

June 2020

LEGEND

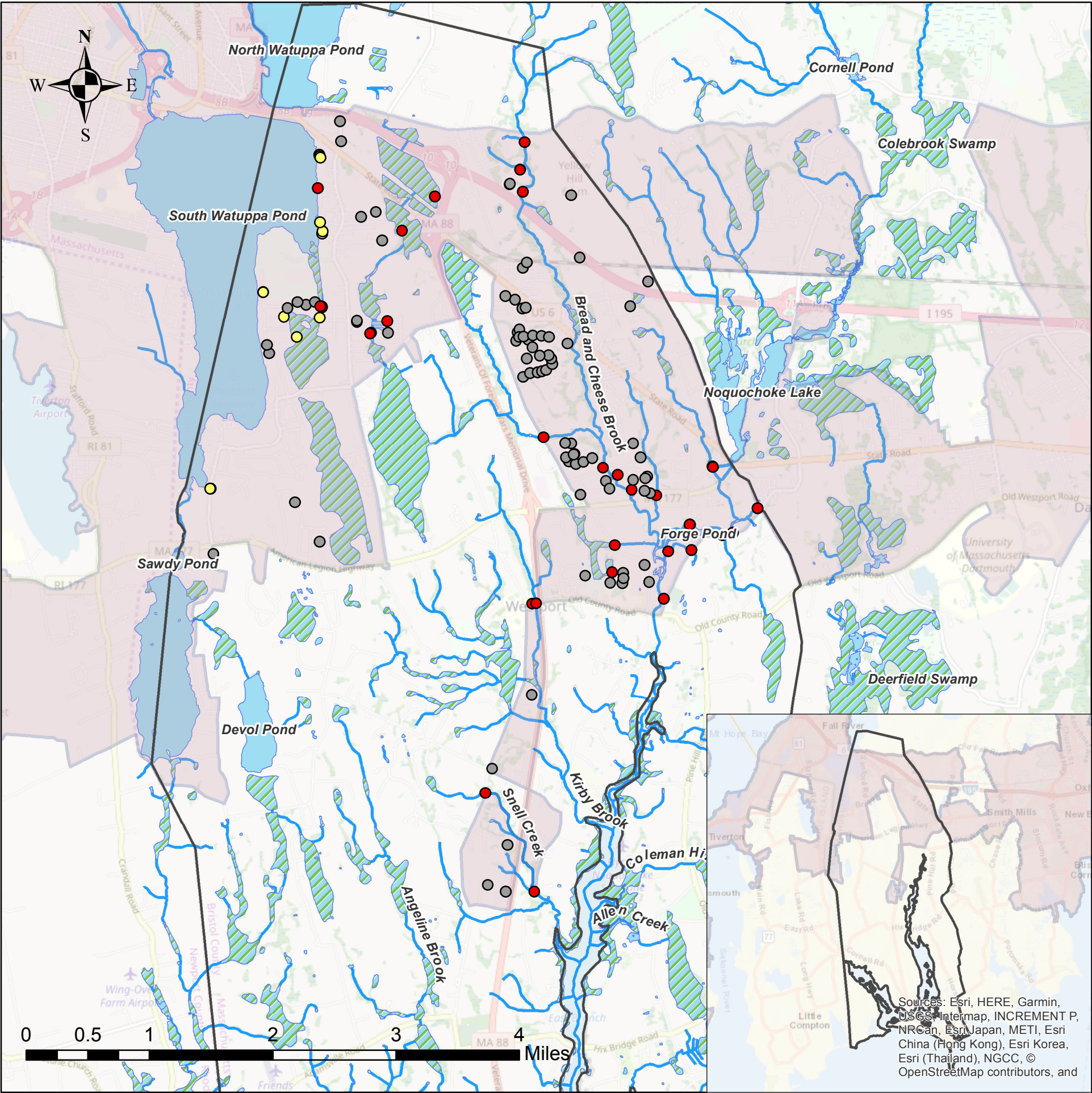
- MS4 Outfall's Receiving Waterbody**
- ◆ Bread and Cheese Brook
 - ◆ East Branch Westport River
 - ◆ Kirby Brook
 - ◆ Snell Creek
 - ◆ South Watuppa Pond
 - ◆ Tributary to East Branch Westport River
 - River or Stream
 - Surface Waterbody
 - Wetland
 - Urbanized Areas - 2010 Census
 - Westport Townline

Water Bodies in Westport, MA (2016 Integrated List of Waters)	Impaired Waters Category	Impairment(s)
North Watuppa Pond (MA 61004)	4a	Mercury in Fish Tissue
South Watuppa Pond (MA 61006)	3	N/A
Sawdy Pond (MA 61005)	4a	Mercury in Fish Tissue
Bread and Cheese Brook (MA 95-58)	4a	Fecal Coliform Enterococcus
East Branch Westport River (MA 95-40)	4a	Fecal Coliform Enterococcus
Snell Creek (MA 95-44)	4a	Fecal Coliform Enterococcus E.Coli
Kirby Brook (MA 95-82)	5	Enterococcus



Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and

APPENDIX B. INITIAL PRIORITY OUTFALL MAP



Town of Westport, MA Outfall Priority Map

June 2020

LEGEND

Outfall Priority

- Excluded
- High
- Low

- River or Stream
- Surface Waterbody
- Wetland
- Urbanized Areas - 2010 Census
- Westport Townline

Water Bodies in Westport, MA (2016 Integrated List of Waters)	Impaired Waters Category	Impairment(s)
North Watuppa Pond (MA 61004)	4a	Mercury in Fish Tissue
South Watuppa Pond (MA 61006)	3	N/A
Sawdy Pond (MA 61005)	4a	Mercury in Fish Tissue
Bread and Cheese Brook (MA 95-58)	4a	Fecal Coliform Enterococcus
East Branch Westport River (MA 95-40)	4a	Fecal Coliform Enterococcus
Snell Creek (MA 95-44)	4a	Fecal Coliform Enterococcus E.Coli
Kirby Brook (MA 95-82)	5	Enterococcus



Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and

APPENDIX C. INITIAL PRIORITY OUTFALL RANKING

HIGH PRIORITY OUTFALLS				
OBJECTID *	ID	FacilityID	MS4 Priority	Final Rank
211	WEEBREDP-02	WEB1019PI	HI	1
11	WEEBUNRC-01	WEB1009RC	HI	2
12	WEEBUNRC-02	WEB1008RC	HI	2
65	WEEBFORC-01	WEB1025RC	HI	2
47	WEEBMARC-04	WEB1159RC	HI	3
60	WEEBDRRC-05	WEB1127RC	HI	3
62	WEEBRERC-03	WEB1004RC	HI	3
67	WEEBGIRC-02	WEB1091RC	HI	3
86	WEEBGIRC-04	WEB1123RC	HI	3
108	WEEBGARC-01	WEB1163RC	HI	3
181	WEEBRDRC-01	WEB1213RC	HI	3
212	WEEBPSDP-01	WEB1018PI	HI	3
214	WEEBREDP-07	WEB1004PI	HI	3
215	WEEBREDP-11	WEB1002PI	HI	3
263	WEEBGADP-01	WEB1191PI	HI	3
275	WEEBALDP-01	WEB1024PI	HI	3
296	WEEB88DP-50	WEB1286PI	HI	3
297	WEEBOBDP-01	WEB1192PI	HI	3
298	WEEB88DP-51	WEB1269PI	HI	3
299	WEEBEDDP-02	WEB1185PI	HI	3
309	WEEBREDP-05	WEB1014PI	HI	3
326	WEEBRDDP-01	WEB1290PI	HI	3
327	WEEBBDDP-01	WEB1287PI	HI	3
348	WEEBTPDP-03	WEB1038PI	HI	3
351	WEEBFODP-01	WEB1050PI	HI	3
355	WEEBBRDP-01	WEB1060PI	HI	3
398		WEB1051PI	HI	3
201	WEEBOCDP-01	WEB1107PI	HI	5
341	WEMTBADP-01	RWP1023PI	HI	5
10	WEEBFORC-02	WEB1024RC	HI	2
203	WEEBOCDP-04	WEB1100PI	HI	6
93	WEMTBERC-01	RWP1011RC	HI	7
94	WEMTBERC-02	RWP1010RC	HI	7
333	WEMTBEDP-01	RWP1013PI	HI	7

LOW PRIORITY OUTFALLS				
OBJECTID *	ID	FacilityID	MS4 Priority	Final Rank
328	WEMTWNDP-01	RWP1032PI	LO	4
106	WETRHCRC-02	RWP1012RC	LO	5
260	WEMTHCDP-01	RWP1017PI	LO	5
258	WEMTPLDP-01	RWP1036PI	LO	6
259	WEMTPLDP-02	RWP1035PI	LO	6
90	WEMTTIRC-02	RWP1019RC	LO	7
300	WEMTNODP-01	RWP1022PI	LO	7
301	WEMTMODP-01	RWP1012PI	LO	7
334	WEMTHADP-01	RWP1019PI	LO	7
335	WEMTBODP-01	RWP1028PI	LO	7
336	WEMTBODP-02	RWP1026PI	LO	7
337	WEMTBODP-03	RWP1025PI	LO	7

EXCLUDED OUTFALLS				
OBJECTID *	ID	FacilityID	MS4 Priority	Final Rank
384	WEEBOSDP-05	WEB1124PI	EXCLUDED	3
376	WEEBAADP-03	WEB1139PI	EXCLUDED	4
381	WEEBOSDP-03	WEB1144PI	EXCLUDED	4
383	WEEBOSDP-04	WEB1136PI	EXCLUDED	4
385	WEEBOSDP-06	WEB1109PI	EXCLUDED	4
184	WEEBOSRC-01	WEB1126RC	EXCLUDED	4
367	WEEBSVDP-01	WEB1140PI	EXCLUDED	5
368	WEEBSVDP-02	WEB1132PI	EXCLUDED	5
375	WEEBAADP-02	WEB1120PI	EXCLUDED	5
378	WEEBCLDP-01	WEB1152PI	EXCLUDED	5
382	WEEBTHDP-01	WEB1134PI	EXCLUDED	5
390	WEEBBGDP-03	WEB1153PI	EXCLUDED	5
391	WEEBBGDP-04	WEB1147PI	EXCLUDED	5
393	WEEBZUDP-01	WEB1183PI	EXCLUDED	5
394	WEEBZUDP-02	WEB1161PI	EXCLUDED	5
92	WEMTPLRC-02	RWP1015RC	EXCLUDED	5
174	WEWBVERC-01	WEB1221RC	EXCLUDED	5
177	WEEBFKRC-01	WEB1142RC	EXCLUDED	5
178	WEEBFKRC-02	WEB1136RC	EXCLUDED	5
183	WEEBCLRC-01	WEB1134RC	EXCLUDED	5
340	WEEBOBDP-07	WEB1296PI	EXCLUDED	6
369	WEEBSVDP-03	WEB1121PI	EXCLUDED	6
370	WEEBSVDP-04	WEB1112PI	EXCLUDED	6
373	WEEBFRDP-02	WEB1099PI	EXCLUDED	6
374	WEEBAADP-01	WEB1105PI	EXCLUDED	6
379	WEEBOSDP-01	WEB1156PI	EXCLUDED	6
380	WEEBOSDP-02	WEB1151PI	EXCLUDED	6
91	WEMTPLRC-01	RWP1014RC	EXCLUDED	6
105	WEEBSMRC-01	WEB1214RC	EXCLUDED	6
185	WEEBOARC-01	WEB1117RC	EXCLUDED	6
103	WEMTSURC-01	RWP1006RC	EXCLUDED	7
264	WEMTSUDP-01	RWP1008PI	EXCLUDED	7
302	WEMTUNDP-01	RWP1007PI	EXCLUDED	7
303	WEMTCHDP-01	RWP1010PI	EXCLUDED	7
304	WEMTWEDP-01	RWP1002PI	EXCLUDED	7
323	WEEBHUDP-01	WEB1180PI	EXCLUDED	7
325	WEEBRDDP-02	WEB1284PI	EXCLUDED	7
329	WEMTBEDP-05	RWP1029PI	EXCLUDED	7
330	WEMTBEDP-03	RWP1020PI	EXCLUDED	7

EXCLUDED OUTFALLS				
OBJECTID *	ID	FacilityID	MS4 Priority	Final Rank
331	WEMTBEDP-02	RWP1015PI	EXCLUDED	7
332	WEMTBEDP-04	RWP1024PI	EXCLUDED	7
352	WEEBTPDP-04	WEB1037PI	EXCLUDED	7
353	WEEBTPDP-02	WEB1031PI	EXCLUDED	7
354	WEEBDIDP-01	WEB1066PI	EXCLUDED	7
356	WEEBBRDP-02	WEB1056PI	EXCLUDED	7
357	WEEBBRDP-03	WEB1055PI	EXCLUDED	7
358	WEEBANDP-01	WEB1075PI	EXCLUDED	7
359	WEEBANDP-04	WEB1070PI	EXCLUDED	7
360	WEEBANDP-02	WEB1065PI	EXCLUDED	7
194	WEEBHLDP-07	WEB1162PI	EXCLUDED	7
216	WEEBOCDP-10	WEB1041PI	EXCLUDED	7
217	WEEBOCDP-11	WEB1042PI	EXCLUDED	7
218	WEEBOCDP-12	WEB1040PI	EXCLUDED	7
219	WEEBLVDP-04	WEB1063PI	EXCLUDED	7
221	WEEBCWDP-01	WEB1172PI	EXCLUDED	7
223	WEEBPRDP-06	WEB1196PI	EXCLUDED	7
262	WEEBEDDP-01	WEB1195PI	EXCLUDED	7
265	WEMTBADP-01	RWP1016PI	EXCLUDED	7
276	WEEBBTDP-01	WEB1111PI	EXCLUDED	7
310	WEEBGIDP-01	WEB1030PI	EXCLUDED	7
313	WEEB195DP-53	WEB1087PI	EXCLUDED	7
324	WEEBBLDP-01	WEB1114PI	EXCLUDED	7
343	WEEBSTDP-01	WEB1295PI	EXCLUDED	7
347	WEEBTPDP-01	WEB1028PI	EXCLUDED	7
349	WEEBFODP-03	WEB1034PI	EXCLUDED	7
350	WEEBFODP-02	WEB1039PI	EXCLUDED	7
361	WEEBANDP-03	WEB1062PI	EXCLUDED	7
362	WEEBJADP-01	WEB1078PI	EXCLUDED	7
363	WEEBJADP-02	WEB1071PI	EXCLUDED	7
364	WEEBLYDP-01	WEB1074PI	EXCLUDED	7
365	WEEBSVDP-01	WEB1081PI	EXCLUDED	7
371	WEEBSVDP-05	WEB1106PI	EXCLUDED	7
372	WEEBFRDP-01	WEB1095PI	EXCLUDED	7
399		WEB1052PI	EXCLUDED	7
83	WEEBWIRC-01	WEB1055RC	EXCLUDED	7
84	WEEBWIRC-02	WEB1058RC	EXCLUDED	7
89	WEMTTIRC-01	RWP1018RC	EXCLUDED	7
95	WEEBGIRC-01	WEB1053RC	EXCLUDED	7

EXCLUDED OUTFALLS				
OBJECTID *	ID	FacilityID	MS4 Priority	Final Rank
102	WEWBCLRC-01	WEB1086RC	EXCLUDED	7
104	WEMTSURC-02	RWP1008RC	EXCLUDED	7
107	WEEBEDRC-01	WEB1170RC	EXCLUDED	7
164	WEMTRORC-02	RWP1017RC	EXCLUDED	7
175	WEWBSSRC-01	WEB1215RC	EXCLUDED	7
176	WEEBMNRC-01	WEB1095RC	EXCLUDED	7
179	WEEBBDRC-01	WEB1216RC	EXCLUDED	7
180	WEEBBDRC-02	WEB1217RC	EXCLUDED	7
182	WEEBJARC-01	WEB1108RC	EXCLUDED	7

APPENDIX D. INSPECTION FIELD FORMS AND SAMPLING PROCEDURES

OUTFALL INVENTORY FIELD SHEET

Section 1: Background Data

City/Town:	Street:	Tax Map #:	Outfall ID: OF-
Owner: <input type="checkbox"/> City <input type="checkbox"/> State <input type="checkbox"/> Private <input type="checkbox"/> Other: _____		Nearest House/Utility Pole #:	
Today's date:		Time (Military):	
Investigators:		Form completed by:	
Temperature (°F):	Rainfall (in.): Last 24 hours: Last 48 hours:		
Northing:	Easting:	GPS Unit:	GPS LMK #:
Rim Elevation:	Invert Elevation:		
Elevation Datum:	Receiving Water:		
Camera:	Photo #s: -- Take 1 Upstream (head on) and 1 Downstream view		
Land Use in Drainage Area (Check all that apply):			
<input type="checkbox"/> Industrial		<input type="checkbox"/> Open Space	
<input type="checkbox"/> Urban Residential		<input type="checkbox"/> Institutional	
<input type="checkbox"/> Suburban Residential		Other: _____	
<input type="checkbox"/> Commercial		Known Industries: _____	
Notes (e.g., origin of outfall, if known):			

Section 2: Outfall Description

TYPE	MATERIAL	SHAPE		DIMENSIONS (IN.)	SUBMERGED
<input type="checkbox"/> Closed Pipe	<input type="checkbox"/> RCP <input type="checkbox"/> CMP <input type="checkbox"/> PVC <input type="checkbox"/> HDPE <input type="checkbox"/> Steel <input type="checkbox"/> Other: _____	<input type="checkbox"/> Circular <input type="checkbox"/> Elliptical <input type="checkbox"/> Box <input type="checkbox"/> Other: _____	<input type="checkbox"/> Single <input type="checkbox"/> Double <input type="checkbox"/> Triple <input type="checkbox"/> Other: _____	Diameter/Dimensions: _____ _____	In Water: <input type="checkbox"/> No <input type="checkbox"/> Partially <input type="checkbox"/> Fully With Sediment: <input type="checkbox"/> No <input type="checkbox"/> Partially <input type="checkbox"/> Fully
<input type="checkbox"/> Open drainage	<input type="checkbox"/> Concrete <input type="checkbox"/> Pavement/Scupper <input type="checkbox"/> Earthen <input type="checkbox"/> rip-rap <input type="checkbox"/> Other: _____	<input type="checkbox"/> Trapezoid <input type="checkbox"/> Parabolic <input type="checkbox"/> Other: _____		Depth: _____ Top Width: _____ Bottom Width: _____	
Flow Present?	<input type="checkbox"/> Yes <input type="checkbox"/> No <i>If No, Skip to Section 3. If Yes, Notify Town and continue field reconnaissance.</i>				
Flow Description (If present)	<input type="checkbox"/> Trickle <input type="checkbox"/> Moderate <input type="checkbox"/> Substantial			Flow Direction (If Present):	

Section 3: Sketch

Outfall Inventory Field Sheet

Section 4: Physical Indicators for Flowing Outfalls Only

Are Any Physical Indicators Present in the flow? ☐ Yes ☐ No (If No, Skip to Section 5)

INDICATOR	CHECK if Present	DESCRIPTION	RELATIVE SEVERITY INDEX (1-3)		
Odor	<input type="checkbox"/>	<input type="checkbox"/> Sewage <input type="checkbox"/> Rancid/sour <input type="checkbox"/> Petroleum/gas <input type="checkbox"/> Sulfide <input type="checkbox"/> Other:	<input type="checkbox"/> 1 – Faint	<input type="checkbox"/> 2 – Easily detected	<input type="checkbox"/> 3 – Noticeable from a distance
Color	<input type="checkbox"/>	<input type="checkbox"/> Clear <input type="checkbox"/> Brown <input type="checkbox"/> Gray <input type="checkbox"/> Yellow <input type="checkbox"/> Green <input type="checkbox"/> Orange <input type="checkbox"/> Red <input type="checkbox"/> Other:	<input type="checkbox"/> 1 – Faint colors in outfall flow	<input type="checkbox"/> 2 – Clearly visible in outfall flow	<input type="checkbox"/> 3 – Clearly visible in outfall flow
Turbidity	<input type="checkbox"/>	See severity	<input type="checkbox"/> 1 – Slight cloudiness	<input type="checkbox"/> 2 – Cloudy	<input type="checkbox"/> 3 – Opaque
Floatables -Does Not Include Trash!!	<input type="checkbox"/>	<input type="checkbox"/> Sewage (Toilet Paper, etc.) <input type="checkbox"/> Suds <input type="checkbox"/> Petroleum (oil sheen) <input type="checkbox"/> Other:	<input type="checkbox"/> 1 – Few/slight; origin not obvious	<input type="checkbox"/> 2 – Some; indications of origin (e.g., possible suds or oil sheen)	<input type="checkbox"/> 3 – Some; origin clear (e.g., obvious oil sheen, suds, or floating sanitary materials)

Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls

Are physical indicators that are not related to flow present? ☐ Yes ☐ No (If No, Skip to Section 6)

INDICATOR	CHECK if Present	DESCRIPTION	COMMENTS
Outfall Damage	<input type="checkbox"/>	<input type="checkbox"/> Spalling, Cracking or Chipping <input type="checkbox"/> Peeling Paint <input type="checkbox"/> Corrosion	
Deposits/Stains	<input type="checkbox"/>	<input type="checkbox"/> Oily <input type="checkbox"/> Flow Line <input type="checkbox"/> Paint <input type="checkbox"/> Other:	
Abnormal Vegetation	<input type="checkbox"/>	<input type="checkbox"/> Excessive <input type="checkbox"/> Inhibited	
Poor pool quality	<input type="checkbox"/>	<input type="checkbox"/> Odors <input type="checkbox"/> Colors <input type="checkbox"/> Floatables <input type="checkbox"/> Oil Sheen <input type="checkbox"/> Suds <input type="checkbox"/> Excessive Algae <input type="checkbox"/> Other:	
Pipe benthic growth	<input type="checkbox"/>	<input type="checkbox"/> Brown <input type="checkbox"/> Orange <input type="checkbox"/> Green <input type="checkbox"/> Other:	

Section 6: Potential for Illicit Discharge

<input type="checkbox"/> Unlikely <input type="checkbox"/> Potential (presence of two or more indicators) <input type="checkbox"/> Suspect (one or more indicators with a severity of 3) <input type="checkbox"/> Obvious

Section 7: Any Non-Illicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?



Ammonia Nitrogen Test Kit

NI-SA (2428700)

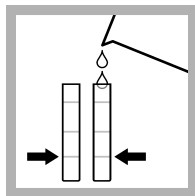
DOC326.98.00007

Test preparation

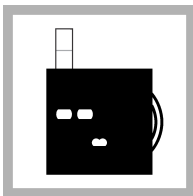
CAUTION: ⚠️ *Review the Safety Data Sheets (MSDS/SDS) for the chemicals that are used. Use the recommended personal protective equipment.*

- Put the color disc on the center pin in the color comparator box (numbers to the front).
- Use sunlight or a lamp as a light source to find the color match with the color comparator box.
- Rinse the tubes with sample before the test. Rinse the tubes with deionized water after the test.
- If the color match is between two segments, use the value that is in the middle of the two segments.
- If the color disc becomes wet internally, pull apart the flat plastic sides to open the color disc. Remove the thin inner disc. Dry all parts with a soft cloth. Assemble when fully dry.
- To verify the test accuracy, use a standard solution as the sample.
- This test kit is for seawater. If used for brackish or fresh water, the test kit gives a higher than actual value. The error in brackish water is usually less than 10%. The error in low salinity or fresh water is a maximum 16%.
- This test is very sensitive to contamination. Try to get the same result on a second test. Fully rinse the tubes with fresh sample before the second test. The reagents clean the tubes during the first test.
- To increase the range of this test to 4 mg/L $\text{NH}_3\text{-N}$, dilute the sample as follows. Use a 3-mL syringe to add 2.5 mL of sample to each tube. Dilute the sample to the 5-mL mark with deionized water. Use the diluted sample in the test procedure and multiply the result by 2.

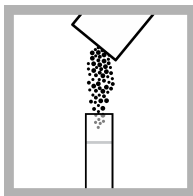
Test procedure—Ammonia-nitrogen (0–2.0 mg/L $\text{NH}_3\text{-N}$)



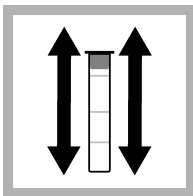
1. Fill two tubes to the first line (5 mL) with sample.



2. Put one tube into the left opening of the color comparator box.



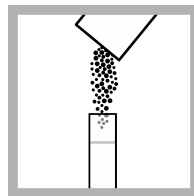
3. Add one Ammonia Salicylate Reagent Powder Pillow to the second tube.



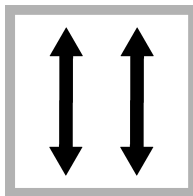
4. Put a stopper on the tube. Shake until the powder fully dissolves.



5. Wait 3 minutes.



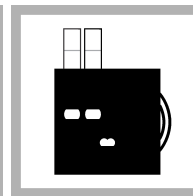
6. Add one Ammonia Cyanurate Reagent Powder Pillow to the same tube. Put a stopper on the tube.



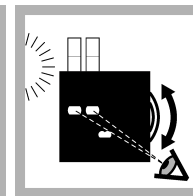
7. Shake until the powder fully dissolves.



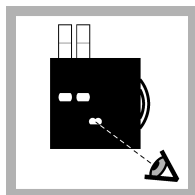
8. Wait 15 minutes. A green color develops.



9. Put the second tube into the color comparator box.



10. Hold the color comparator box in front of a light source. Turn the color disc to find the color match.



11. Read the result in mg/L in the scale window.

Replacement items

Description	Unit	Item no.
Ammonia Salicylate Reagent Powder Pillows, 5 mL	50/pkg	2395266
Ammonia Cyanurate Reagent Powder Pillows, 5 mL	50/pkg	2395466
Color disc, ammonia nitrogen, salicylate, 0–2.0 mg/L	each	9261300
Color comparator box	each	173200
Glass viewing tubes, glass, 18 mm	6/pkg	173006
Stoppers for 18-mm glass tubes and AccuVac Ampuls	6/pkg	173106

Optional items

Description	Unit	Item no.
Nitrogen ammonia standard solution, 1.0 mg/L $\text{NH}_3\text{-N}$	500 mL	189149
Water, deionized	500 mL	27249
Syringe, Luer-Lok® Tip, 3 mL	each	4321300

Calculate the mg/L NH₃ and mg/L NH₄⁺

Ammonia in water is in the form of the ammonium ion (NH₄⁺) and un-ionized ammonia (NH₃). NH₃ is toxic to fish. [Table 1](#) shows that the percent of NH₃ increases as the pH and temperature increase. This test kit measures both NH₄⁺ and NH₃ as ammonia nitrogen (NH₃-N).

To calculate the mg/L NH₃ in the sample, refer to [Table 1](#) and the equation that follows.

$$\text{mg/L NH}_3 = ((\text{mg/L NH}_3\text{-N} \times \text{percent NH}_3 \text{ from Table 1}) \div 100) \times 1.2$$

Example: The test result was 1.6 mg/L NH₃-N. The sample pH was 7.6 and the sample temperature was 16 °C. The mg/L NH₃ is $((1.6 \times 1.16) \div 100) \times 1.2 = 0.02 \text{ mg/L NH}_3$.

To calculate the mg/L NH₄⁺ in the sample, refer to [Table 1](#) and the equation that follows.

$$\text{mg/L NH}_4^+ = ((\text{mg/L NH}_3\text{-N} \times (100 - \text{percent NH}_3 \text{ from Table 1})) \div 100) \times 1.3$$

Example: The test result was 1.6 mg/L NH₃-N. The sample pH was 7.6 and the sample temperature was 16 °C. The mg/L NH₄⁺ is $((1.6 \times (100 - 1.16)) \div 100) \times 1.3 = 2.056 \text{ mg/L NH}_4^+$.

Table 1 Percent of NH₃ in water

pH	16 °C	18 °C	20 °C	22 °C	24 °C	26 °C	28 °C	30 °C	32 °C
7.0	0.29	0.34	0.39	0.46	0.52	0.60	0.69	0.80	0.91
7.2	0.46	0.54	0.62	0.82	0.83	0.96	1.10	1.26	1.44
7.4	0.73	0.85	0.98	1.14	1.31	1.50	1.73	1.98	2.26
7.6	1.16	1.34	1.55	1.79	2.06	2.36	2.71	3.10	3.53
7.8	1.82	2.11	2.44	2.81	3.22	3.70	4.23	4.82	5.48
8.0	2.86	3.30	3.81	4.38	5.02	5.74	6.54	7.43	8.42
8.2	4.45	5.14	5.90	6.76	7.72	8.80	9.98	11.29	12.72
8.4	6.88	7.90	9.04	10.31	11.71	13.26	14.95	16.78	18.77
8.6	10.48	11.97	13.61	15.41	17.37	19.50	21.78	24.22	26.80
8.8	15.66	17.73	19.98	22.41	25.00	27.74	30.62	33.62	36.72
9.0	22.73	25.46	28.36	31.40	34.56	37.83	41.16	44.53	47.91
9.2	31.80	35.12	38.55	42.04	45.57	49.09	52.58	55.99	59.31
9.4	42.49	46.18	49.85	53.48	57.02	60.45	63.73	66.85	69.79
9.6	53.94	57.62	61.17	64.56	67.77	70.78	73.58	76.17	78.55
9.8	64.99	68.31	71.40	74.28	76.92	79.33	81.53	83.51	85.30
10.0	74.63	77.35	79.83	82.07	84.08	85.88	87.49	88.92	90.19
10.2	82.34	84.41	86.25	87.88	89.33	90.60	91.73	92.71	93.58



Detergents CHEMets Kit

K-9400/R-9400: 0 - 3 ppm

Test Procedure

1. Rinse the reaction tube with the sample to be tested, and then fill it to the 5 mL mark with the sample.
2. While holding the double-tipped ampoule in a vertical position, snap the upper tip using the tip breaking tool (fig. 1).
3. Invert the ampoule and position the open end over the reaction tube. Snap the upper tip and allow the contents to drain into the reaction tube (fig. 1).
4. Cap the reaction tube and shake it vigorously for **30 seconds**. Allow the tube to stand undisturbed for **1 minute**.
5. Make sure that the flexible tubing is firmly attached to the CHEMet ampoule tip.
6. Insert the CHEMet assembly (tubing first) into the reaction tube making sure that the end of the flexible tubing is at the bottom of the tube. Break the tip of the CHEMet ampoule by gently pressing it against the side of the reaction tube (fig. 2). The ampoule should draw in fluid only from the organic phase (bottom layer).
7. When filling is complete, remove the CHEMet assembly from the reaction tube.
8. Remove the flexible tubing from the CHEMet ampoule and wipe all liquid from the exterior of the ampoule. Place an ampoule cap firmly onto the tip of the CHEMet ampoule. Invert the ampoule several times, allowing the bubble to travel from end to end.

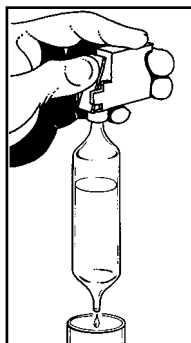


Figure 1

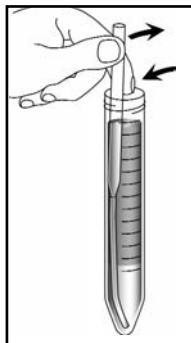


Figure 2

9. Obtain a test result by placing the ampoule, flat end first, into the comparator. Hold the comparator up toward a source of light and view from the bottom. Rotate the comparator until the best color match is found (fig. 3).

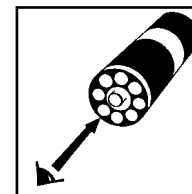


Figure 3

Tip Breaker

The tip breaker opens for easy disposal of the glass tips (pull lever away from body of tip breaker or pull open the side wall). The tip breaker will work most effectively if the tips are emptied out frequently.

Test Method

The Detergents CHEMets®¹ test kit employs the methylene blue extraction method^{2,3,4}. Anionic detergents react with methylene blue to form a blue complex that is extracted into an immiscible organic solvent. The intensity of the blue color is directly related to the concentration of "methylene blue active substances (MBAS)" in the sample. Anionic detergents are one of the most prominent methylene blue active substances. Test results are expressed in ppm (mg/Liter) linear alkylbenzene sulfonate (equivalent weight 325).

1. CHEMets is a registered trademark of CHEMetrics, Inc. U.S. Patent No. 3,634,038
2. APHA Standard Methods, 22nd ed., Method 5540 C - 2000
3. EPA Methods for Chemical Analysis of Water and Wastes, Method 425.1 (1983)
4. ASTM D 2330-02, Methylene Blue Active Substances

Safety Information

Read SDS (available at www.chemetrics.com) before performing this test procedure. Wear safety glasses and protective gloves.



www.chemetrics.com
4295 Catlett Road, Midland, VA 22728 U.S.A.
Phone: (800) 356-3072; Fax: (540) 788-4856
E-Mail: orders@chemetrics.com

Feb. 18, Rev. 10

CHLORINE, TOTAL, Low Range (0 to 2.00 mg/L Cl₂)

For water, wastewater and seawater

DPD Method* USEPA accepted (powder pillows only)**

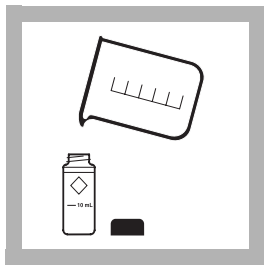
Measuring Hints

If the sample temporarily turns yellow after reagent addition or the display shows overrange (flashing **2.20** in display), dilute a fresh sample and repeat the test. A slight loss of chlorine may occur because of the dilution. Multiply the result by the appropriate dilution factor.

* Adapted from *Standard Methods for the Examination of Water and Wastewater*.

** Procedure is equivalent to USEPA method 330.5 for wastewater and Standard Method 4500-Cl G for drinking water.

CHLORINE, TOTAL, Low Range, continued



- 1.** Fill a 10-mL cell to the 10-mL line with sample. Cap.

Note: Samples must be analyzed immediately and cannot be preserved for later analysis.

Note: Be sure the instrument is in the low range mode. See page 37.



- 2.** Add the contents of one DPD Total Chlorine Powder Pillow to the sample cell (the prepared sample). Cap and gently shake for 20 seconds.

Note: Gently shaking dissipates bubbles which may form in samples containing dissolved gases.

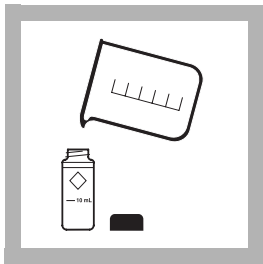


- 3.** Wait 3 minutes. During this period, proceed with steps 4–8.

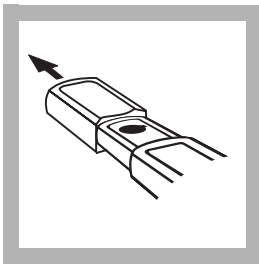
Note: A pink color will form if chlorine is present.

Note: Accuracy is not affected by undissolved powder.

CHLORINE, TOTAL, Low Range, continued

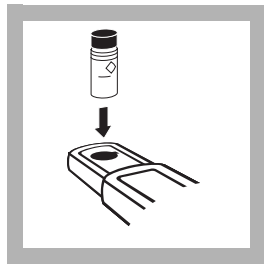


4. Fill a 10-mL sample cell to the 10-mL line with sample (the blank). Cap.



5. Remove the instrument cap.

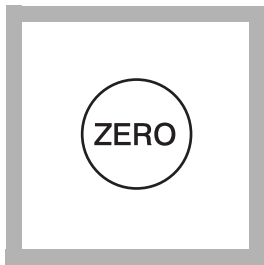
Note: For best results, zero the instrument and read the sample under the same lighting conditions.



6. Place the blank in the cell holder, with the diamond mark facing you. Tightly cover the cell with the instrument cap (flat side should face the back of the instrument).

Note: Wipe liquid off sample cells.

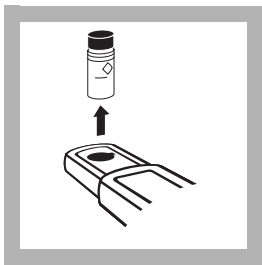
CHLORINE, TOTAL, Low Range, continued



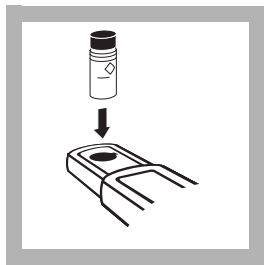
7. Press: ZERO

The instrument will turn on and the display will show - - - followed by **0.00**.

Note: The instrument automatically shuts off after 1 minute and stores the last zero in memory. Press **READ** to complete the analysis.



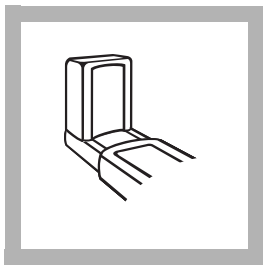
8. Remove the cell from the cell holder.



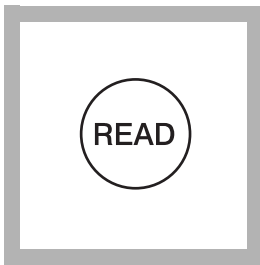
9. Within 3 minutes after the 3-minute reaction period, place the prepared sample in the cell holder.

Note: Wipe liquid off sample cells.

CHLORINE, TOTAL, Low Range, continued



10. Cover the cell with instrument cap.



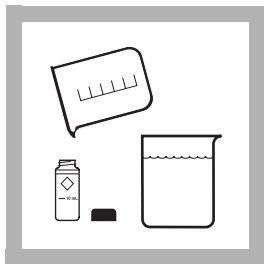
11. Press: **READ**

The instrument will show
- - - followed by the result
in mg/L total chlorine.

Note: *If the sample temporarily turns yellow after reagent addition or shows overrange (flashing 2.20), dilute a fresh sample and repeat the test. Some loss of chlorine may occur. Multiply the result by the dilution factor.*

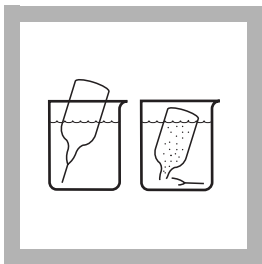
CHLORINE, TOTAL, Low Range, continued

Using AccuVac® Ampuls



1. Fill a 10-mL sample cell to the 10-mL line with sample (the blank). Cap. Collect at least 40 mL of sample in a 50-mL beaker.

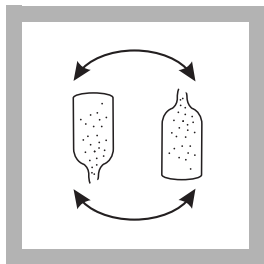
Note: Samples must be analyzed immediately and cannot be preserved for later analysis.



2. Fill a DPD Total Chlorine Reagent AccuVac Ampul with sample (the prepared sample).

Note: Keep the tip immersed until the ampul fills completely.

Note: Be sure the instrument is in low range. See page 37.



3. Quickly invert the ampul several times to mix. Wipe off any liquid or fingerprints.

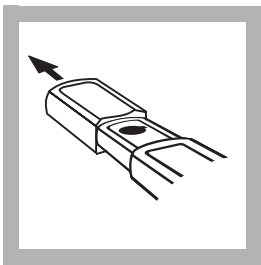
Note: A pink color will develop if chlorine is present.

Note: Accuracy is not affected by undissolved powder.

CHLORINE, TOTAL, Low Range, continued

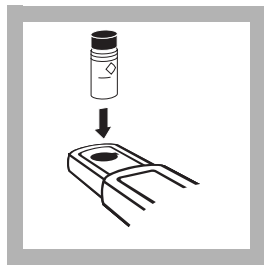


4. Wait 3 minutes. During this period, proceed with steps 5–8.



5. Remove the instrument cap.

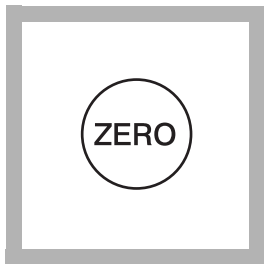
Note: For best results, zero and read the sample measurements under the same lighting conditions.



6. Place the blank in the cell holder with the diamond mark facing you. Tightly cover the cell with the instrument cap (flat side should face the back of the instrument).

Note: Wipe liquid off sample cells.

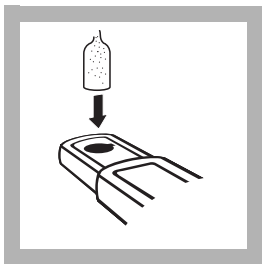
CHLORINE, TOTAL, Low Range, continued



7. Press: ZERO

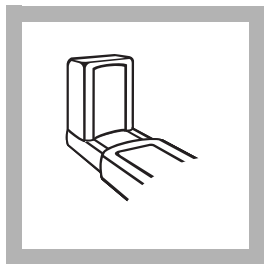
The instrument will turn on and the display will show - - - then **0.00**.

Note: The instrument automatically shuts off after 1 minute and stores the last zero in memory. Press **READ** to complete the analysis.



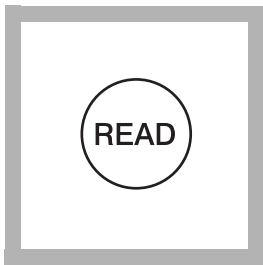
8. Within 3 minutes after the 3-minute reaction period, place the prepared sample in the cell holder.

Note: Wipe liquid off sample cells.



9. Cover the ampule with the instrument cap.

CHLORINE, TOTAL, Low Range, continued



10. Press: **READ**

The instrument will show
- - - followed by the result
in mg/L total chlorine.

Note: *If the sample temporarily turns yellow after reagent addition or shows overrange (flashing 2.20), dilute a fresh sample and repeat the test. Some loss of chlorine may occur. Multiply the result by the dilution factor.*

CHLORINE, TOTAL, Low Range, continued

Accuracy Check

Standard Additions Method

- a. Snap the neck off a Chlorine Standard Solution Voluette® Ampule.
- b. Use a TenSette® pipet to add 0.1, 0.2, and 0.3 mL of standard to three 25-mL samples. Swirl gently to mix. (For AccuVac Ampuls, use 50-mL beakers.)
- c. Analyze a 10-mL aliquot of each sample as described in the procedure. Each 0.1 mL of standard will cause an incremental increase in chlorine, the exact value depends on the concentration of the Voluette ampule standard. Check the certificate enclosed with the Voluette ampules for this value.
- d. If these increases do not occur, call Hach at 800-227-4224. Outside the United States, contact the Hach office or distributor serving you.

Interferences

Samples containing more than the 250 mg/L alkalinity or 150 mg/L acidity as CaCO_3 may inhibit full color development, or the color may fade instantly. Neutralize these samples to pH 6–7 with 1 N Sulfuric Acid or 1 N Sodium Hydroxide. Determine the

CHLORINE, TOTAL, Low Range, continued

amount required on a separate 10-mL sample. Add the same amount to the sample to be tested. Correct for the additional volume.

Bromine, iodine, ozone and oxidized forms of manganese and chromium may also react and read as chlorine.

To compensate for the effects of manganese (Mn^{4+}) or chromium (Cr^{6+}), adjust the pH to 6–7 as described above. To a 25-mL sample, add 3 drops of 30 g/L Potassium Iodide Solution, mix, and wait one minute. Add 3 drops of 5 g/L Sodium Arsenite and mix. If chromium is present, allow exactly the same reaction period with DPD for both analyses. Subtract the result of this test from the original analysis to obtain the accurate chlorine concentration.

DPD Total Chlorine Reagent Powder Pillows and AccuVac Ampuls contain a buffer formulation that withstands high levels (at least 1000 mg/L) of hardness without interference.

CHLORINE, TOTAL, Low Range, continued

REQUIRED REAGENTS

Description	Unit	Cat. No.
DPD Total Chlorine Reagent Powder Pillows	100/pkg.....	21056-69
or		
DPD Total Chlorine Reagent AccuVac® Ampuls.....	25/pkg.....	25030-25

REQUIRED APPARATUS (AccuVac® Ampuls)

Beaker, 50 mL.....	each.....	500-41
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OPTIONAL REAGENTS

Chlorine Standard Solution Voluette®		
Ampules, 50-75 mg/L, 10 mL.....	16/pkg.....	14268-10
Chlorine Standards, secondary, Specv™,		
0.0, 0.2, 0.8, and 1.5 mg/L	4/set.....	26353-00
DPD Total Chlorine Reagent w/dispensing cap	250 tests.....	21056-29
Potassium Iodide Solution, 30 g/L.....	100 mL MDB*.....	343-32
Sodium Arsenite Solution, 5 g/L	100 mL MDB.....	1047-32
Sodium Hydroxide Standard Solution, 1 N	100 mL MDB.....	1045-32
Sulfuric Acid Standard Solution, 1 N	100 mL MDB.....	1270-32
Water, deionized	4 L.....	272-56

* Marked Dropper Bottle

CHLORINE, TOTAL, Low Range, continued

OPTIONAL APPARATUS

Description	Unit	Cat. No.
AccuVac® Snapper Kit.....	each	24052-00
Batteries, AAA, alkaline.....	4/pkg	46743-00
Caps for 10-mL sample cells.....	12/pkg	24018-12
Cylinder, graduated, 25 mL, poly.....	each	1081-40
Cylinder, graduated, 100 mL, PMP.....	each	2172-42
sens <i>ion</i> ™ I Basic Portable pH Meter, with electrode	each	51700-10
Pipet, TenSette®, 0.1 to 1.0 mL.....	each	19700-01
Pipet Tips, For 19700-01 TenSette®.....	50/pkg	21856-96
Sample Cells, 10-mL with screw caps.....	6/pkg	24276-06

REPLACEMENT PARTS

Instrument Cap/light shield	each	46704-00
Instrument Manual.....	each	46760-88



Pro30



USER MANUAL

English

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Rev A
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July 2011

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WARRANTY

The YSI Professional 30 instrument (Pro30) is warranted for three (3) years from date of purchase by the end user against defects in materials and workmanship, exclusive of batteries and any damage caused by defective batteries. Pro30 cable/ probe assemblies are warranted for two (2) years from date of purchase by the end user against defects in material and workmanship. Pro30 instruments & cables are warranted for 90 days from date of purchase by the end user against defects in material and workmanship when purchased by rental agencies for rental purposes. Within the warranty period, YSI will repair or replace, at its sole discretion, free of charge, any product that YSI determines to be covered by this warranty.

To exercise this warranty, call your local YSI representative, or contact YSI Customer Service in Yellow Springs, Ohio at +1 937 767-7241, 800-897-4151 or visit www.YSI.com for a Product Return Form. Send the product and proof of purchase, transportation prepaid, to the Authorized Service Center selected by YSI. Repair or replacement will be made and the product returned, transportation prepaid. Repaired or replaced products are warranted for the balance of the original warranty period, or at least 90 days from date of repair or replacement.

LIMITATION OF WARRANTY

This Warranty does not apply to any YSI product damage or failure caused by:

1. Failure to install, operate or use the product in accordance with YSI's written instructions;
2. Abuse or misuse of the product;
3. Failure to maintain the product in accordance with YSI's written instructions or standard industry procedure;
4. Any improper repairs to the product;
5. Use by you of defective or improper components or parts in servicing or repairing the product;
6. Modification of the product in any way not expressly authorized by YSI.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. YSI'S LIABILITY UNDER THIS WARRANTY IS LIMITED TO REPAIR OR REPLACEMENT OF THE PRODUCT, AND THIS SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY DEFECTIVE PRODUCT COVERED BY THIS WARRANTY. IN NO EVENT SHALL YSI BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY DEFECTIVE PRODUCT COVERED BY THIS WARRANTY.

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INTRODUCTION

Thank you for purchasing the YSI Pro30, an instrument from the YSI *Professional Series* product family. The Pro30 measures conductivity and temperature in water. The Pro30 features an impact resistant and waterproof (IP-67) case, a rugged MS-8 (military-spec) cable connector, backlit display, user-selectable sensor options, 50 data set memory, internal barometer and a rubber over-mold case.

The Pro30 provides valuable instructions and prompts near the bottom of the display that will guide you through operation and use. However, reading the entire manual is recommended for a better understanding of the instrument's features.




The Pro30 cannot communicate to a PC via a Pro Series communications saddle. Connecting the Pro30 to a communication saddle may cause erratic instrument behavior.

GETTING STARTED

INITIAL INSPECTION

Carefully unpack the instrument and accessories and inspect for damage. Compare received parts with items on the packing list. If any parts or materials are damaged or missing, contact YSI Customer Service at 800-897-4151 (+1 937 767-7241) or the authorized YSI distributor from whom the instrument was purchased.

BATTERY INSTALLATION

The instrument requires 2 alkaline C-cell batteries. Under normal conditions, the average battery life is 425 hours at room temperature without using the back light. A battery symbol  will blink in the lower, left corner of the display to indicate low batteries when approximately 1 hour of battery life remains.

To install or replace the batteries:

1. Turn the instrument off and flip over to view the battery cover on the back.
2. Unscrew the four captive battery cover screws.
3. Remove the battery cover and remove the old batteries if necessary.
4. Install the new batteries, ensuring correct polarity alignment (figure 1).

- Place the battery cover on the back of the instrument and tighten the four screws. Do not over-tighten.

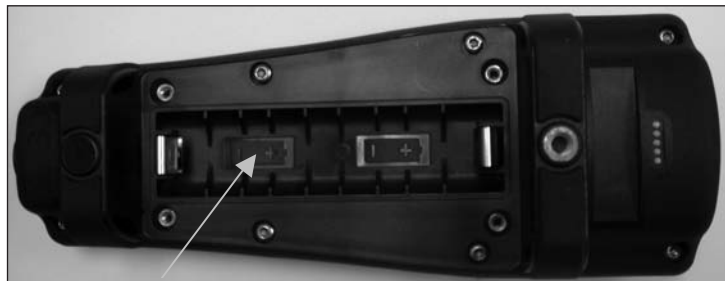


Figure 1. Pro30 with battery cover removed. Notice battery symbols indicating polarities.



The waterproof instrument case is sealed at the factory and is not to be opened, except by authorized service technicians. Do not attempt to separate the two halves of the instrument case as this may damage the instrument, break the waterproof seal, and will void the warranty.

KEY PAD

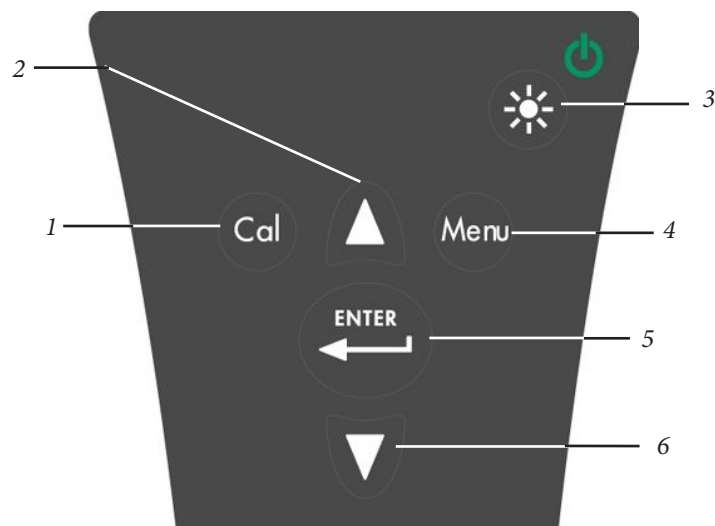


Figure 2, Keypad

Number	Key	Description
1		Calibrate Press and hold for 3 seconds to calibrate. Opens Calibrate menu from the Run screen.
2		Up Arrow Use to navigate through menus, to navigate through box options along the bottom of the Run screen and to increase numerical inputs.
3		Power and Backlight Press once to turn instrument on. Press a second time to turn backlight on. Press a third time to turn backlight off. Press and hold for 3 seconds to turn instrument off.
4		Menu Use to enter the System Setup menu from the Run screen.
5		Enter Press to confirm entries and selections.
6		Down Arrow Use to navigate through menus, to navigate through box options at the bottom of the Run screen and to decrease numerical inputs.

CONNECTING THE PROBE/CABLE ASSEMBLY TO THE INSTRUMENT


The conductivity and temperature sensors are integral to the cable assembly; therefore, they cannot be removed from the cable.

To connect the cable, align the keys on the cable connector to the slots on the instrument connector. Push together firmly and then twist the outer ring until it locks into place (figure 3). This connection is water-proof.



Figure 3, Note the keyed connector.

RUN SCREEN

Press the power/backlight key  to turn the instrument on. The instrument will run through a self test and briefly display a splash screen with system information before displaying the main Run screen (figure 4). The first time the Pro30 is turned on, it will prompt you to select a language; see the First Power On section of this manual for more information.

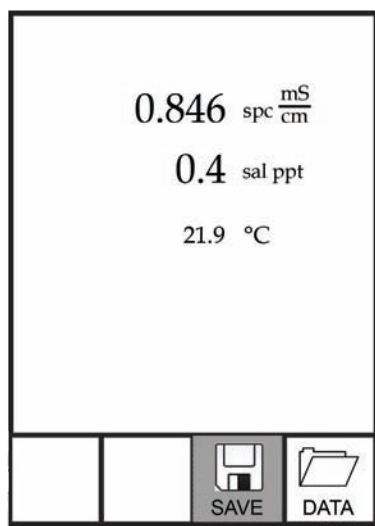




Figure 4, Run screen.

BACKLIGHT

Once the instrument is powered on, pressing the power/backlight key  will turn on the display backlight. The backlight will remain on until the key is pressed again or after two minutes of not pressing any key on the keypad.



POWERING OFF

To turn the instrument off, press and hold the power/backlight key  for three seconds.



NAVIGATION

The up  and down  arrow keys allow you to navigate through the functions of the Pro30.

NAVIGATING THE RUN SCREEN

When in the Run screen, the up  and down  arrow keys will move the highlighted box along the bottom options. Once a box is highlighted, press enter to access the highlighted option.

Description of Run screen box functions from left to right:

Option	Description
 SAVE	Highlight and press enter to save displayed data to memory.
 DATA	Highlight and press enter to view and/or erase saved data.

NAVIGATING THE SYSTEM SETUP MENU

When in the System Setup menu, the up and down arrow keys will move the highlighted bar up and down the system setup options. See the System Setup menu section of this manual for more information about these options.

FIRST POWER ON

The instrument will step through an initial language configuration when powered on for the first time. Use the up or down arrow keys to highlight the

appropriate language then press enter to confirm (figure 5). If an incorrect language is selected, it may be changed in the System Setup menu.

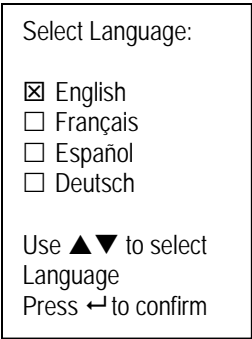



Figure 5, Select language.

After selecting a language, the Run screen will be displayed. The next time the instrument is powered up, the Run screen will display immediately after the splash screen.

SYSTEM SETUP MENU

Press the menu  key to access the System Setup menu. The System Setup menu contains multiple screens that are notated as 'pages'. The current page is indicated near the bottom of the display (figure 6).

Use the up and down arrow keys to scroll through menu options and menu pages.

EXITING THE SYSTEM SETUP MENU

To exit the System Setup menu, press the down arrow key until the ESC - Exit box is highlighted, then press enter to return to the Run screen.

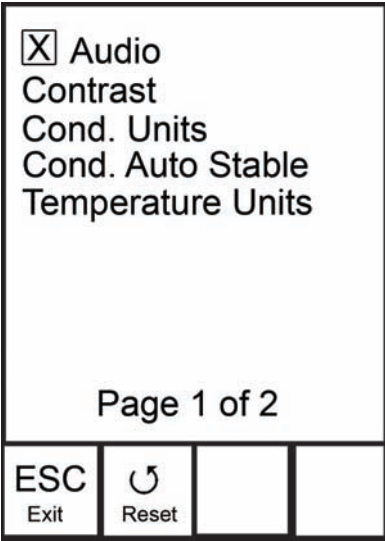


Figure 6, page 1 of System Setup menu. Audio is enabled.

AUDIO

Audio can be enabled or disabled by using the up or down arrow keys to highlight Audio and pressing enter. When enabled, there will be an 'X' in the box next to Audio.

When Audio is enabled, the Pro30 will beep twice to indicate stability when Auto Stable is enabled. The instrument will also beep when a key is pressed. When Audio is disabled, the Pro30 will not beep.

CONTRAST

To adjust the display Contrast, use the up or down arrow keys to highlight Contrast, then press enter. Next, use the up or down arrow keys to adjust the contrast. The up arrow key will darken the contrast and the down arrow key will lighten the contrast. After adjusting the contrast, press enter to save and exit the Contrast adjustment option.

EMERGENCY CONTRAST ADJUSTMENT

If necessary, there is an alternate method of adjusting the contrast. To adjust the contrast, press and hold the menu key, then press the up arrow key to darken the contrast or press the down arrow key to lighten the contrast.

CONDUCTIVITY UNITS (COND. UNITS)

Highlight Cond. Units (Conductivity Units) and press enter to open a submenu that allows you to select the conductivity units to be displayed on the Run screen. Highlight a unit and press enter to enable or disable it. An enabled conductivity unit will have an 'X' in the box next to it. Highlight the ESC-Exit box along the bottom of the display and press enter to save any changes and to close the conductivity units submenu.

There are seven options for displaying conductivity. Only four units can be enabled at the same time:

- COND-mS/cm displays conductivity in milliSiemens per centimeter.
- COND-uS/cm displays conductivity in microSiemens per centimeter.
- SPC-mS/cm displays Specific Conductance in milliSiemens per centimeter. Specific Conductance is temperature compensated conductivity.
- SPC-uS/cm displays Specific Conductance in microSiemens per centimeter. Specific Conductance is temperature compensated conductivity.
- Sal ppt displays salinity in parts per thousand. The salinity reading is calculated from the instrument's conductivity and temperature values using algorithms found in *Standard Methods for the Examination of Water and Wastewater*.
- TDS g/L displays Total Dissolved Solids in grams per liter. TDS is calculated from conductivity and temperature using a user-selectable TDS constant.
- TDS mg/L displays Total Dissolved Solids in milligrams per liter. TDS is calculated from conductivity and temperature using a user-selectable TDS constant.

Note: 1 milliSiemen = 1,000 microSiemens.

SPECIFIC CONDUCTANCE

The conductivity of a sample is highly dependent on temperature, varying as much as 3% for each change of one degree Celsius (temperature coefficient = 3%/°C). In addition, the temperature coefficient itself varies with the nature of the ionic species present in the sample. Therefore, it is useful to compensate for this temperature dependence in order to quickly compare conductivity readings taken at different temperatures.

The Pro30 can display non-temperature compensated conductivity as well as temperature compensated Specific Conductance. If Specific Conductance is selected, the Pro30 uses the temperature and conductivity values associated with

each measurement to calculate a specific conductance value compensated to a user selected reference temperature, see below. Additionally, the user can select the temperature coefficient from 0% to 4%.

Using the Pro30's default reference temperature and temperature coefficient (25 °C and 1.91%), the calculation is carried out as follows:

$$\text{Specific Conductance (25°C)} = \frac{\text{Conductivity of sample}}{1 + 0.0191 * (T - 25)}$$

T = Temperature of the sample in °C

CONDUCTIVITY AUTO STABLE (COND. AUTO STABLE)

Auto Stable utilizes preset values to indicate when a reading is stable. The preset values are adjustable in the System Setup menu. The user can input a % change in readings (0.0 to 1.9) over 'x' amount of time in seconds (3-19).

Highlight Cond. Auto Stable, then press enter to open the submenu.

Use the up or down arrow keys to highlight the % change or seconds (secs) input field, then press enter to make the highlighted field adjustable. Use the up or down arrow keys to adjust the selected value, then press enter to confirm changes. Once you have confirmed any changes, highlight the ESC-Exit box along the bottom of the display and press enter to close the Auto Stable submenu.

To disable Auto Stable, set the % Change input to 0.0.

When Auto Stable is enabled, an AS symbol will display next to the reading on the Run screen and blink during stabilization. When the dissolved oxygen and/or conductivity reading stabilizes based on the Auto Stable settings, the AS symbol will display steadily and the instrument will beep twice if Audio is turned on.

TEMPERATURE UNITS

Highlight Temperature Units and press enter to open a submenu that allows you to change the temperature units displayed on the Run screen. Highlight the desired unit (Celsius or Fahrenheit) and press enter to enable. The enabled temperature unit will have an 'X' in the box next to it. Only one unit may be enabled at a time. Highlight the ESC-Exit box and press enter to save any changes and to close the Temperature Units submenu.

SPECIFIC CONDUCTANCE REFERENCE TEMPERATURE (SPC REF. TEMP.)

SPC Ref. Temp. (Specific Conductance Reference Temperature) is the reference temperature used to calculate Specific Conductance. The reference temperature range is 15 and 25 °C. The default value is 25 °C.

To change the reference temperature, highlight SPC Ref. Temp. and press enter to open the submenu. With the reference temperature highlighted, press enter to make the field adjustable. Next, use the up or down arrow key to increase or decrease the value. Press enter to save the new reference temperature. Next, highlight the ESC-Exit box and press enter to close the submenu.

SPECIFIC CONDUCTANCE TEMPERATURE COEFFICIENT (SPC %/°C)

SPC %/°C (Specific Conductance Temperature Coefficient) is the temperature coefficient used to calculate Specific Conductance. The coefficient range is 0.00 to 4.00. The default value is 1.91% which is based on KCl standards.

To change the temperature coefficient, highlight SPC %/°C and press enter to open the submenu. With the temperature coefficient highlighted, press enter to make the field adjustable. Next, use the up or down arrow key to increase or decrease the value. Press enter to save the new coefficient. Next, highlight the ESC-Exit box and press enter to close the submenu.

TDS CONSTANT

TDS Constant is a multiplier used to calculate an estimated TDS (Total Dissolved Solids) value from conductivity. The multiplier is used to convert Specific Conductance in mS/cm to TDS in g/L. The Pro30's default value is 0.65. This multiplier is highly dependent on the nature of the ionic species present in the water sample. To be assured of moderate accuracy for the conversion, you must determine a multiplier for the water at your sampling site. Use the following procedure to determine the multiplier for a specific sample:

1. Determine the specific conductance of a water sample from the site;
2. Filter a sample of water from the site;
3. Completely evaporate the water from a carefully measured volume of the filtered sample to yield a dry solid;
4. Accurately weigh the remaining solid;
5. Divide the weight of the solid (in grams) by the volume of water used (in liters) to yield the TDS value in g/L for this site;
6. Divide the TDS value in g/L by the specific conductance of the water in mS/cm to yield the conversion multiplier. Be certain to use the correct units.

If the nature of the ionic species at the site changes between sampling studies, the TDS values will be in error. TDS cannot be calculated accurately from specific conductance unless the make-up of the chemical species in the water remains constant.

To change the TDS Constant in the Pro30, highlight TDS Constant and press enter to open the submenu. With the TDS Constant highlighted, press enter to make the field adjustable. Next, use the up or down arrow key to increase or decrease the value. The input range is 0.30 to 1.00. Press enter to save the new TDS Constant. Next, highlight the ESC-Exit box and press enter to close the submenu.

LANGUAGE

Highlight Language and press enter to open a submenu that allows you to change the language. Highlight the desired language (English, Spanish, German, or French) and press enter to enable. The enabled language will have an 'X' in the box next to it. Highlight ESC-Exit box and press enter to save any changes and to close the Language submenu.

The text in the boxes along the bottom of the Run screen will always be displayed in English regardless of the language enabled in the System Setup menu.

AUTO SHUTOFF


Auto Shutoff allows you to set the instrument to turn off automatically after a period of time. Use the up or down arrow keys to highlight Auto Shutoff, then press enter to open the submenu. Press enter while the minute field is highlighted to make it adjustable. Next, use the up or down arrow keys to adjust the shut off time from 0 to 60 minutes. Press enter to save the new shutoff time. Next, highlight the ESC-Exit box and press enter to close the submenu.

To disable Auto Shutoff, set the Time in Minutes to 0 (zero).

CELL CONSTANT

The Cell Constant displays the cell constant of the conductivity cell. The cell constant is calculated and updated each time a conductivity calibration is performed. The cell constant range is 4.0 to 6.0. Resetting the System Menu resets the cell constant to 5.0.

RESETTING THE SYSTEM SETUP MENU TO FACTORY DEFAULT

To reset the Pro30 settings to factory default, press the down arrow key while in the System Setup menu until the Reset -  box is highlighted, then press enter. The instrument will ask you to confirm the reset. Highlight Yes and press enter to continue with the reset or highlight No and press enter to cancel the reset. A Factory Reset will not affect data saved in the instrument’s memory.

The following will be set in the Pro30 after performing a reset:

Parameter	Reset Defaults
Audio	On
Contrast	Set to mid range
Conductivity Units	cond uS/cm, spc mS/cm, spc uS/cm and sal ppt
Conductivity Auto Stable	Off (0.0 % Change and 10 seconds)
SPC Reference Temperature	25°C
SPC Temperature Coefficient	1.91%/°C
TDS Constant	0.65
Temperature Units	°C
Language	English
Auto Shutoff	30 minutes
Conductivity Cell Constant	Cell constant reset to 5.0*

*It is recommended to perform a Conductivity calibration after performing a reset.

CALIBRATION

TEMPERATURE

All Pro30 cables have built-in temperature sensors. Temperature calibration is not required nor is it available.

CONDUCTIVITY CALIBRATION

Ensure the conductivity sensor is clean and dry before performing a conductivity, specific conductance or salinity calibration.



It is not necessary to calibrate conductivity, specific conductance and salinity. Calibrating one of these parameters will simultaneously calibrate the others. YSI recommends calibrating specific conductance for greatest ease.

CALIBRATING SPECIFIC (SP.) CONDUCTANCE OR CONDUCTIVITY

Note: When calibrating Specific Conductance, the Pro30 uses the factory default values for the Specific Conductance Reference Temperature and the Specific Conductance Temperature Coefficient regardless of what is configured in the System Setup Menu. The default value for the Reference Temperature is 25°C and the default value for the Temperature Coefficient is 1.91%/°C. It is important to note that the Temperature Coefficient of a calibration solution is dependent on the contents of the solution. Therefore, YSI recommends using a traceable calibration solution made of KCl (potassium chloride) when calibrating Specific Conductance since these solutions typically have a Temperature Coefficient of 1.91%/°C. Additionally, be sure to enter the value of the solution as it is listed for 25°C when calibrating Specific Conductance.

1. Fill a clean container (i.e. plastic cup or glass beaker) with fresh, traceable conductivity calibration solution and place the sensor into the solution. The solution must cover the holes of the conductivity sensor that are closest to the cable (figure 7). Ensure the entire conductivity sensor is submerged in the solution or the instrument will read approximately half the expected value. Gently move the probe up and down to remove any air bubbles from the conductivity sensor.

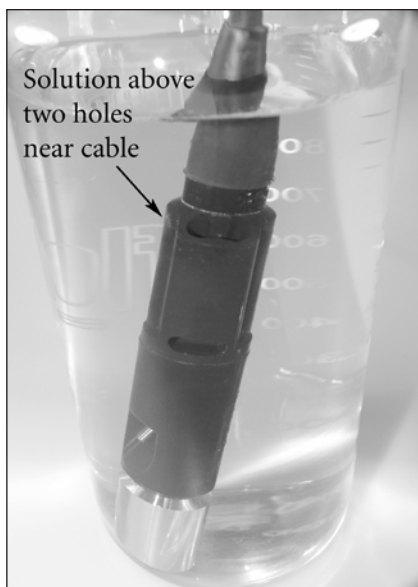


Figure 7, solution above two holes near cable.

2. Turn the instrument on and allow the conductivity and temperature readings to stabilize. Press and hold the Cal key for 3 seconds. Highlight Conductivity and press enter. Next, highlight the desired calibration method, Sp. Conductance or Conductivity, and press enter.
3. Highlight the units you wish to calibrate, either uS/cm or mS/cm, and press enter. 1 mS = 1,000 uS. Next, use the up or down arrow key to adjust the value on the display to match the value of the conductivity calibration solution. If calibrating conductivity, it is necessary to look up the value of the solution at the current temperature and enter that value into the Pro30. Most conductivity solutions are labeled with a value at 25°C. If calibrating specific conductance, enter the value listed for 25°C. Depressing either the up or down arrow key for 5 seconds will move the changing digit one place to the left. The Pro30 will remember the entered calibration value and display it the next time a conductivity calibration is performed.
4. Press enter to complete the calibration. Or, press Cal to cancel the calibration and return to the Run screen.
5. 'Calibration Successful' will display for a few seconds to indicate a successful calibration and then the instrument will return to the Run screen.
6. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the calibration error message and return to the Run screen. See the Troubleshooting guide for possible solutions.

CALIBRATING IN SALINITY

1. Fill a clean container (i.e. plastic cup or glass beaker) with fresh, traceable salinity calibration solution and place the sensor into the solution. The solution must cover the holes of the conductivity sensor that are closest to the cable (figure 7). Ensure the entire conductivity sensor is submerged in the solution or the instrument will read approximately half the expected value. Gently move the probe up and down to remove any air bubbles from the conductivity sensor.
2. Turn the instrument on and allow the conductivity and temperature readings to stabilize. Press and hold the Cal key for 3 seconds. Highlight Conductivity and press enter. Next, highlight Salinity and press enter.
3. Use the up or down arrow key to adjust the value on the display to match the value of the salinity solution. Depressing either the up or down arrow key for 5 seconds will move the changing digit one place to the left. The Pro30 will remember the entered calibration value and display it the next time a salinity calibration is performed.
4. Press enter to complete the calibration. Or, press Cal to cancel the calibration and return to the Run screen.
5. 'Calibration Successful' will display for a few seconds to indicate a successful calibration and then the instrument will return to the Run screen.
6. If the calibration is unsuccessful, an error message will display on the screen. Press the Cal key to exit the calibration error message and return to the Run screen. See the Troubleshooting guide for possible solutions.


TAKING MEASUREMENTS

Before taking measurements, be sure the instrument has been calibrated to ensure the most accurate readings. Place the probe in the sample to be measured and give the probe a quick shake to release any air bubbles. Be sure the conductivity sensor is completely submerged in the sample. The two holes near the cable should be covered by the sample for accurate conductivity readings (figure 7). Allow the temperature readings to stabilize.

SAVING AND VIEWING DATA

The Pro30 can store 50 data sets in non-volatile memory for later viewing. A data set includes the values currently on the display, i.e. temperature, dissolved oxygen and two conductivity parameters. Each data point is referenced with a data set number, 01 through 50.

SAVING DATA



The Pro30 can not communicate to a PC via a Pro Series communications saddle. Connecting the Pro30 to a communication saddle may cause erratic instrument behavior.

From the Run screen, use the up or down arrow keys to highlight the Save box and press enter to save the current readings. The instrument will indicate the data set is saved and display the saved data set's number (figure 8).

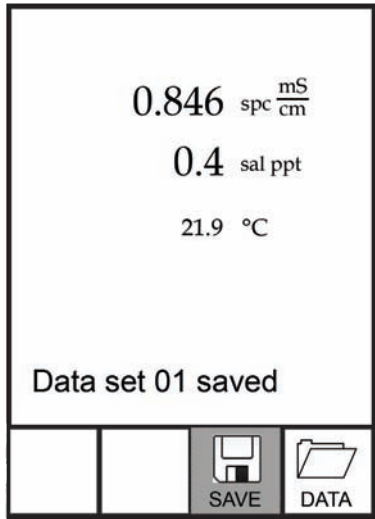


Figure 8, data set saved.

The instrument will display 'Memory Full' if all 50 data sets have been saved and you attempt to save another data set.

VIEWING AND ERASING SAVED DATA - DATA MODE

Data mode allows you to view and erase saved data. From the Run screen, use the up or down arrow keys to highlight Data and press enter to access Data mode. Note that the function boxes at the bottom of the display are different in Data mode (figure 9).

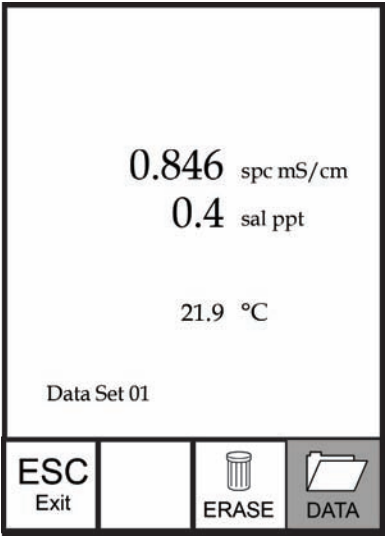


Figure 9, Data mode.

VIEWING DATA

Once in Data mode, use the up and down arrow keys to view saved data sets in sequential order or press enter to access the bottom functions. After accessing the bottom functions, highlight the Data box and press enter to regain access to viewing data. The data set displayed is indicated by the data set number, 01 through 50.

ERASING DATA

While viewing saved data, press the enter key to access the function boxes at the bottom of the display. Next, use the up or down arrow keys to highlight Erase, then press enter. The instrument will give you the option to erase one data set or all data sets (figure 10).

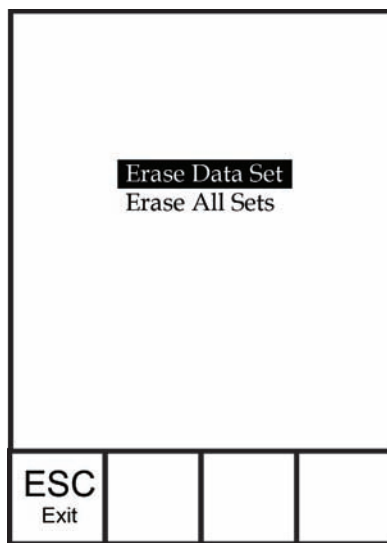


Figure 10, Erase data mode.

Use the up or down arrow key to select Erase Data Set, Erase All Sets or the ESC-Exit function box, then press enter to confirm.

Select ESC-Exit and press enter to exit Erase mode without erasing any data.

Select Erase Data Set and press enter to erase the data set that was displayed before entering Erase mode. For example, if data set 12 was displayed before entering erase mode, and Erase Data Set is selected, Data Set 12 will be erased from memory and the data sets AFTER that number will move up to keep them sequential. For example, if there are 15 records and number 12 is erased then 13 becomes 12, 14 becomes 13, and 15 becomes 14. The instrument will return to Data mode after erasing one data set.

Select Erase All Data Sets and press enter to clear the Pro30 memory and return to Data mode.

EXITING DATA MODE

While in Data mode, press enter to access the bottom functions. Next, highlight the ESC-Exit box and press enter to return to the Run screen.

CARE, MAINTENANCE AND STORAGE

This section describes the proper procedures for care, maintenance and storage of the instrument. The goal is to maximize their lifetime and minimize downtime associated with improper instrument usage.

GENERAL MAINTENANCE

GENERAL MAINTENANCE - GASKET

The instrument utilizes a gasket as a seal to prevent water from entering the battery compartment. Following the recommended procedures will help keep the instrument functioning properly.

If the gasket and sealing surfaces are not maintained properly, it is possible that water can enter the battery compartment. If water enters this area, it can severely damage the battery terminals causing loss of battery power and corrosion to the battery terminals. Therefore, when the battery compartment lid is removed, the gasket that provides the seal should be carefully inspected for contamination (i.e. debris, grit, etc.) and cleaned with water and mild detergent if necessary.

SENSOR MAINTENANCE

SENSOR MAINTENANCE - TEMPERATURE

You must keep the temperature sensor free of build up. Other than that, no additional maintenance is required. A toothbrush can be used to scrub the temperature sensor if needed.

SENSOR MAINTENANCE - CONDUCTIVITY

The openings that allow sample access to the conductivity electrodes should be cleaned regularly. The small cleaning brush included in the Maintenance Kit is intended for this purpose. Dip the brush in clean water and insert it into each hole 10 to 12 times. In the event that deposits have formed on the electrodes, it may be necessary to use a mild detergent (laboratory grade soap or bathroom foaming tile cleaner) with the brush. Rinse thoroughly with clean water, then check the response and accuracy of the conductivity cell with a calibration solution.

SENSOR STORAGE

SHORT AND LONG TERM STORAGE

For both short and long term storage, the conductivity sensor should be stored clean and dry.

Remove the batteries from the instrument when storing it for long periods of time (>30 days).

Long Term Storage Temperature: -5 to 70°C (23 to 158°F)

TROUBLESHOOTING

<i>Symptom</i>	<i>Possible Solution</i>
Instrument will not turn on, a battery symbol appears, or “Critical Shutdown” displays on the screen.	<ol style="list-style-type: none">1. Low battery voltage, replace batteries.2. Batteries installed incorrectly, check battery polarity.3. Return system for service.
Temperature values display Over or Undr on Run screen.	<ol style="list-style-type: none">1. Sample temperature is less than -5° C or more than +55°C. Increase or decrease the sample temperature to bring within the allowable range.2. Contact YSI Tech Support.
Instrument will not calibrate the Conductivity sensor; instrument displays “Calibration Over”, “Calibration Under”, or “Unstable Reading” during calibration.	<ol style="list-style-type: none">1. Ensure the conductivity sensor is clean. Follow the cleaning procedures in the Care, Maintenance and Storage section of this manual.2. Verify the calibration solution is above the two holes near the cable, see figure 8.3. Verify the calibration solution is not expired or contaminated. Try a new bottle of solution.4. Ensure you are entering in the correct value for the solution according to the measurement units. 1 mS = 1,000 uS.5. Allow sufficient stabilization time for conductivity and temperature AND wait at least 3 seconds before confirming a calibration.6. Contact YSI Tech Support.

<i>Symptom</i>	<i>Possible Solution</i>
Conductivity readings are inaccurate.	<ol style="list-style-type: none">1. Ensure the conductivity sensor is clean. Follow the cleaning procedures in the Care, Maintenance and Storage section of this manual.2. Verify the sample is above the two holes near the cable, see figure 8.3. Verify calibration.4. Verify temperature readings are accurate.5. Verify the correct units are setup in the System Setup menu, i.e. uS vs mS and Conductivity vs. Specific Conductance.6. Contact YSI Tech Support.
Conductivity values display Over or Undr on Run screen.	<ol style="list-style-type: none">1. Ensure the conductivity sensor is clean. Follow the cleaning procedures in the Care, Maintenance and Storage section of this manual.2. Verify the sample is above the two holes near the cable, see figure 83. Verify calibration.4. Verify temperature readings are accurate.5. Sample conductivity is outside the measurement range of the instrument, i.e. 0-200 mS.6. Contact YSI Tech Support.

SPECIFICATIONS

These specifications represent typical performance and are subject to change without notice. For the latest product specification information, please visit YSI's website at www.ysi.com or contact YSI Tech Support.

<i>Parameter</i>	<i>Range</i>	<i>Resolution</i>	<i>Accuracy</i>
Temperature	-5 to 55°C	0.1°C	± 0.2°C
Conductivity	0-500 uS/cm 0-5 mS/cm 0-50 mS/cm 0-200 mS/cm (auto ranging)	0.0001 to 0.1 mS/cm; 0.1 to 0 uS/cm (range dependent)	Instrument only: ± 0.5% of the reading or 1 uS/cm, whichever is greater. Instrument with 1 or 4 meter cables: ± 1.0% of the reading or 1 uS/cm, whichever is greater. Instrument with 10, 20, or 30 meter cables: ± 2.0% of the reading or 1 uS/cm, whichever is greater.
Salinity	0 to 70 ppt	0.1 ppt	± 1.0% of the reading or ± 0.1 ppt, whichever is greater.
Total Dissolved Solids (TDS)	0 to 100 g/L. TDS Constant range: 0.3 to 1.00 (0.65 default)	0.0001 to 0.1 g/L (range dependent)	Dependent on accuracy of temperature, conductivity and TDS Constant.

ACCESSORIES / PART NUMBERS

<i>Part Number</i>	<i>Description</i>
6050030	Pro30 Instrument
60530-1, -4, -10, -20, or -30	1, 4, 10, 20, 30-meter cable assembly*
603077	Flow cell
603056	Flow cell mounting spike
603075	Carrying case, soft-sided
603074	Carrying case, hard-sided
603069	Belt clip
063517	Ultra clamp for instrument
063507	Tripod for instrument
603062	Cable management kit, included with all cables longer than 1 meter.
605978	Cable weight, 4.9 oz, stackable
603070	Shoulder strap
060907	Conductivity Calibration Solution, 1,000 µS/cm. 1 box of 8 pints.
060911	Conductivity Calibration Solution, 10,000 µS/cm. 1 box of 8 pints.
060660	Conductivity Calibration Solution, 50,000 µS/cm. 1 box of 8 pints.
065274	Conductivity Calibration Solution, 100,000 µS/cm. 1 box of 8 pints.

*All cables include a temperature and conductivity sensor.

DECLARATION OF CONFORMITY

The undersigned hereby declares on behalf of the named manufacturer under our sole responsibility that the listed product conforms to the requirements for the listed European Council Directive(s) and carries the CE mark accordingly.

<i>Manufacturer:</i>	YSI Incorporated 1725 Brannum Lane Yellow Springs, OH 45387 USA
<i>Product Name:</i>	Pro30 Water Quality Instrument
<i>Model Numbers</i>	
<i>Instrument/Accessory:</i>	Pro30 (6050030)
<i>Probe/Cable Assemblies:</i>	60530-1, -4, -10, -20, and -30
<i>Conforms to the following:</i>	
<i>Directives:</i>	IEC 61326-1:2005 RoHS 2002/95/EC WEEE 2002/96/EC IP-67 Protection per ANSI/IEC 60529-2004
<i>Harmonized Standards:</i>	<ul style="list-style-type: none">EN61326-1:2006 (IEC 61326-1:2005) Basic Immunity
<i>Supplementary Information:</i>	All performance met the operation criteria as follows: 1. ESD, IEC 61000-4-2:2001, Performance Criterion B 2. Radiated Immunity, IEC 61000-4-3, Performance Criterion A 3. Electrical Fast Transient (EFT), IEC 61000-4-4:2004, +Corr. 1:2006 + Corr. 2:2007, Performance Criterion B 4. Radio Frequency, Continuous Conducted Immunity, IEC61000-4-6, Performance Criterion A 5. Radiated Emissions, EN 61326-1:2006 (IEC61326-1:2005) Class B
<i>Authorized EU Representative</i>	YSI Hydrodata Ltd Unit 2 Focal Point, Lacerta Court, Works Road Letchworth, Hertfordshire, SG6 1FJ UK



Signed: Lisa M. Abel
Title: Director of Quality

Date: 27 June 2011

RECYCLING

YSI is committed to reducing the environmental footprint in the course of doing business. Even though materials reduction is the ultimate goal, we know there must be a concerted effort to responsibly deal with materials after they've served a long, productive life-cycle. YSI's recycling program ensures that old equipment is processed in an environmentally friendly way, reducing the amount of materials going to landfills.

- Printed Circuit Boards are sent to facilities that process and reclaim as much material for recycling as possible.
- Plastics enter a material recycling process and are not incinerated or sent to landfills.
- Batteries are removed and sent to battery recyclers for dedicated metals.

When the time comes for you to recycle, follow the easy steps outlined at www.ysi.com.

BATTERY DISPOSAL

The Pro30 is powered by alkaline batteries which the user must remove and dispose of when the batteries no longer power the instrument. Disposal requirements vary by country and region, and users are expected to understand and follow the battery disposal requirements for their specific locale.

CONTACT INFORMATION

ORDERING AND TECHNICAL SUPPORT

Telephone: 800 897 4151 (USA)
+1 937 767 7241 (Globally)
Monday through Friday, 8:00 AM to 5:00 ET

Fax: +1 937 767 9353 (orders)
+1 937 767 1058 (technical support)

Email: environmental@ysi.com
Mail: YSI Incorporated
1725 Brannum Lane
Yellow Springs, OH 45387 USA

Internet: www.ysi.com

When placing an order please have the following available:

- 1.) YSI account number (if available)
- 2.) Name and phone number
- 3.) Purchase Order or Credit Card number
- 4.) Model Number or brief description
- 5.) Billing and shipping addresses
- 6.) Quantity

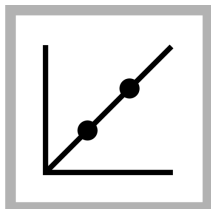
SERVICE INFORMATION

YSI has authorized service centers throughout the United States and Internationally. For the nearest service center information, please visit www.ysi.com and click 'Support' or contact YSI Technical Support directly at 800-897-4151 (+1 937-767-7241).

When returning a product for service, include the Product Return form with cleaning certification. The form must be completely filled out for a YSI Service Center to accept the instrument for service. The form may be downloaded from www.ysi.com by clicking on the 'Support'.

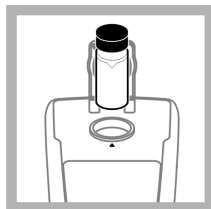
Item # 606082
Rev A
Drawing # A606082
July 2011

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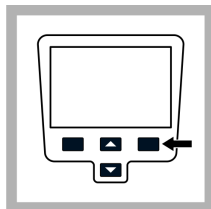


1. Push the **CALIBRATION** key to enter the Calibration mode. Follow the instructions on the display.

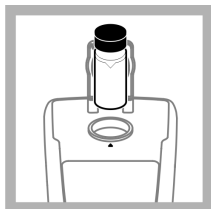
Note: Gently invert each standard before inserting the standard.



2. Insert the 20 NTU StablCal Standard and close the lid.
Note: The standard to be inserted is bordered.

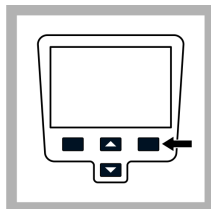


3. Push **Read**. The display shows Stabilizing and then shows the result.

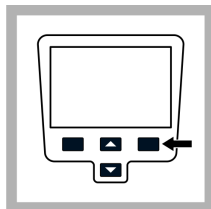


4. Repeat Step 2 and 3 with the 100 NTU and 800 NTU StablCal Standard.

Note: Push **Done** to complete a 2 point calibration.



5. Push **Done** to review the calibration details.



6. Push **Store** to save the results. After a calibration is complete, the meter automatically goes into the Verify Cal mode. Refer to [Calibration verification \(Verify Cal\)](#) on page 16.

Turbidity measurement

⚠ WARNING

Potential explosion and fire hazard. This turbidimeter is designed for water based samples. Do not measure solvent or combustible based samples.

Readings can be taken with the Normal reading mode, Signal Average mode or in the Rapidly Settling Turbidity mode. Refer to [Reading modes](#) on page 16 for more information. For accurate turbidity readings use clean sample cells and remove air bubbles (degassing).

Measurement notes

Proper measurement techniques are important in minimizing the effects of instrument variation, stray light and air bubbles. Use the following measurement notes for proper measurements.

Instrument

- Make sure that the meter is placed on a level, stationary surface during the measurement.
Note: Do not hold the meter in the hand during measurement.
- Always close the sample compartment lid during measurement, calibration and storage.
- Remove sample cell and batteries from the instrument if the instrument is stored for an extended time period (more than a month).
- Keep the sample compartment lid closed to prevent the entry of dust and dirt.

Sample cells

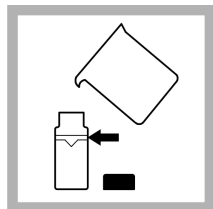
- Always cap the sample cell to prevent spillage of the sample into the instrument.
- Always use clean sample cells in good condition. Dirty, scratched or damaged cells can cause inaccurate readings.
- Make sure that cold samples do not "fog" the sample cell.
- Store sample cells filled with distilled or deionized water and cap tightly.

Measurement

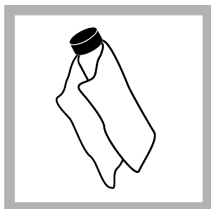
- Measure samples immediately to prevent temperature changes and settling. Before a measurement is taken, always make sure that the sample is homogeneous throughout.
- Avoid sample dilution when possible.
- Avoid operation in direct sunlight.

Turbidity measurement procedure

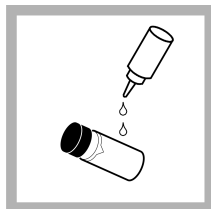
Note: Before a measurement is taken, always make sure that the sample is homogeneous throughout.



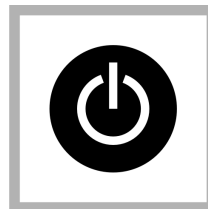
1. Collect a representative sample in a clean container. Fill a sample cell to the line (about 15 mL). Take care to handle the sample cell by the top. Cap the cell.



2. Wipe the cell with a soft, lint-free cloth to remove water spots and fingerprints.

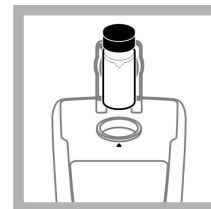


3. Apply a thin film of silicone oil. Wipe with a soft cloth to obtain an even film over the entire surface ([Apply silicone oil to a sample cell](#) on page 17).

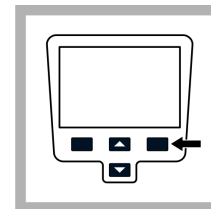


4. Push the **Power** key to turn the meter on. Place the instrument on a flat, sturdy surface.

Note: Do not hold the instrument while making measurements.



5. Gently invert and then insert the sample cell in the instrument cell compartment so the diamond or orientation mark aligns with the raised orientation mark in front of the cell compartment. Close the lid.



6. Push **Read**. The display shows Stabilizing then the turbidity in NTU (FNU). The result is shown and stored automatically (Refer to [Data management](#) on page 11)

Data management

About stored data

The following types of data are stored in the data log:

- Reading Log: stores automatically each time a sample reading is taken (500 records).
- Calibration Log: stores only when **Store** is selected at the end of a calibration (25 records).
- Verify Cal Log: stores only after **Done** is selected at the end of a verification calibration (250 records).

When the data log becomes full, the oldest data point is deleted when more data is added to the log.

View data log

The data log contains Reading Log, Calibration Log and Verify Cal log. All logs can be sorted by date.



MANHOLE INSPECTION FORM

Fill out form,
>Save to file<
Click Update
button =
Fills Summary
line page 2 &
Clears Form

Manhole ID:

Inspection Date:
Inspector:
Street Name:
Nearest Address #:
Manhole Depth:

Overall Rating (1 to 5):
(1=new ... 5=failing)Inflow Infiltration Rate:
(0=none ... 5=gusher)

Conditions: Dry ☐ Wet ☐ Standing Water ☐ Frozen ☐

MH DETAILS

Location:	Material:	MH Cover size:	MH Barrel size:	Direction Effluent:
Roadway <input type="checkbox"/>	Brick <input type="checkbox"/>	22" <input type="checkbox"/>	48" <input type="checkbox"/>	NW/ <input type="text"/>
Gutter <input type="checkbox"/>	Block <input type="checkbox"/>	24" <input type="checkbox"/>	60" <input type="checkbox"/>	
Paved Alley <input type="checkbox"/>	Concrete <input type="checkbox"/>	30" <input type="checkbox"/>	Other (below) <input type="checkbox"/>	# of Influent: <input type="text"/>
Unpaved Alley <input type="checkbox"/>	Lined <input type="checkbox"/>	36" <input type="checkbox"/>	<input type="checkbox"/>	
Easement <input type="checkbox"/>	Other <input type="checkbox"/>	Other (describe) <input type="text"/>	<input type="checkbox"/>	
Other (describe) <input type="text"/>				

CONDITION

Cover:	Ring & Frame	Cone & Riser:	Barrel:	Rungs:
Serviceable <input type="checkbox"/>	Serviceable <input type="checkbox"/>	Serviceable <input type="checkbox"/>	Serviceable <input type="checkbox"/>	Serviceable <input type="checkbox"/>
Loose <input type="checkbox"/>	Loose <input type="checkbox"/>	Cracked/Broken <input type="checkbox"/>	Cracked/Broken <input type="checkbox"/>	Unsafe <input type="checkbox"/>
Below Grade <input type="checkbox"/>	Displaced <input type="checkbox"/>	Corroded <input type="checkbox"/>	Corroded <input type="checkbox"/>	Missing any <input type="checkbox"/>
Damaged <input type="checkbox"/>	Missing Grout <input type="checkbox"/>	Misaligned <input type="checkbox"/>	Misaligned <input type="checkbox"/>	Corroded <input type="checkbox"/>
Sealed <input type="checkbox"/>	Raise <input type="checkbox"/>	Infiltration <input type="checkbox"/>	Infiltration <input type="checkbox"/>	N/A - no rungs <input type="checkbox"/>
Holes (# of holes) <input type="text"/>	Lower <input type="checkbox"/>	Roots at Joints <input type="checkbox"/>	Roots at Joints <input type="checkbox"/>	

Bench:	Channel:
Serviceable <input type="checkbox"/>	Serviceable <input type="checkbox"/>
Cracked/Broken <input type="checkbox"/>	Obstructed <input type="checkbox"/>
Bad base joint <input type="checkbox"/>	Bad joints <input type="checkbox"/>
	Roots at connection <input type="checkbox"/>

Hydraulics

Indications of

Surcharge?:

None ☐
Minor ☐
Yes, need followup ☐
Infiltration, if yes, note below
(None, Minor, Some, Excessive)

Issues:

Grease ☐
Debris ☐
Silt ☐
Infiltration, if yes, note below
(None, Minor, Some, Excessive)

Describe Flow:

Steady ☐
Pulsing ☐
Turbulent ☐
Surcharging ☐
Sluggish ☐

COMMENTS:

[illegible]

APPENDIX E. IDDE EMPLOYEE TRAINING RECORD

ILLICIT DISCHARGE DETECTION AND ELIMINATION PROGRAM TRAINING

SIGN-IN SHEET

TOWN OF WESTPORT, MA

DATE: MARCH 2020

By signing this, I attest that have reviewed the IDDE training materials.

NAME (PRINT)	DEPARTMENT