Town of Belmont
Illicit Discharge Detection and Elimination (IDDE) Program

REVISED 2023

Prepared for:

Town of Belmont, MA

Prepared by:

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ABBREVIATIONS

CALM	Consolidated Assessment and Listing Methodology
CCTV	closed-circuit television
cfu	colony-forming unit
DDT	dichloro-diphenyl-trichloroethane
DPW	Department of Public Works
GIS	geographic information system
GPS	Global Positioning System
IDDE	Illicit Discharge Detection and Elimination
LOS	Level of Service
MassDEP	Massachusetts Department of Environmental Protection
mg/L	Milligrams per liter
mL	Milliliter
MPN	Most probable number
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
PCB	polychlorinated biphenyl
PPE	Personal Protective Equipment
SOP	Standard Operating Procedure
SM	Standard Method
SSO	Sanitary Sewer Overflow
SVF	System Vulnerability Factors
SWMP	Stormwater Management Program

TMDL	Total Maximum Daily Load
TSS	Total Suspended Solids
Town	Town of Belmont
USEPA	United States Environmental Protection Agency
µS/cm	Micro Siemens per Centimeter

GLOSSARY

Catchment	Area that drains to an individual outfall or interconnection
Dry Weather	No more than 0.1 inches of rainfall has occurred in the previous 24-hour period, and no significant snow melt is occurring
Illicit connection	Any connection to the MS4, or, directly or indirectly, to a watercourse or waters of the United States, that is not authorized and is causing or contributing to an illicit discharge
Illicit discharge	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
Impaired waters	Water bodies that do not meet water quality standards for one or more designated use(s) such as recreation or aquatic habitat
Interconnection	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
Outfall	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.
Junction Manhole	A manhole or structure with two or more inlets accepting flow from two or more MS4 alignments

Key Junction Manhole	Junction manholes that can represent one or more junction manholes without compromising adequate implementation of the illicit discharge program
Sump Manhole	Manholes with a significant difference in elevation between the bottom of the structure to the bottom of the outlet pipe
SSO	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.
Wet Weather	A storm event of sufficient depth or intensity to produce a stormwater discharge at the outfall

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1.0 INTRODUCTION

1.1 MS4 PROGRAM

This Illicit Discharge Detection and Elimination (IDDE) Plan has been developed by the Town of Belmont 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 (MS4s) in Massachusetts, hereinafter 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 MS4 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. This Plan has adapted procedures from guidance documents from the Central Massachusetts Regional Stormwater Coalition, the Center for Watershed Protection, the New England Interstate Water Pollution Control Commission, and the U.S. EPA.

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 a sump pump that discharges contaminated water to a storm drain system 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 (SSOs) 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 such inappropriate use is 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 installation of dog waste bins.

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. These authorized discharges to the stormwater system are also defined in the Town's Wastewater and Stormwater Drainage Use Regulations.

- Water line flushing
- Landscape irrigation
- Diverted stream flows
- Rising groundwater
- Uncontaminated groundwater infiltration (as defined at 40 CFR 35.2005(20))
- Uncontaminated pumped groundwater
- Discharge from potable water sources including discharges from reverse osmosis systems which have their own separate NPDES permits
- Foundation drains
- Air conditioning condensation
- Irrigation water, springs
- Water from crawl space pumps
- Footing drains
- Lawn watering
- Individual resident car washing
- Flows from riparian habitats and wetlands (Per Town Regulations)
- De-chlorinated swimming pool discharges
- Street wash waters by methods approved by the Town
- Residential building wash waters without detergents
- Discharges or flows from emergency fire-fighting activities

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., the permittee must 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 "impaired waters" within the boundaries of the Town of Belmont regulated area based on the Final 2022 Massachusetts Integrated List of Waters produced by MassDEP every two years. These are water bodies that do not meet water quality standards for one or more designated use(s) such as recreation or aquatic habitat.

Table 1-1 Impaired Waters, Belmont, Massachusetts

Water Body Name	Segment ID	Integrated List Category[1]/ Designated Water Use[2]	Pollutants Causing Impairment(s)	ATTAINS[3] Action ID
Beaver Brook	MA72-28	5/Class B	E. coli, total phosphorus, algae, chloride, DO, Organic Enrichment (Sewage) Biological Indicators, Sedimentation/siltation, (Flow Regime Modification*), (Other anthropogenic substrate alterations*), (Water Chestnut*)	32379 (E. coli) 40317 (Algae, DO, phosphorus, sewage)
Clay Pit Pond	MA71011	5/Class B	Chlordane in fish tissue	None
Little Pond	MA71024	5/Class B	Harmful algal blooms, (Water Chestnut*)	None
Little River	MA71-21	5/ClassB	Chloride, Copper in Sediment, Dissolved Oxygen, E. coli, Flocculant Masses, Lead in Sediment, odor, oil and grease, PCB in Fish Tissue, Total Phosphorus, Scum/Foam, Transparency / Clarity, Trash, (Debris*), (Water Chestnut*)	R1_MA_2020_5a (phosphorus, DO) R1_MA_2019_01 (E. coli)
Spy Pond	MA71040	5/Class B	Chlordane and DDT in fish tissue, dissolved oxygen (DO), harmful algal blooms, total phosphorus, (Curly-leaf Pondweed*), (Eurasian Water Milfoil, Myriophyllum Spicatum*), (Water Chestnut*)	None
Winn Brook	MA71-09	4a/Class B	E. coli, (Physical substrate habitat alterations*)	R1_MA_2019_01 (E. coli)

[1] Category 4a Waters – TMDL is completed
Category 5 Waters – impaired water bodies that require a TMDL.

[2] Class B – designated as a habitat for fish, other aquatic life, and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation. Where designated in 314 CMR 4.06, they shall be suitable as a source of public water supply with appropriate treatment ("Treated Water Supply"). Class B waters shall be suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses. These waters shall have consistently good aesthetic value.

[3] Assessment and TMDL Tracking and Implementation System

*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 MS4 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
- SSO Program Evaluation.

The IDDE investigation procedure framework is shown in Figure 1. The required timeline for implementing the IDDE program is shown in Table 1-2. Each of the components of this program are discussed in further detail in the subsequent sections.

Figure 1-1 IDDE Investigation Procedure Framework

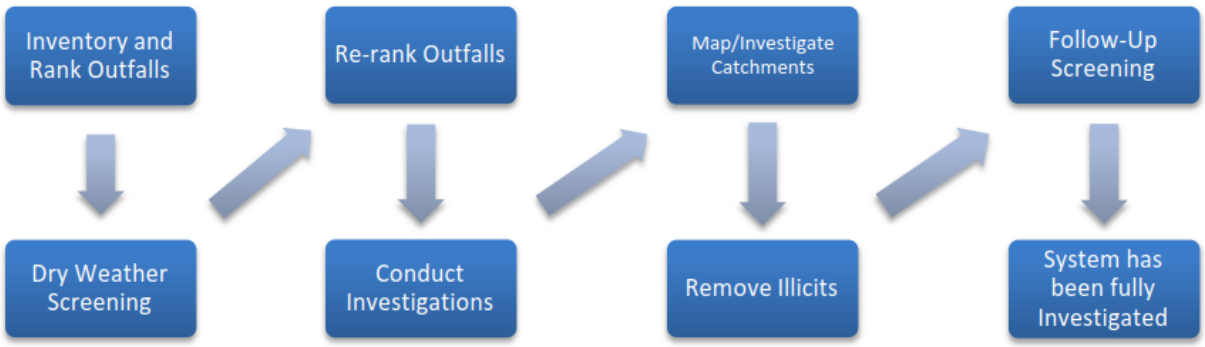


Table 1-2 IDDE Program Implementation Timeline

IDDE Program Requirement	Completion Date from July 1, 2018 (Effective Date of 2016 Permit)						Status
	1 Year	1.5 Years	2 Years	3 Years	7 Years	10 Years	
Written IDDE Program Plan[1]	X						Complete
SSO Inventory	X						Complete
Written Catchment Investigation Procedure		X					Complete
Phase I Mapping			X				Complete
Phase II Mapping						X	In progress
IDDE Regulatory Mechanism or By-law (if not already in place)				X			Complete
Dry Weather Outfall Screening				X			Complete
Follow-up Ranking of Outfalls and Interconnections				X			Complete
Catchment Investigations – Problem Outfalls					X		In progress
Catchment Investigations – all Problem, High and Low Priority Outfalls						X	In progress

[1]This written IDDE Program Plan must be updated in accordance with milestones of the permit (year 3, year 7, and year 10).

1.6 WORK COMPLETED UNDER 2003 MS4 PERMIT

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

The Town has completed the following IDDE program activities consistent with the 2016 MS4 Permit requirements:

- Developed a map of outfalls and receiving waters
- Adopted an IDDE bylaw or regulatory mechanism
- Developed procedures for locating illicit discharges
- Developed procedures for locating the source of the discharge
- Developed procedures for removal of the source of an illicit discharge
- Developed procedures for documenting actions and evaluating impacts on the storm drain system subsequent to removal.

- Informed system users of hazards associated with illegal discharges and improper waste disposal.

In addition to the 2016 MS4 Permit requirements, other IDDE-related activities that have been completed include:

- SSO inventory
- Outfall sampling
- Additional storm system mapping, including the locations of catch basins, manholes and pipe connectivity, holding tanks, pump stations, and flush valves
- Trained staff to identify illicit discharges

The Town has also conducted activities associated with the Wellington Brook and Winn Brook tributary areas and the Mystic River Watershed in accordance with the EPA Order on Consent (Docket No. CWA-AO-R01-FY17-11). The Town submits semiannual Reports on Compliance to the EPA, with summaries of work conducted during the reporting period, which include:

- Outfall Sampling
- Upper tributary and sub-catchment sampling
- Dyed water testing
- Sewer and drain improvements including point repairs, service lining and replacement, and cured-in-place mainline lining
- Eliminating identified illicit connections

2.0 AUTHORITY AND STATEMENT OF IDDE RESPONSIBILITIES

2.1 LEGAL AUTHORITY

The Town has adopted a Stormwater Management and Erosion Control By-Law (7/2/2013), and the Stormwater Management and Erosion Control Rules and Regulations (9/29/2014). The by-law is provided on the Town's website. The by-law provides the Town with adequate legal authority to:

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

The Town reviewed its current Stormwater Management and Erosion Control By-Law, Rules and Regulations, and related land use regulations and policies for consistency with the 2016 MS4 Permit. Changes are anticipated to be approved in the spring of 2022.

2.2 STATEMENT OF RESPONSIBILITIES

The Office of Community Development (OCD) is the lead municipal department responsible for implementing the IDDE program pursuant to the provisions of the Stormwater and Erosion Control By-Law and Regulations. The OCD will work with the Department of Public Works (DPW) for day-to-day supervision of the IDDE program and reporting. Other departments or divisions with responsibility for aspects of the program include:

- Highway Division (DPW) – Maintenance/repairs to the Town's MS4
- Water Division (DPW) – potential use of hydrants during dye testing
- Plumbing and Gas Division (OCD) – Enforcement of State Plumbing Code
- Select Board – By-Law and Regulations
- Information Technology Department – GIS/Mapping
- Parking Clerk – Permits/no parking signs for manhole inspections
- Belmont Police Department – Police Details

3.0 STORMWATER SYSTEM MAPPING

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

The 2016 MS4 Permit requires the storm system map to be updated in two phases as outlined below. The Town has already completed all Phase I mapping requirements, and Phase II mapping requirements are ongoing. The DPW is responsible for continuing to update the stormwater system mapping based on information collected during the permit term. The Town will report on the progress of updates to the storm system map in each annual report. Updates to the stormwater mapping will be included in **Appendix A**.

3.1 PHASE I MAPPING

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

- Outfalls and receiving waters (previously required by the 2003 MS4 permit)
- Open channel conveyances (swales, ditches, etc.)
- Interconnections with other MS4s and other storm drain systems
- Municipally-owned stormwater treatment structures
- Water bodies identified by name and indication of all use impairments as identified on the most recent EPA-approved Massachusetts Integrated List of Waters report
- Initial catchment delineations. Topographic contours and drainage system information may be used to produce initial catchment delineations.

The Town has completed all updates to its stormwater mapping to meet the Phase I requirements. A copy of the existing storm system map is provided in **Appendix A**.

3.2 PHASE II MAPPING

Phase II mapping must be completed within ten (10) years of the effective date of the 2016 MS4 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)

The Town's efforts towards completing all updates to its stormwater mapping to meet Phase II requirements are ongoing. The Town will continue to update its stormwater mapping to include updates to stormwater infrastructure and further refined catchment delineations based on information collected during future catchment investigations. Town's GIS viewer is available online (https://www.mapsonline.net/belmontma/index.html).

3.3 ADDITIONAL RECOMMENDED MAPPING ELEMENTS

Although not a requirement of the 2016 MS4 Permit, the Town may include the following recommended elements in its storm system mapping. Some of these elements are already included in the Town's GIS viewer and other information will be added as it becomes available.

- Storm drain material, size (pipe diameter), age
- Sanitary sewer system material, size (pipe diameter), age
- Privately owned stormwater treatment structures
- Seasonal high-water table elevations impacting sanitary alignments
- Topography
- Orthophotography
- Alignments, dates and representation of work completed of past illicit discharge investigations (identifies the areas where IDDE work is complete)
- Locations of suspected confirmed and corrected illicit discharges with dates and flow estimates (identifies location of illicit discharges, such as specific buildings).

4.0 SANITARY SEWER OVERFLOWS (SSOs)

4.1 BACKGROUND

The 2016 MS4 Permit requires municipalities to prohibit illicit discharges, including sanitary sewer overflows (SSOs), to the separate storm drain 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 has compiled an inventory of SSOs that have discharged to the MS4 within the five (5) years prior to the effective date of the 2016 MS4 Permit, based on review of available documentation pertaining to SSOs. The inventory includes all SSOs that were reported to MassDEP. This includes all SSOs that occurred during wet or dry weather resulting from inadequate conveyance capacities, or where interconnectivity of the storm and sanitary sewer infrastructure allows for transfer of flow between systems. The SSO inventory is included in **Appendix B**.

The SSO inventory is provided with the Stormwater Management Plan (SWMP) and will be maintained and updated by the Town when new SSOs are detected. The SSO inventory will also be included in the annual report, including the status of mitigation and corrective measures to address each identified SSO.

Upon detection of an SSO, the Town 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. A detailed SOP is included with the Town's SSO Response Plan which was revised June 2022 to include requirements of 314 CMR 12.00 and the new 314 CMR 16.00 requirements for public notification.

4.2 NOTIFICATION TO STATE AND FEDERAL AGENCIES (314 CMR 12.00)

Upon becoming aware of an SSO to the MS4, the Town will provide oral notice to EPA, MassDEP, and others as applicable within 24 hours, and written notice to EPA and MassDEP within five (5) days of becoming aware of the SSO occurrence.

The following situations applicable to the Town of Belmont require notification to MassDEP and submittal of the SSO Report Form:

- An un-permitted overflow or bypass;
- Backup of wastewater into public or private property when the event is caused by a condition of the system owned and operated by the sewer authority

Backups of wastewater into a property which are not caused by conditions in the system owned and operated by the sewer system are not required to be reported. These incidents normally occur due to blockages in service connections to a property or blockages in the internal plumbing system.

4.2.1 24 Hour Notice

Unanticipated SSOs meeting the criteria listed above must be reported to MassDEP no later than 24-hours after discovery by phone or email. The MassDEP contact for Belmont is the Northeast Region (978 694-3215).

https://www.mass.gov/how-to/sanitary-sewer-overflowbypassbackup-notification

Table 4-1 Report by Phone within 24 hours (Oral Notice)

Agency	Contact	Requirements
MassDEP	During Business Hours: (978) 694-3215, or 24-Hour Emergency Line: (888) 304-1133	Report all SSO events
EPA	EPA New England: (617) 918-1510, or Northeast Region, Douglas Koopman (617) 918-1747	Report all SSO events
Local Board of Health	Belmont Public Health Department: (617) 993-2720	Report all SSO events where impacts may occur
Department of Conservation and Recreation	State House Ranger Base: (617) 722-1188	Where DCR beaches or parks are affected
MA Division of Marine Fisheries	Boston/Northeast: (617) 727-3336 x 165	Where shellfish resources may be affected
Water	DPW Water Division (617) 993-2700	Where drinking water resources may be affected

Hazardous Material Releases: If crews believe an overflow, bypass, or any other discharge may have resulted in an oil or hazardous material release, report it to DEP at any time, 24 hours a day, at this toll free number: 1-888-304-1133.

In addition, the DPW will notify the Office of Community Development when an SSO enters the storm drain system.

4.2.2 5 Day Notice

Within 5 calendar days, a written and complete Sanitary Sewer Overflow (SSO)/Bypass Notification Form must be submitted to MassDEP. The form shall include a clear description of the overflow or bypass and its causes, including the best approximation of the dates and times, and if the situation has not been corrected, the amount of time the overflow/bypass is expected to continue, and a description of the measures to be implemented to stop the discharge. The Form or attachments must also include steps taken or planned to reduce, eliminate, and prevent recurrence.

Send Notification Form by Fax:

- Massachusetts Department of Environmental Protection, Northeast Regional Office, 205B Lowell Street, Wilmington, MA 01887. **Fax: 978-694-3499**, and
- US EPA Water Technical Unit (OES 04-4), 5 Post Office Square, Suite 100, Boston, MA 02109-3912. Attn: Douglas Koopman. **Fax: 617-918-0747.**

4.3 PUBLIC NOTIFICATION (314 CMR 16.00)

Under the new state regulations 314 CMR 16.00 (Notification Requirements to Promote Public Awareness of Sewage Pollution), beginning on July 6, 2022 the Town is required to notify the public of SSOs that reach a surface water.

This regulation establishes requirements and procedures for notifying the public of discharges of certain types of untreated or partially treated wastewater, including discharges that fall into the categories of combined sewer overflows (CSOs), sanitary sewer overflows (SSOs), and blended wastewater. CSOs and blended wastewater are not applicable to the Town of Belmont, therefore only SSO reporting applies.

The Town of Belmont must issue a public advisory notification for the following events:

- Any SSO that flows into a surface water of the Commonwealth and is the result of the sanitary sewer system surcharging under high flow conditions when peak flows cannot be conveyed to a POTW due to capacity constraints; and

4.3.1 Timeline for Reporting

- Four (4) hours Discovery window
- Issue Public Advisory Notification within two (2) hours of discovery:
    - Posted to the Town's website[1]
    - Issued electronically to:
        - MassDEP;
        - the U.S. Environmental Protection Agency;
        - the Massachusetts Department of Public Health;
        - the municipal board of health or the health department where the outfall or overflow is located;
        - the board of health or the health department and shellfish constables (if applicable) for any municipality directly impacted by the discharge or overflow;
        - any person who subscribed to receive such public advisory notifications by email or text messaging;
        - the public water supplier(s) where drinking water supplies may be affected;
        - the Massachusetts Division of Marine Fisheries where shellfish growing areas may be affected;
        - the Massachusetts Department of Conservation and Recreation when its water recreation properties may be affected;
        - the Massachusetts Division of Fisheries and Wildlife when its boat ramps and fishing piers may be affected;

[1] If an SSO occurs outside regular business hours, the website may be updated the next day

        - and operators of any potentially affected bathing beaches, as defined in 105 CMR 445.00: Minimum Standards for Bathing Beaches (State Sanitary Code: Chapter VII).
    - Issued to at least the two largest news organizations that report on local news in municipalities near the outfall. In municipalities with environmental justice populations, if neither of the two largest news organizations specifically serves the environmental justice populations, at least one additional news organization that primarily serves the environmental justice population(s) within the impacted municipalities must be notified.
- Enter data into system within 18 hours from issuing notification

5.0 ASSESSMENT AND PRIORITY RANKING OF OUTFALLS

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

5.1 OUTFALL CATCHMENT DELINEATIONS

A catchment is the area that drains to an individual outfall or interconnection. The catchments for each of the MS4 outfalls are delineated to define contributing areas for investigation of potential sources of illicit discharges. Catchments were delineated based on topographic contours and mapped drainage infrastructure. As described in **Section 3.0**, initial catchment delineations have been completed as part of the Phase I mapping, and refined catchment delineations will be updated as they become available to reflect information collected during catchment investigations.

5.2 OUTFALL AND INTERCONNECTION INVENTORY AND RANKING

The Town completed an initial outfall and interconnection inventory and priority ranking to assess illicit discharge potential based on existing information, which is required within one (1) year from the effective date of the permit. An updated inventory and ranking will be provided in each annual report thereafter. The inventory will be updated annually to include data collected in connection with dry weather screening and other relevant inspections. The current ranking is provided in **Appendix C**.

The outfall and interconnection inventory identifies each outfall and interconnection discharging from the MS4, records its location and condition, and provides a framework for tracking inspections, screenings and other IDDE program activities. 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.

Outfalls and interconnections are classified into one of the following categories:

1. **Problem Outfalls**: Outfalls/interconnections with known or suspected contributions of illicit discharges are designated as Problem Outfalls. This includes any outfalls/interconnections where previous screening indicates likely sewer input. Likely sewer input indicators are any of the following:

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

    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.

The most recent round of dry weather outfall sampling took place during 2022 (Permit Year 3/4). None of the outfall sample results from 2022 meet the criteria to indicate likely sewer input. However, the Town has categorized three (3) outfalls as Problem Outfalls based on known/suspected illicit discharges. As detailed in the June 2022 Final Compliance Memo for the Order on Consent, this includes OF-1, OF-2, and OF-11.

- OF-1: Known partial illicit connection at 58 Van Ness Rd
- OF-2: Contamination identified near Shaw Rd
- OF-11: Sewer leaking into capped drain line Staunton Rd at Oliver Rd

2. **High Priority Outfalls**: Outfalls/interconnections that have not been classified as Problem Outfalls and that are:
    - Discharging to an area of concern to public health due to proximity of public beaches, recreational areas, drinking water supplies or shellfish beds; or
    - Determined by the permittee as high priority based on the characteristics listed in Table 5-1, or other available information.

    The Town has categorized 24 outfalls as High Priority Outfalls based on Appendix F of the 2016 Permit, which states that catchments draining to any waterbody impaired for bacteria or pathogens shall be designated either Problem or High Priority. The Little River, Winn Brook, and Beaver Brook are impaired for E. coli. Outfalls discharging to these waterbodies which were not already designated as Problem outfalls (because existing information does not indicate likely sewer input) have been categorized as High Priority.

3. **Low Priority Outfalls:** Outfalls/interconnections determined by the permittee as low priority based on the characteristics listed in Table 5-1, or other available information. The Town has categorized five (5) outfalls as Low Priority because they were either observed dry during 2022 dry weather screening or sampling results were below all IDDE thresholds, and they discharge to waterbodies that are not impaired for bacteria/pathogens.

4. **Excluded Outfalls:** Outfalls/interconnections with no potential for illicit discharges may be excluded from the IDDE program. This category is limited to roadway drainage in undeveloped areas with no dwellings and no sanitary sewers; drainage for athletic fields, parks or undeveloped green space and associated parking without services; cross-country drainage alignments (that neither cross nor are in proximity to sanitary sewer alignments) through undeveloped land. The Town has categorized one (1) outfall (OF-14) as Excluded Outfalls based on this definition.

Outfalls were ranked into the above priority categories (except for Excluded Outfalls, which may be excluded from the IDDE program) based on several characteristics of the defined initial catchment areas, where information was available. Table 5-1 provides a comparison of recommended characteristics in the 2016 permit against the characteristics analyzed by the Town. Characteristics recommended in the

Permit were substituted in some cases based on readily available information and based on the Town's knowledge of the MS4 and suspected contributions of illicit discharges.

Table 5-1 Outfall Priority Ranking Characteristics

Permit Recommended Characteristics	Belmont Characteristics
Past discharge complaints and reports	Not Applicable
Poor receiving water quality – the following guidelines are recommended to identify waters as having a high illicit discharge potential: exceeding water quality standards for bacteria; ammonia levels above 0.5 mg/l; surfactants levels greater than or equal to 0.25 mg/l.	Previous dry weather outfall screening results analyzed (E. coli, ammonia).
Density of generating sites – Generating sites are those places, including institutional, municipal, commercial, or industrial sites, with a potential to generate pollutants that could contribute to illicit discharges. Examples of these sites include, but are not limited to, car dealers; car washes; gas stations; garden centers; and industrial manufacturing areas.	Not Applicable
Age of development and infrastructure – Industrial areas greater than 40 years old and areas where the sanitary sewer system is more than 40 years old will probably have a high illicit discharge potential. Developments 20 years or younger will probably have a low illicit discharge potential.	Age of drainage infrastructure: >40 years very high potential, 20-40 years high potential, 10-20 years medium potential, 5-10 years low potential, <5 years very low potential, non-MS4 no potential
Sewer conversion – contributing catchment areas that were once serviced by septic systems but have been converted to sewer connections may have a high illicit discharge potential.	Not applicable
Historic combined sewer systems – contributing areas that were once serviced by a combined sewer system but have been separated may have a high illicit discharge potential.	Not applicable
Surrounding density of aging septic systems – Septic systems thirty years or older in residential land use areas are prone to have failures and may have a high illicit discharge potential.	Not applicable
Culverted streams – any river or stream that is culverted for distances greater than a simple roadway crossing may have a high illicit discharge potential.	Applicable for Wellington Brook (OF-8) and Winn Brook (OF-10), as well as outlet of Spy Pond (OF-13) and outlet of Clay Pit Pond (OF-8)
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.	Many catchments discharge to water quality limited waterbodies
The permittee may also consider additional relevant characteristics, including location-specific characteristics; if so, the permittee shall include the additional characteristics in its written (hardcopy or electronic) IDDE program.	

6.0 DRY WEATHER OUTFALL SCREENING AND SAMPLING

Dry weather flow is a common indicator of potential illicit connections. The MS4 Permit requires all outfalls/interconnections (excluding Problem and Excluded Outfalls) to be inspected for the presence of dry weather flow. The Town is responsible for conducting dry weather outfall screening, starting with High Priority outfalls, based on the initial priority rankings described in the previous section. Outfall Screening was completed June 2022 through September 2022.

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. When possible, 48 to 72 hours of dry weather is preferred. For purposes of determining dry weather conditions, program staff will use precipitation data from the National Weather Service (NWS).

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:
    - Photograph the outfall
    - Record the inspection information and outfall characteristics (using paper forms or digital form using a tablet or similar device) (See form in **Appendix D,** modified from the *EPA New England Bacterial Source Tracking Protocol.*).
    - 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 Section 6.2.3.
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.

6. Input results from screening and sampling into spreadsheet/database. Include pertinent information in the outfall/interconnection inventory and priority ranking.

7. Include all outfall screening and monitoring data collected during the reporting period and cumulative for the permit term in the annual report.

The DPW has undertaken water quality sampling during dry weather conditions to satisfy requirements of the United States Environmental Protection Agency (USEPA) Order on Consent CWA-AO-R01-FY17-11, and DEP Notice of Non-Compliance (00012454). This water quality sampling data is available in the Annual Reports.

Previous outfall screening/sampling conducted under the 2003 MS4 Permit may be used to satisfy the dry weather outfall screening requirements of the 2016 MS4 Permit only if the previous screening and sampling was substantially equivalent to that required by the 2016 MS4 Permit, including the list of analytes outlined in Section 2.3.4.7.b.iii.4 of the 2016 permit. A review of previous outfall screening data revealed that several of the listed analytes were not included. Therefore, the previous outfall screening will not be used to satisfy the 2016 permit requirements.

6.2.2 Field Equipment

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

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

Equipment	Use/Notes
Clipboard	For organization of field sheets and writing surface
Field Forms or Tablet for Electronic Forms	Field sheets for both dry weather inspection and dry weather sampling should be available, with extra sheets included
Chain of Custody Forms	To ensure proper handling of all samples
Pens/Pencils/Permanent Markers	For proper labeling
Nitrile Gloves	To protect the sampler as well as the sample from contamination
Flashlight/headlamp with batteries	For looking in outfalls or manholes, helpful in early mornings as well
Cooler with Ice	For transporting samples to the laboratory
Digital Camera	For documenting field conditions at time of inspection
Personal Protective Equipment (PPE)	Reflective vest, safety glasses, hard hats, and boots at a minimum
GPS Receiver	For taking spatial location data
Distilled water	For use with test kits
Water Quality Meters	Hand-held meters for testing for various water quality parameters. Recommend Hach™ DR/890 for chlorine and YSI™ Pro30 for conductivity, temperature, and salinity.
Test Kits (see Table 6-2)	For ammonia and surfactants. Have extra kits on hand to sample more outfalls than are anticipated to be screened in a single day
Label Tape	For labeling sample containers

Equipment	Use/Notes
Sample Containers	Make sure all sample containers are clean. Keep extra sample containers on hand at all times. Make sure there are proper sample containers for what is being sampled for (i.e., bacteria and total phosphorus analysis require sterile containers and preservatives (see **Table 6-5**)).
Pry Bar or Pick	For opening catch basins and manholes when necessary
Sandbags	For damming low flows in order to take samples
Small Mallet or Hammer	Helping to free stuck manhole and catch basin covers
Utility Knife	Multiple uses
Measuring Tape	Measuring distances and depth of flow
Traffic Cones	Safety
Hand Sanitizer	Disinfectant/decontaminant
Zip Ties/Duct Tape	For making field repairs
Rubber Boots/Waders	For accessing shallow streams/areas
Sampling Pole/Dipper/Sampling Cage	For accessing hard-to-reach outfalls and manholes
5-gallon bucket with cover	Disposal of chemical waste
Confined Space Entry Equipment (if needed)	TBD

6.2.3 Sample Collection and Analysis

If flow is present during a dry weather outfall inspection, samples will be collected and analyzed for the required permit parameters[2] identified in Table 6-2.

Table 6-2 Dry Weather Flow Analysis

Parameter	Analysis Methods
Ammonia	Field Test Kit or Laboratory Procedure
Chlorine	Portable Meter
Conductivity	Portable Meter
Salinity	Portable Meter
Temperature	Portable Meter
Surfactants	Field Test Kit or Laboratory Procedure
Indicator Bacteria (E. coli)	EPA Certified Laboratory Procedure (40 CFR Part 136)
Pollutants of Concern[1]	Various

[1]Pollutants of Concern vary by waterbody; see Table 6-3

[2] 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).

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 into sample containers. If possible, collect water from the flow directly into 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, except for bacteria sampling.
5. Use test strips, test kits, and field meters (rinse similar to dipper) for most parameters (See Table 6-4.).
6. Place laboratory samples on ice for analysis of bacteria and pollutants of concern.
7. Fill out chain-of-custody form for laboratory samples.
8. Coordinate with the Laboratory to pick up samples.
9. Store used test strips and test kit waste/ampules properly in a 5-gallon bucket with a cover, store at DPW, and dispose at a Household Hazardous Waste collection event. Disposal dates can be accessed from the Town of Belmont website: https://www.belmont-ma.gov/dpw-highway-division/pages/hazardous-waste; and
10. Decontaminate all testing personnel and equipment.

Some of the stormwater outfalls may be at least partially submerged. 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 observation and sampling and will 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. In some cases, there may be drain connections downstream of the first structure free of influence from the receiving water. These situations will be reviewed on a case-by-case basis. The Town may choose to complete screening at multiple locations, may inspect downstream drain connections through building inspections or may bypass pump the storm drain so it can be inspected.

For the Town, indicator bacteria are E. coli, because all outfalls discharge to freshwater. Pollutants of concern applicable to the Town are listed in Table 6-3 and vary by receiving waterbody.

Table 6-3 Monitoring Requirements for Pollutants of Concern

Water Body Segment	Segment ID	Monitoring Requirements	Outfalls
Beaver Brook	MA72-28	Total Phosphorus, Chloride, Dissolved Oxygen, Temperature, BOD5, E. coli, TSS	OF-16, OF-17, OF-18, OF-19, OF-20, OF-21, OF-22, OF-23, OF-24, OF-25, OF-26, OF-27, OF-28
Clay Pit Pond	MA71011	None	No outfall ID
Little Pond	MA71024	Total Phosphorus	OF-9, OF-9A, OF-11, OF-12, OF-13
Little River	MA71-21	Total Copper, Chloride, Dissolved Oxygen, E. coli, Temperature, BOD5, Total Phosphorus, Total Lead, Oil and Grease, TSS	OF-1, OF-2, OF-3, OF-4, OF-5, OF-6, OF-7, OF-8
Spy Pond	MA71-09	Dissolved Oxygen, Temperature, BOD5, Total Phosphorus	OF-15, OF-15A
Winn Brook	MA72-09	E. coli	OF-10

All analysis with the exception of indicator bacteria and pollutants of concern can be performed with field test kits or field instrumentation and are not subject to 40 CFR part 136. Field kits need to have appropriate detection limits and ranges. Table 6-4 lists the field test kits and field instruments the Town intends to use for outfall sampling associated with the 2016 MS4 Permit parameters. Instrument detection range, applicable SDS No., analytical method, and max holding time are also provided. Preservation is not required if samples are analyzed immediately. Analytical procedures and users' manuals for field test kits and field instrumentation are provided in **Appendix E**.

Table 6-4 Field Sampling Parameters and Analysis Methods

Analyte or Parameter	Field Instrumentation/Test Kit	Detection Range	SDS No.	EPA or Approved Method No.[1]	Max Holding Time[2]
Ammonia	Hach™ Test Strips	0-6 mg/L	NA	**EPA:** 350.1	28 days
Surfactants (Detergents)	CHEMetrics™ I-2017	0-2.5 mg/L	R9402		48 hours
Chlorine (Total)	Hach™ DR-300 Colorimeter • DPD Total Chlorine Reagent Powder Pillows, 10 mL	0.02 to 2.00 mg/L Cl_2	M00110		Analyze within 15 minutes
Salinity	Oakton PCTSTestr™ 50	0 to 10 ppt	NA		28 days
Conductivity		0 to20 µS/cm	NA	**EPA**: 120.1	28 days
Temperature		0 to 60°C (32 to 1240°F)	NA	**SM**: 2550	Analyze within 15 minutes
pH		-1 - 15	NA	**EPA**: 150.2	Analyze within 15 minutes
Dissolved Oxygen	YSI 556/600/650	varies	NA	**EPA**: 360.1; 360.2	Analyze within 15 minutes

[1]EPA or Approved Method No. obtained from Appendix G of the MA Small MS4 Permit
[2]Max Holding Time obtained from 40 CFR Part 136

Testing for indicator bacteria and pollutants of concern must be conducted using analytical methods and procedures found in 40 CFR § 136[3]. Samples must also be stored and preserved in accordance with procedures found in 40 CFR § 136. Table 6-5 lists analytical methods, hold times, preservation requirements, and recommended sample sizes.

Table 6-5 Analytical Methods, Hold Times, and Preservatives for Laboratory Analysis

Analyte or Parameter	EPA or Approved Method No.[1]	Max. Hold Time[2]	Preservation[2]	Sample Size[3]
Ammonia[4]	**EPA**: 350.1	28 days	Cool ≤6°C, H_2SO_4 to pH <2	(1) 500 mL container
Surfactants[4]	**SM**: 5540-C	48 hours	Cool ≤6°C	(1) 500 mL container
E. coli	**EPA**: 1103.1; 1603 **Other**: Colilert®, Colilert-18®, mColiBlue-24® **SM:** 9223B, 9213D	8 hours	Cool ≤10°C, 0.0008% $Na_2S_2O_3$	(2) 100 mL sterile cup container
BOD_5	**EPA:** 360.1, 360.2	48 hours	Cool ≤6 °C	(1) liter plastic container to cover both tests
Total Suspended Solids	**EPA**: 160.2	7 days	Cool ≤6 °C	
Total Phosphorus	**EPA**: 365.1; 365.2; 365.3 **SM**: 4500-P-E	28 days	Cool ≤6 °C, H_2SO_4 to pH <2	(1) 500 mL container
Oil and Grease	**EPA**: 1664	28 days	Cool to ≤6 °C, HCl or H_2SO_4 to pH <2	(1) 1 liter amber glass
Total Copper	**EPA**: 200.7, 200.8, 200.9	6 months	HNO_3 to pH <2	(1) 500 mL plastic
Total Lead	**EPA**: 200.7, 200.8, 200.9	6 months	HNO_3 to pH <2	(1) 500 mL plastic
Chloride	**EPA:** 300	28 days	None required	

SM = Standard Methods

[1]EPA or Approved Method No. obtained from Appendix G of the MA Small MS4 Permit, except for Surfactants obtained from 40 CFR Part 136 and E.coli SM are actual methods used during 2022 sampling

[2]Max Holding Time and Preservation obtained from 40 CFR Part 136

[3]Sample size obtained from the Laboratory

[4]Ammonia and Surfactants can be analyzed in the field. Samples are sent to the lab to confirm field results if desired (not required to meet 40 CFR Part 136).

Water body segments applicable to the Town also contain several pollutants of concern which have monitoring requirements that are undefined and require contacting MassDEP. Those pollutants of concern are listed in Table 6-6.

[3] 40 CFR § 136: http://www.ecfr.gov/cgi-bin/text-idx?SID=b3b41fdea0b7b0b8cd6c4304d86271b7&mc=true&node=pt40.25.136&rgn=div5

Table 6-6 Pollutants of Concern with Undefined Monitoring Requirements

Analyte or Parameter	Water Body Segments	Notes
Scum/Foam	MA71-21	Contact MassDEP for monitoring requirements
Flocculant Masses	MA71-21	

There are also several pollutants of concern with no monitoring requirements. Those pollutants of concern are DDT in Fish Tissue, PCB in Fish Tissue, Chlordane in Fish Tissue, Sediment Bioassays, Odor, and Trash.

6.2.4 Safety

In some cases, sampling may take place within a roadway or risky environment. It is recommended to request police detail when working within major roadways and be compliant with Part 6 of the Manual on Uniform Traffic Control Devices (MUTCD) standards to implement proper traffic control, including traffic cones and signage as needed. Wear proper PPE including high-visibility safety vests, safety glasses, boots, hard hats and gloves at a minimum.

6.3 INTERPRETING OUTFALL SAMPLING RESULTS

Outfall analytical data from dry weather sampling can be used to help identify the major type or source of discharge. Table 6-7 shows values identified by the U.S. EPA and the Center for Watershed Protection as typical threshold screening values for select parameters. These represent the typical threshold concentration (or value) of each parameter expected to be found in stormwater. Screening values that exceed these benchmarks may be indicative of pollution and/or illicit discharges.

Table 6-7 Benchmark Field Measurements for Select Parameters

Analyte or Parameter	Benchmark
Ammonia	>0.5 mg/L
Conductivity	>2,000 µS/cm
Surfactants	>0.25 mg/L
Chlorine	>0.02 mg/L (detectable levels per the 2016 MS4 Permit)
Indicator Bacteria[4]: *E.coli*	The geometric mean of all samples collected within any 90-day or smaller interval shall not exceed 126 colony-forming units (cfu) per 100 mL No more than 10% of all such samples shall exceed 410 cfu/100mL (314CMR04)

[4] Massachusetts Water Quality Standards: https://www.mass.gov/doc/314-cmr-400/download

Analyte or Parameter	Benchmark
Pollutants of Concern:	Greater than relevant water quality criteria of receiving water, as follows:
Total Phosphorus[5]	MassDEP Guideline: When multiple biological and physico-chemical nutrient enrichment indicator screening guidelines are exceeded, the seasonal average for Total Phosphorus exceeding 0.1 mg/l in flowing waters, or exceeding 0.05 mg/l for rivers entering a lake or reservoir during the summer growing season (April 1 to October 31), is considered additional confirmation that there is a condition of nutrient enrichment.
Dissolved Oxygen	≥6.0 mg/l in cold water fisheries and ≥5.0 mg/L in warm water fisheries. Where natural background conditions are lower, DO shall not be less than natural background conditions. Natural seasonal and daily variations that are necessary to protect existing and designated uses shall be maintained. (314CMR04; Class B)
TSS	These waters shall be free from floating, suspended and settleable solids in concentrations and combinations that would impair any use assigned to this Class, that would cause aesthetically objectionable conditions, or that would impair the benthic biota or degrade the chemical composition of the bottom. (314CMR04; Class B)
Oil and Grease	These waters shall be free from oil, grease and petrochemicals that produce a visible film on the surface of the water, impart an oily taste to the water or an oily or other undesirable taste to the edible portions of aquatic life, coat the banks or bottom of the water course, or are deleterious or become toxic to aquatic life. (314CMR04; Class B)

6.4 FOLLOW-UP RANKING OF OUTFALLS AND INTERCONNECTIONS

The Town 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.

Outfalls/interconnections where relevant information was found indicating sewer input to the MS4, or where sampling results indicate 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 dry weather screening.

[5] Massachusetts Consolidated Assessment and Listing Methodology (CALM) Guidance Manual for the 2018 Reporting Cycle: https://www.mass.gov/files/documents/2018/05/07/2018calm.pdf

7.0 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; and dye testing. This section outlines a systematic procedure to investigate outfall catchments to trace the source of potential illicit discharges.

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 July 1, 2020 (2 years from permit effective date)	By July 1, 2025 (within 7 years of permit effective date)
Catchments with sewer input identified at outfall[1]	No permit requirement	By July 1, 2025 (within 7 years of permit effective date)
All Catchments	No permit requirement	By July 1, 2028 (within 10 years of permit effective date)

[1]Likely sewer input indicators are any of the following:

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

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

7.1 SYSTEM VULNERABILITY FACTORS

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

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

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 System 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 more than 40 years old.

An SVF inventory will be documented for each catchment, retained as part of this IDDE Plan in **Appendix F**, and included in the annual report. The majority of MS4 catchments were formerly served by combined sewers, therefore they have at least one SVF.

7.2 DRY WEATHER MANHOLE INSPECTIONS

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

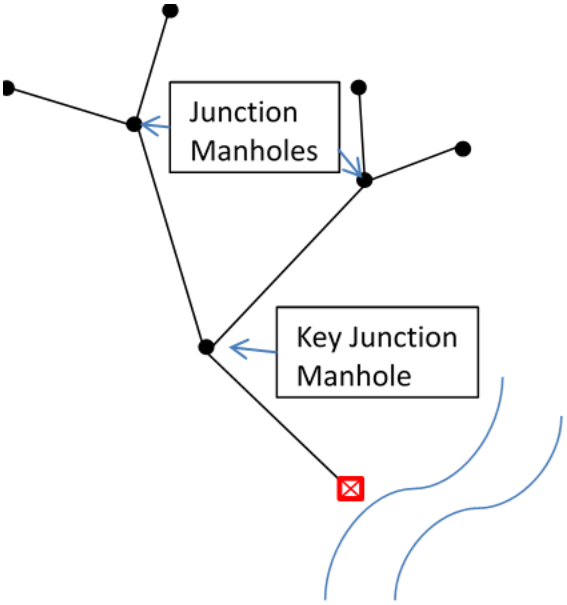
The OCD will be responsible for implementing the dry weather manhole inspection program and making updates as necessary. Infrastructure information will be incorporated into the storm system map, and catchment delineations will be refined based on the field investigation, where necessary. The SVF inventory 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 2016 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.
- **Common Manholes** have connections to both the sewer and drain system and therefore provide a potential for cross-contamination.
- **Sump Manholes** have a significant difference in elevation between the bottom of the structure to the bottom of the outlet pipe, which could allow evidence of illicit discharges to collect in the sump and not flow to downstream manholes.

Figure 7-1 IDDE Investigation Procedure Framework



In preparation for field inspections, all key junction manholes will be identified, as well as potential connections to other catchments such as weirs or overflows. For all catchments identified for investigation during dry weather, field crews will systematically inspect all 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.

7.2.1 Public Notification

Prior to field investigation of manholes and isolation of illicit discharges, the public will be notified of the investigation. Flyers and door hangers can be used to notify property owners of the ongoing investigation and of the potential need for access to their property in order to investigate illicit discharge sources.

7.2.2 Storm Drain Cleaning

Review cleaning records to determine the last time storm drains in the catchment were cleaned and identify possible candidates for cleaning. As a general rule, if it has been more than five (5) years since a drain has been cleaned, it should be flagged for cleaning prior to investigations. However, it should be noted that large diameter pipes may not require cleaning as frequently. In addition, any known blockages will be removed, and known problem areas will be cleaned prior to the inspection of manholes. If cleaning is not completed prior to the investigation, there will be a note made on the manhole inspection form if cleaning is needed.

7.2.3 Manhole Inspection Methodology

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

- By working progressively down from the upper parts of the catchment toward the outfall ("top-down"); or
- By working progressively up from the outfall and inspecting key junction manholes along the way ("bottom-up").

The decision to move up or down the system depends on the nature of the drainage system (e.g., size, receiving water influence) and availability of information on the catchment and drainage system. Starting upstream and working progressively down is the preferred option, as it is typically more efficient. Belmont is well-suited for this approach because the Town has complete and accurate GIS mapping of the MS4 system already. As discussed in Section 6.2.3, some outfalls are at least partially submerged. This is another reason that a "top-down" approach is more suitable for Belmont.

As manhole inspections progress toward the receiving water, there will inevitably be a point where submerged manholes are encountered. When manholes are observed to be partially or completely submerged, samples should not be collected. The Town may choose to complete the investigation of submerged pipes via building inspections and dye testing, or by bypass pumping the storm drain so it can be inspected. If dye testing is the selected method, it may not be possible to observe dye in a submerged storm drain. In this case, positive identification of dye in the sanitary sewer would be considered proof of a legal connection to the sewer.

There are some exceptions where it is efficient to start inspections at the outfall and work progressively upstream. This approach is most appropriate for small catchment areas free of influence from receiving waters. Once a manhole inspection methodology has been selected, investigations will continue systematically through the catchment.

Manhole investigation begins with key junction manholes and mainline sump manholes and continues with junction manholes and other manholes as needed to isolate illicit discharges. Manhole inspections will proceed as follows (also as depicted in flowchart provided in **Appendix G):**

1. Manholes will be opened and inspected for visual and olfactory evidence of illicit connections during dry weather. Dry weather is defined as less than 0.1 inches of rain in the preceding 24 hours. When possible, 48 to 72 hours of dry weather preceding the investigation is preferred. A sample field inspection form is provided in **Appendix D**.

   Visual evidence may include toilet paper, sanitary products, sewage, soap, food, or other indications of anything other than stormwater. Olfactory evidence may include sewage, soap, laundry, bleach or other odors not typical of stormwater.

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. At the Town's discretion, samples may be collected and sent to a lab for analysis of E. coli[6]. If a positive result is obtained from the field kit for ammonia, a sample may be collected and sent to a lab for analysis of ammonia to confirm the field kit[7]. Similarly, if a positive result is obtained from the field kit for surfactants, a sample may be collected and sent to a lab for analysis of surfactants to confirm the field kit[8].

3. If no flow is observed, the inlets or outlet to the manhole may be partially blocked using sandbags or similar barriers (e.g., caulking, weirs/plates, or other temporary barriers) for 48 hours, if dry weather is predicted for the next 48 hours. Following 48 hours of dry weather the manholes are re-inspected, and any flow that was captured behind the sand bags is tested in accordance with the protocols outlined in Step 2. If no flow collects behind the sandbag, the upstream pipe network can be ruled out as a source of the intermittent discharge. The inlets of the manhole may be blocked in the case of a manhole with multiple stormwater pipes entering (junction manhole) to isolate the source of the flow, and the outlet may be blocked if there is a single pipe entering.

   To install sandbags, swing the sandbag into place using rope and tie the rope to the top rung.

[6] The 2016 Permit does not require E. coli sampling at manholes, however, this information can be very useful in identifying storm drains with illicit discharge potential.
[7] The 2016 Permit does not require ammonia to be analyzed by a lab, however, this information can be very useful in identifying storm drains with illicit discharge potential.
[8] The 2016 Permit does not require surfactants to be analyzed by a lab, however, this information can be very useful in identifying storm drains with illicit discharge potential.

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

5. Subsequent manhole inspections will proceed until the location of suspected illicit discharges or SSOs can be isolated to a pipe segment between two manholes.

6. 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) SVF is identified based on previous information or the catchment investigation, a wet weather investigation must also be conducted at the associated outfall. The DPW will be responsible for implementing the wet weather outfall sampling program and making updates as necessary.

Outfalls will be inspected and sampled under wet weather conditions, to the extent necessary, to determine whether wet weather-induced high flows in sanitary sewers 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, and the same form will be used to record data.

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. The permit does not require a minimum rainfall event prior to wet weather screening. The permit also does not require capturing “first flush”.

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

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:

- Dye Testing
- CCTV/Video Inspections

These methods are described in the sections below. Instructions and Standard Operating Procedures (SOPs) for these and other IDDE methods are available at the following links:

- EPA New England Bacterial Source Tracking Protocol, January 2012: https://www3.epa.gov/region1/npdes/stormwater/ma/2014AppendixI.pdf
- University of Michigan Guideline, Dye Testing for Storm Water and Sanitary Systems, Revised 1/27/2022: https://ehs.umich.edu/wp-content/uploads/2016/12/dye_testing_guideline.pdf
- CMRSWC SOP, Locating Illicit Discharges, July 2013: https://www.centralmastormwater.org/sites/g/files/vyhlif386/f/uploads/locating_illicit_discharges_sop_and_form_final.pdf

Public notification is an important aspect of a detailed source investigation program. Prior to dye testing, the OCD will notify property owners in the affected area. Notification will include flyers and door hangers for single family homes, businesses, and building lobbies for multi-family dwellings.

7.4.1 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 may be beneficial to inform residents and business owners of properties that will need to be accessed for a dye test, prior to conducting the dye test. The intention is to increase the likelihood of gaining access to buildings that need to be dye tested.

A team of two or more people is needed to perform dye testing (ideally, all with two-way radios). The team starts by inspecting the discharge piping at the lowest building level to determine the location and number of sanitary and storm drain discharge points. Based on this inspection, a fixture or fixtures are selected for dye testing. When possible, the fixture selected should be at the lowest level of the building with plumbing fixtures. If discharge piping is visible and the team confirms there is a single sanitary discharge, one fixture will be tested. When there are multiple discharge points observed, or it is not possible to confirm the configuration of discharge piping, multiple fixtures may be tested. In this situation it is recommended to select fixtures on different sides of the building.

Once the fixtures are selected, one person is inside the building, while the others are stationed at the appropriate storm drain 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 added, and the outside crew watches for the dye in the storm drain 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.

Green dye typically shows up best in the sewer and storm drain. However, if multiple fixtures in the same building are being tested or multiple buildings along the same stretch of pipe, it may be necessary to use different color dyes to differentiate. Red is typically the second-best color choice, and blue the next.

Another option is to space out the dye tests to allow time for the dye to clear from the sewer/drain in between tests.

Dye is available in liquid or tablet form. Liquid is commonly used and works faster but presents a higher risk for spills and can stain clothes and carpets. It is important to handle with care.

In areas with very flat drains, it can take longer for the dye to make its way to a downstream manhole. There are a few ways to address this issue; by inspecting the storm drain with a video camera during dye testing, or by using a nearby hydrant to introduce flow to the storm drain and push dye downstream. The use of a hydrant will require coordination with the Water Division.

7.4.2 CCTV/Video Inspection

Another method of source isolation involves the use of mobile video cameras that are guided remotely through stormwater drain lines to observe possible illicit discharges. IDDE program staff can review the videos and note any visible illicit discharges. While this tool is both effective and usually definitive, it can be costly and time consuming when compared to other source isolation techniques. CCTV is recommended in cases where dye testing is inconclusive (dye not found, or dye found in sewer and storm drain), and in cases where dye testing did not identify a source. As noted above, it can also be combined with dye testing.

7.5 ILLICIT DISCHARGE REMOVAL

When the specific source of an illicit discharge is identified, the Town will exercise its authority as necessary to require its removal within (60) sixty 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.

The volume of flow can be estimated using an assumed volume of sewage from a typical house or can be based on water use. If only a portion of the building is illicitly connected, the volume of sewage must be proportionally reduced.

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 SVFs 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 SVFs, and will be conducted in accordance with the procedures described in **Section 7.3**. All sampling results will be reported in the annual report.

8.0 TRAINING

Annual IDDE training will be made available to all employees involved in the IDDE program. This training will at a minimum include information on how to identify illicit discharges and SSOs and may also include additional training specific to the functions of particular personnel and their function within the framework of the IDDE program. Training records will be maintained in **Appendix H**. The frequency and type of training will be included in the annual report.

9.0 PROGRESS REPORTING

The progress and success of the IDDE program will be evaluated on an annual basis. The evaluation will be documented in the annual report and will include the following indicators of program progress:

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

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

10.0 REFERENCES

United States Environmental Protection Agency (EPA). 2020. *Massachusetts Small MS4 General Permit, Modified 2020*. https://www3.epa.gov/region1/npdes/stormwater/ma/2016fpd/final-2016-ma-sms4-gp-mod.pdf. Accessed April 2022.

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Electronic Code of Federal Regulations (e-CFR). 2018. *Title 40: Protection of Environment* (Chapter I, Subchapter D, Part 136). http://www.ecfr.gov/cgi-bin/text-idx?SID=b3b41fdea0b7b0b8cd6c4304d86271b7&mc=true&node=pt40.25.136&rgn=div5. Accessed January 2019.

Massachusetts Department of Environmental Protection (MassDEP). 2022. *314 CMR 4.00: Massachusetts Surface Water Quality Standards*. https://www.mass.gov/doc/314-cmr-4-massachusetts-surface-water-quality-standards/download . Accessed September 2022.

Commonwealth of Massachusetts. November 2021. *Final Massachusetts Integrated List of Waters for the Clean Water Act 2022 Reporting Cycle*. https://www.mass.gov/lists/integrated-lists-of-waters-related-reports#final-2022-integrated-list-of-waters-. Accessed August 2023.

Massachusetts Department of Environmental Protection (MassDEP). 2018. *Massachusetts Consolidated Assessment and Listing Methodology (CALM) Guidance Manual for the 2018 Reporting Cycle*. https://www.mass.gov/files/documents/2018/05/07/2018calm.pdf. Accessed May 2019.

APPENDIX A

Storm System Mapping

Town of Belmont, MA
Phase I MS4 Map

March 2023

Winn Brook (MA71-09)
Class B
Pollutants Causing Impairments:
E.coli, (physical substrate habitat

Spy Pond (MA71040)
Class B
Pollutants Causing Impairments:
chlordane and DDT in fish tissue, DO, harmful algal blooms, total phosphorus, (curly-leaf pondweed*), (eurasian water milfoil*), (water chestnut*)

Little Pond (MA71024)
Class B
Pollutants Causing Impairments:
harmful algal blooms, (water chestnut*)

Beaver Brook (MA72-28)
Class B
Pollutants Causing Impairments:
chloride, DO, E.coli, total phosphorus, algae, organic enrichment (sewage) biological indicators, sedimentation/ siltation, (flow regime modification*), (other anthropogenic substrate alterations*), (water chestnut*)

Clay Pit Pond (MA71011)
Class B
Pollutants Causing Impairments:
chlordane in fish tissue

Little River (MA71-21)
Class B
Pollutants Causing Impairments:
chloride, copper in sediment, DO, E.coli, flocculant masses, lead in sediment, odor, oil and grease, PCBs in fish tissue, total phosphorus, scum/foam, transparency/clarity, trash, (Debris*), (water chestnut*)

Legend

River Basin
- BOSTON HARBOR: Mystic
- CHARLES

Public Water Supplies
- Surface Water Intake

Stormwater Outfalls

Type
- Outlet Little Pond
- Final Outfall
- Interconnection
- Interim Outlet
- <all other values>

Catchments
- Catchments

Waterbody AUs - Rivers

Category
- 4A - Impaired - TMDL is completed
- 5 - Impaired - TMDL required

Waterbody AUs - Lakes, Estuaries

Category
- 4C - Impairment not caused by a pollutant
- 5 - Impaired - TMDL required

*TMDL not required (non-pollutant)

0 0.1 0.2 0.4 Miles

Stantec

APPENDIX B

SSO Inventory

SSO Inventory

Belmont, Massachusetts
Revision Date: 03/29/2023

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]
148-150 Oakley Rd	SSO to receiving water	5/1/2021	6:00 pm	7:30 pm		The backup was determined to have come from the corner of Payson Road and Pine Street due to a grease blockage. The Claimant called the Police Department at approximately 6:20PM, who then notified the DPW. The DPW arrived at the claimant's home at 7:20PM.	DPW jet rodded the blockage until normal flow was determined	
Goden St (at School)	SSO discharge to MS4	4/29/2022	9:45	10:15	25-50 gallons	Owner broke Backflow preventor and main backed up into sump pump sinkhole. Owner used a sump pump to pump sewage into Street	From the house, catch basin absorbent mat and boom socks were uses to prevent further flow to catch basin. At the main, jet flushed the main and cleared all obstructions, observed normal flow	
Goden St	SSO to receiving water	3/23/2023				Break in Town owned sewer main and 2 adjacent lateral joints		

[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

APPENDIX C

Outfall Priority Ranking

Outfall Priority Ranking

Updated: 2/8/2023

									Field Data						Lab Data								
Outfall ID	Outfall Type	Priority Category	Reason for Priority	Watershed	Receiving Water	Date of Screening/ Sampling	Flow?	If No, Reason	Chlorine	DO	Conductivity	Salinity	pH	Temperature (c)	Ammonia (mg/L)	Surfactants (mg/L)	E.Coli[1]	Total Phosphorus (mg/L)	Chloride	BOD5 (mg/L)	TSS (mg/L)	Total Lead (mg/L)	Total Copper (mg/L)	Oil & Grease (mg/L)
OF-2	Interconnection	Problem	Contamination identified near Shaw Rd & potential direct connection at 10 Hartley Rd	Boston Harbor: Mystic River	Tributary to Little River MA71-21 (Blair Pond)	9/19/2022	Yes		0.06	95.70%	0.003	0.5		18.2	3.5	0.11	52,000 col/100mL	0.678	210	14	7.9	ND	0.00487	ND
OF-1	Interconnection	Problem	Known partial illicit connection at 58 Van Ness Rd	Boston Harbor: Mystic River	Tributary to Little River MA71-21 (Blair Pond)	9/19/2022	Yes		0.08	70%	0.004	0.6	7.4	19.2	ND	ND	8,500 col/100mL	0.127	280	ND	12	0.00145	0.00143	ND
OF-11	Outfall	Problem	Sewer leaking into capped drain line Staunton Rd at Oliver Rd	Boston Harbor: Mystic River	Little Pond	6/20/2022 (11)	Yes		0.03		0	0.4		18.61	0.116	ND	1,800 col/100mL	0.246	200					
						6/20/2022 (11A)	Yes		0.06		0	0.4		22.1	0.194	ND	2,000 col/100mL	0.123	120					
OF-27	Outfall	High	Bacteria and ammonia above thresholds	Charles River	Wetland (Freshwater Forested/Shrub)	7/28/2022	Yes		0.02	98.7	1.66	0.8		16.72	2.37	0.05	1,203.33 MPN/100mL	0.058	460	7.6	51			
OF-12	Outfall	High	Bacteria above threshold	Boston Harbor: Mystic River	Little Pond	6/16/2022	Yes		0.03		0.003	0.8		20.57	ND	NT	2,100 col/100mL	0.1	340					
OF-10	Outfall	High	Impaired for e.coli and e.coli above IDDE thresholds; culverted stream	Boston Harbor: Mystic River	Winn Brook	7/28/2022	Yes		0.2		1.315	0.7		27.44	ND	ND	1,413.61 MPN/100mL	0.104	350	5.9				
OF-15A	Interconnection	High	Above IDDE threshold for e.coli	Boston Harbor: Mystic River	Spy Pond	7/28/2022	Yes		0.23	9.78	0.433	0.2		19.82	0.221	ND	435.17 MPN/100mL	0.119	88	ND	ND			
OF-16	Outfall	High	Above IDDE threshold for e.coli	Charles River	Close proximity (~500 ft) to Freshwater Pond and Riverine Wetland to Beaver Brook	7/1/2022; 9/19/2022	Yes		0.11	13.05	0.003	0.6	8.01	16.86	0.151	0.05	816.41 MPN/100mL	0.023	290	2	ND			
OF-8	Outfall	High	LR impaired for e.coli; culverted stream	Boston Harbor: Mystic River	Tributary to Little River MA71-21 (Blair Pond)	6/20/2022	No	CNA, paved over																
OF-4	Interconnection	High	LR impaired for e.coli	Boston Harbor: Mystic River	Tributary to Little River MA71-21 (Blair Pond)	6/20/2022	No	Standing Water																
OF-18	Outfall	High	BB impaired for e.coli	Charles River	Wetland (Freshwater Forested/Shrub) to Beaver Brook	7/1/2022; 9/19/2022	No	Standing Water																
OF-24	Outfall	High	BB impaired for e.coli	Charles River	Beaver Brook	7/1/2022; 9/19/2022	No	Standing Water																
OF-23	Outfall	High	BB impaired for e.coli	Charles River	Beaver Brook	7/1/2022	No	Standing Water																
OF-30	Outfall	High	BB impaired for e.coli	Charles River	Beaver Brook	7/1/2022; 9/19/2022	No	Dry; Standing Water																
OF-17	Outfall	High	BB impaired for e.coli	Charles River	Riverine Wetland to Beaver Brook	7/1/2022; 9/19/2022	No	Standing Water; Dry																
OF-13	Outfall	High	Culverted stream (outlet from Spy Pond)	Boston Harbor: Mystic River	Little Pond	6/20/2022	Yes		0.04		0.001	0.6		18.8	0.166	ND	64 col/100mL	0.046	340					
OF-7	Outfall	High	LR impaired for e.coli	Boston Harbor: Mystic River	Tributary to Little River MA71-21 (Blair Pond)	6/20/2022; 9/19/2022	Yes		0.12	12.67	0	0.6	9.44	26.89	0.088	ND	11 col/100mL	0.028	320	4.4	7.3	ND	0.00248	ND
OF-20	Outfall	High	BB impaired for e.coli	Charles River	Beaver Brook	7/1/2022; 9/19/2022	Yes		0	10.41	0	0.3		22.8	ND	ND	8.6 MPN/100mL	ND	200	ND	ND			
OF-22	Outfall	High	BB impaired for e.coli	Charles River	Beaver Brook	7/28/2022	Yes		0.2	8.83	1.472	0.7		24.04	ND	ND	6.2 MPN/100mL	0.499	390	11	890			
OF-3	Interconnection	High	LR impaired for e.coli	Boston Harbor: Mystic River	Tributary to Little River MA71-21 (Blair Pond)	6/20/2022; 9/19/2022	No	Dry																
OF-5	Interconnection	High	LR impaired for e.coli	Boston Harbor: Mystic River	Tributary to Little River MA71-21 (Blair Pond)	9/19/2022	No	Dry																
OF-6	Interconnection	High	LR impaired for e.coli	Boston Harbor: Mystic River	Tributary to Little River MA71-21 (Blair Pond)	6/20/2022	No	Dry																
OF-25	Outfall	High	BB impaired for e.coli	Charles River	Beaver Brook	7/1/2022; 9/19/2022	No	Dry																
OF-26	Interconnection	High	BB impaired for e.coli	Charles River	Beaver Brook	7/1/2022; 9/19/2022	No	Dry																
OF-29	Outfall	High	BB impaired for e.coli	Charles River	Beaver Brook	7/1/2022; 9/19/2022	No	Dry																
OF-21	Outfall	High	BB impaired for e.coli	Charles River	Beaver Brook	7/1/2022	No	Dry																
OF-28	Outfall	High	BB impaired for e.coli	Charles River	Beaver Brook	7/1/2022	No	Dry																
OF-31	Outfall	Low		Charles River	Wetland (Freshwater Forested/Shrub)	7/28/2022	Yes		0.27	8.65	2.521	1.3		17.97	ND	ND	88.03 MPN/100mL	0.347	730	2.1	34			
OF-19	Outfall	Low		Charles River	Wetland (Freshwater Forested/Shrub)	7/1/2022	No	Dry																
OF-9A	Outfall	Low		Boston Harbor: Mystic River	Little Pond	6/16/2022	No	Damp																
OF-15	Interconnection	Low		Boston Harbor: Mystic River	Spy Pond	7/28/2022	No	Dry																
OF-9	Outfall	Low		Boston Harbor: Mystic River	Little Pond	6/16/2022	No	Dry																

[1]Some E.coli results are reported in MPN/100mL and other by col/100mL. Different methods used by the lab due to supply shortage of test media

ND = Non-detect
NT = Not tested
Sample collected at a separate visit on 9/19/22

APPENDIX D

Field Forms

Attachment 3

STORMWATER MONITORING

Field Collection Requirements (To be recorded at each site)

Sample-
Site Name _____

Time collected_____

Date collected_____

Inspection-
****Take picture at site****
Outfall diameter_____('na' if open stream)

Flow estimate_____('na' if open stream)

Odor_____

Color_____

Turbidity_____

Floatables_____

Other observations_____

_____

YSI Meter (calibrate in lab)-
Salinity_____

Temp_____

Conductivity (give both #'s)

_____

Location information-
Short description of where sample was collected at site_____

_____

_____

GPS_____

_____

Field Kits listed in the order they should be conducted in, include any applicable notes-

NH3 strip_____

Cl2 kit_____
Hach meter – (3 min wait)

Surfactant_____
Chemetrics K-9400 Blue box/detergent test kit

Additional Notes:

(Note any changes in weather conditions)_____

_____

_____

_____

_____

Manhole Inspection Report

MH#

Catchment Area: _____

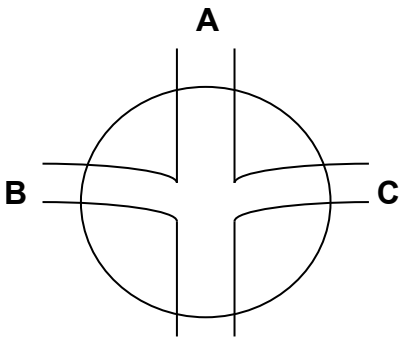
Inspector: _____

Date/Time: _____

Weather: _____

Street/Location: _____

General Comments: _____



(Hold "D" as outlet)

Structural Information:

Cover Size: 24" 30" Other: _____

MH Size: 4' 5' Other: _____

MH Sump: Y / N Sump Depth: _____

MH Channel: Y / N

Weir: Y / N Rim to Top of Weir: _____

Internal Drop: Y / N

Depth to Wet Ring from Rim: _____

General Information:

Manhole Type:	Sanitary ☐	Storm ☐	Combined ☐	Common ☐							
Location of MH:	Roadway ☐	Sidewalk ☐	Roadside ☐	Alley ☐	Easement ☐	Other ☐					
Manhole Material:	Brick ☐	Clay Block ☐	Poured Concrete ☐		Manhole Block ☐	Precast Concrete ☐	Other ☐				
Paved Area Around MH:	Satisfactory ☐		Cracked ☐	☐	Missing Pavement ☐	Vegetation Growth					
Unpaved Area Around MH:	Satisfactory ☐		Eroded ☐								
Odors:											
Recommendations:	No Action ☐	Rebuild ☐	Line Manhole Wall ☐		Reset Frame ☐	Clean / Remove debris from Invert ☐					

Field Test Kit Results:

Pipe (A-F):						
Ammonia, mg/L (Compliant ≤ 0.5 mg/L)						
Surfactants, mg/L (Compliant ≤ 0.25 mg/L)						
Chlorine, mg/L (Compliant < 0.02 mg/L)						

Pipe Information:

	Pipe Size	Material	From / To MH#	Invert Depth (from Rim)	Flow Depth (from Invert)	Debris Depth (from Invert)	Condition	Flow	Clarity of Flow
A.									
B.									
C.									
D.									
E.									
F.									

APPENDIX E

Water Quality Analysis Instructions, Users' Manuals

Detergents CHEMets Kit

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

Test Procedure

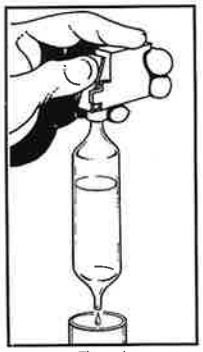


Figure 1

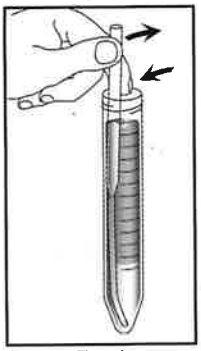


Figure 2

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.

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).

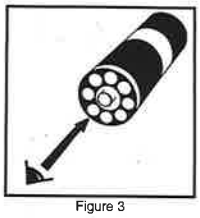


Figure 3

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, 21st ed., method 5540 C (2005)
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 MSDS (available at www.chemetrics.com) before performing this test procedure. Wear safety glasses and protective gloves.

CHEMetrics
Water Analysis Systems

www.chemetrics.com
4295 Catlett Road, Midland, VA 22728 U.S.A.
Phone: (800) 356-3072; Fax: (540) 788-4856
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Sept. 12, Rev. 9

APPENDIX F

System Vulnerability Factor Inventory

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

Cambridge, Massachusetts
Revision Date: 03/29/2023

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[f]	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
OF-1	Tributary to Little River (Blair Pond)	No					No	No	Yes	No	Yes		
OF-2	Tributary to Little River (Blair Pond)	Yes[a]					No	No	Yes	No	Yes		
OF-3	Tributary to Little River (Blair Pond)	No					No	No	Yes	No	Yes		
OF-4	Tributary to Little River (Blair Pond)	No					No	No	Yes	No	Yes		
OF-5	Tributary to Little River (Blair Pond)	No					No	No	Yes	No	Yes		
OF-6	Tributary to Little River (Blair Pond)	No					No	No	Yes	No	Yes		
OF-7	Tributary to Little River (Blair Pond)	No					No	No	Yes	No	Yes		
OF-8	Tributary to Little River (Blair Pond)	Yes[b]					No	No	Yes[c]	No	Yes		
OF-9	Little Pond	No					No	No	Yes	No	Yes		
OF-9A	Little Pond	No					No	No	Yes	No	Yes		
OF-10	Winn Brook	No					No	No	Yes	Yes[d]	Yes		
OF-11	Little Pond	No					No	No	Yes	No	Yes		
OF-11A	Little Pond	No					No	No	Yes	No	Yes		
OF-12	Little Pond	No					No	No	Yes	No	Yes		
OF-13	Little Pond	No					No	No	Yes	No	Yes		
OF-15	Spy Pond	No					No	No	Yes	No	Yes		
OF-15A	Spy Pond	No					No	No	Yes	No	Yes		
OF-16	Close proximity (~500 ft) to Freshwater Pond & Riverine Wetland to Beaver Brook	No					No	No	Yes	No	Yes		
OF-17	Riverine Wetland to Beaver Brook	No					No	No	Yes	No	Yes		
OF-18	Wetland (Freshwater Forested/Shrub) to Beaver Brook	No					No	No	Yes	No	Yes		
OF-19	Wetland (Freshwater Forested/Shrub)	No					No	No	Yes	No	Yes		
OF-20	Beaver Brook	No					No	No	Yes	No	Yes		
OF-21	Beaver Brook	No					No	No	Yes	No	Yes		
OF-22	Beaver Brook	No					No	No	Yes	No	Yes		
OF-23	Beaver Brook	No					No	No	Yes	No	Yes		
OF-24	Beaver Brook	No					No	No	Yes	No	Yes		
OF-25	Beaver Brook	No					No	No	Yes	No	Yes		
OF-26	Beaver Brook	No					No	No	Yes	No	Yes		
OF-27	Wetland (Freshwater Forested/Shrub)	No					No	No	Yes	Yes[e]	Yes		
OF-28	Beaver Brook	No					No	No	Yes	No	Yes		
OF-29	Beaver Brook	No					No	No	Yes	No	Yes		
OF-30	Beaver Brook	No					No	No	Yes	No	Yes		
OF-31	Wetland (Freshwater Forested/Shrub)	No					No	No	Yes	Yes[e]	Yes		

NOTE: SVF Inventory will be further populated as information is gathered during catchment investigations

[a] 5/1/2021 SSO at 148-150 Oakley Rd (grease blockage)
[b] 4/29/2022 and 3/23/2023 SSOs on Goden St (Owner backflow preventor, Town infrastructure breaks)
[c] Sewer defects related to March 2023 SSO on Goden St. CCTV planned.
[d] Woodbine Rd and Winn's Brook sewer pump stations
[e] Stony Brook Rd sewer pump station
[f] Sewer defects identified Town-wide through CCTV; lining ongoing

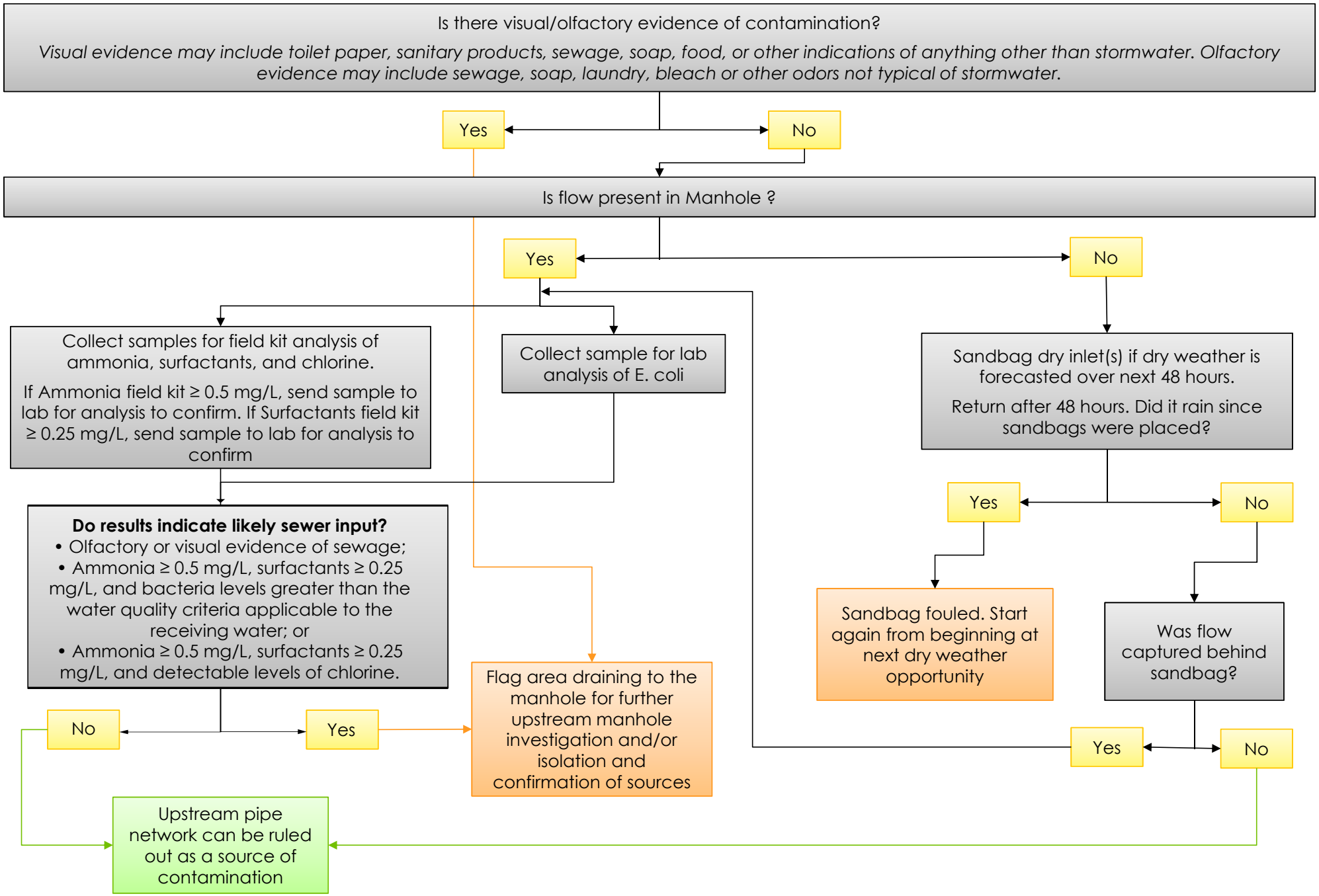
Presence/Absence Evaluation Criteria:

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

APPENDIX G
Manhole Inspection Flowchart

Protocol for Dry Weather Manhole Inspections

Proceed after a minimum of 24 hours of dry weather (less than 0.1" of rain). Recommend 48-72 hours when possible.



APPENDIX H

IDDE Employee Training Records

TRAINING AGENDA

IDDE Training Plan & Sign-In Sheet

Date: April 12, 2022
Time: 9:00 AM – 12:00 PM
Location: Belmont DPW

Training Plan:

1. MS4 Permit – IDDE Training
    - Belmont MS4 System
    - MS4 Permit Overview
    - IDDE
        - Dry Weather Outfall Screening & Sampling
        - Catchment Investigations
        - SSO Reporting

Sign-in Sheet:

Name	Signature	Organization
Rick DaCamara	R. DaCamara	Belmont DPW
Henry J Manuel III	Henry J Manuel III	Belmont DPW
William Uva		Belmont DPW/Highway
Glen Gill		HIGHWAY
Anthony Amedio		HIGHWAY
Scott Troyd		Highway

TRAINING AGENDA

Name	Signature	Organization
Jay Marcotte		DPW
Michael Santoro		DPW
Carlo Rosa		Highway
Paul Duguay		DPW
Marc Todisco		DPW
Michael Eccles		DPW
Timothy Hamann		DPW
Paul Mosca		DPW
John Curro		DPW

TRAINING AGENDA

IDDE Training Plan & Sign-In Sheet

Date: April 4, 2023
Time: 8:30 AM – 11:00 AM
Location: Belmont DPW

Training Plan:

1. Belmont MS4 System Overview
2. MS4 Permit Overview
3. SSOs (Inventory, Response & Reporting)
4. IDDE
    - What is an Illicit Discharge?
    - Dry Weather Outfall Screening & Sampling
    - Catchment Investigations

Sign-in Sheet:

Name	Signature	Organization
Jake Reed	JReed	Highway
Paul Mosca	Paul Mosca	Highway
Gilvanio Pacheco	Gilvanio Pacheco	Highway
Michael Kiernan	Michael Kiernan	Highway
MIKE Eccles	Mike Eccles	Highway

TRAINING AGENDA

Name	Signature	Organization
William Uva		Highway
Rick DaCanada	R. DaCanada	Highway
John Curro		Highway
Jake [illegible]		water
Kevin Rooney	Kevin Rooney	water
Glen Gill		Highway
Gino Villa		Highway
Marc Todisco		Highway
Joe Gerardi		Highway
Tony Amedio		Highway
Rick Bemis		DPW Highway Div
Scott Trout		
Paul Dugay		Highway

APPENDIX I

Safety Data Sheets (SDS)

Simplicity in Water Analysis

Cover Page for Safety Data Sheet

Thank you for choosing CHEMetrics, Inc. We appreciate your business. In order to best serve your needs for accurate and complete Safety Data, we offer the following information as supplemental to the attached SDS.

SDS No.: R9402

Version No.: 3.6

Product Name: Double-Tipped Ampoules for Detergents CHEMets® Kit and Refill and for Detergents Instrumental Test

Components of water analysis reagent sets: Refills R-9400, R-9423; and Kits I-2017, K-9400

Product Descriptions:

Double-Tipped Ampoules: Glass ampoules with dual tapered tips. Each double-tipped ampoule in K-9400 and R-9400 contains approximately 4 mL of liquid reagent. Each double-tipped ampoule in R-9423 contains approximately 9.5 mL of liquid reagent. Refills and test kits contain 20 double-tipped ampoules.

Addendum to Section 14 Transport Information:

Shipping container markings and labels for this product, as received, may vary from the contents of section 14 of the SDS for one or both of the following reasons:

- CHEMetrics has packaged this product as Dangerous Goods in Excepted Quantities according to IATA, US DOT, and IMDG regulations.
- CHEMetrics has packaged this product as part of a test kit or reagent set composed of various chemical reagents and elected to ship as UN 3316 Chemical Kit, Hazard Class 9, Packing Group II or III.

In case of reshipment, it is the responsibility of the shipper to determine appropriate labels and markings in accordance with applicable transportation regulations.

Additional Information:

- "Print Date" = Revision Date (expressed as DD/MM/YYYY)
- Test kits and reagents sets may contain additional chemical reagents. See separate SDS(s).

4295 Catlett Road, Midland, VA 22728 ▪ P: 800.356.3072 ▪ F: 540.788.4856 ▪ www.chemetrics.com

Double-Tipped Ampoules for Detergents CHEMets Kit and Refill and for Detergents Instrumental Test

CHEMetrics, Inc.

Chemwatch Hazard Alert Code:

Chemwatch: **9-87557**
SDS No: **R9402**
Version No: **3.6**
Safety Data Sheet according to OSHA HazCom Standard (2012) requirements

Issue Date: **03/02/2018**
Print Date: **03/02/2018**
Initial Date: **03/02/2018**
S.GHS.USA.EN

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Identifier

Product name	Double-Tipped Ampoules for Detergents CHEMets Kit and Refill and for Detergents Instrumental Test
Synonyms	Not Available
Proper shipping name	Chemical kits; First aid kits
Chemical formula	Not Applicable
Other means of identification	Not Available
CAS number	Not Applicable

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	Component of water analysis reagent sets: Refills R-9400, R-9423 and Kits I-2017, K-9400

Details of the supplier of the safety data sheet

Registered company name	CHEMetrics, Inc.
Address	4295 Catlett Road, Midland VA 22728 - United States
Telephone	1-540-788-9026
Fax	1-540-788-4856
Website	www.chemetrics.com
Email	technical@chemetrics.com

Emergency telephone number

Association / Organisation	ChemTel, Inc.
Emergency telephone numbers	1-800-255-3924
Other emergency telephone numbers	+01-813-248-0585

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

Classification	Acute Toxicity (Oral) Category 4, Acute Toxicity (Inhalation) Category 3, Skin Corrosion/Irritation Category 2, Serious Eye Damage Category 1, Carcinogenicity Category 2, Reproductive Toxicity Category 2, Specific target organ toxicity - repeated exposure Category 2

Label elements

Hazard pictogram(s)	
SIGNAL WORD	**DANGER**

Hazard statement(s)

H302	Harmful if swallowed.
H331	Toxic if inhaled.
H315	Causes skin irritation.
H318	Causes serious eye damage.
H351	Suspected of causing cancer.
H361	Suspected of damaging fertility or the unborn child.
H373	May cause damage to organs through prolonged or repeated exposure.

Continued...

Precautionary statement(s) Prevention

P201	Obtain special instructions before use.
P260	Do not breathe dust/fume/gas/mist/vapours/spray.
P271	Use in a well-ventilated area.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P281	Use personal protective equipment as required.
P270	Do not eat, drink or smoke when using this product.

Precautionary statement(s) Response

P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308+P313	IF exposed or concerned: Get medical advice/attention.
P310	Immediately call a POISON CENTER or doctor/physician.
P362	Take off contaminated clothing and wash before reuse.
P304+P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P301+P312	IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
P302+P352	IF ON SKIN: Wash with plenty of soap and water.
P330	Rinse mouth.
P332+P313	If skin irritation occurs: Get medical advice/attention.

Precautionary statement(s) Storage

P403+P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.

Precautionary statement(s) Disposal

P501	Dispose of contents/container in accordance with local regulations.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
67-66-3	71	chloroform
7732-18-5	26	water
13472-35-0	2	sodium phosphate, monobasic, dihydrate
7664-93-9	1	sulfuric acid
61-73-4	<0.1	methylene blue
Not Available	<0.1	Proprietary ingredient

SECTION 4 FIRST AID MEASURES

Description of first aid measures

General	
Eye Contact	If this product comes in contact with the eyes: ▸ Immediately hold eyelids apart and flush the eye continuously with running water. ▸ Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. ▸ Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes. ▸ Transport to hospital or doctor without delay. ▸ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	If skin contact occurs: ▸ Immediately remove all contaminated clothing, including footwear. ▸ Flush skin and hair with running water (and soap if available). ▸ Seek medical attention in event of irritation.
Inhalation	▸ If fumes or combustion products are inhaled remove from contaminated area. ▸ Lay patient down. Keep warm and rested. ▸ Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures. ▸ Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary. ▸ Transport to hospital, or doctor, without delay.
Ingestion	NOTE: IN massive chloroform overdose,DO NOT INDUCE EMESIS because of the rapid onset of CNS depression and the risk of aspiration If poisoning occurs, contact a doctor or Poisons Information Centre. ▸ Avoid giving milk or oils. ▸ Avoid giving alcohol. ▸ If spontaneous vomiting appears imminent or occurs, hold patient's head down, lower than their hips to help avoid possible aspiration of vomitus.

Continued...

- If swallowed do **NOT** induce vomiting.
- If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.
- Observe the patient carefully.
- Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.
- Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink.
- Seek medical advice.

Most important symptoms and effects, both acute and delayed

See Section 11

Indication of any immediate medical attention and special treatment needed

For chloroform intoxications:
Chloroform concentrations may be determined in blood.
Treat irritation symptomatically.
Oral Management:
Chloroform is radiopaque and X-rays confirm ingestion.
DO NOT INDUCE EMESIS because of the rapid onset of CNS depression and the risk of aspiration.
Consider gastric lavage within 1 hour of ingestion because of very rapid absorption of chloroform (use cuffed ET tube to protect airway)
Contact a poisons information service for further guidance on gut decontamination.
Systematic Management.
All patients initially require at least 24 hours observation with ECG monitoring.
Patients should be kept at complete bed rest, the use of stimulants (including adrenaline and noradrenaline) should be avoided because of the risk of sensitisation of the myocardium.
In symptomatic patients the hepatic and renal function should be monitored for at least 3-days post-exposure.
Chest X-rays will be necessary to monitor development of respiratory complications.
Chloroform depletes glutathione stores; N-acetylcysteine (used in the treatment of paracetamol overdose) has been suggested as a possible antidote for hepatotoxic organic solvents (success in carbon tetrachloride intoxications has been reported).
for intoxication due to Freons/ Halons;
A: Emergency and Supportive Measures
- Maintain an open airway and assist ventilation if necessary
- Treat coma and arrhythmias if they occur. Avoid (adrenaline) epinephrine or other sympathomimetic amines that may precipitate ventricular arrhythmias. Tachyarrhythmias caused by increased myocardial sensitisation may be treated with propranolol, 1-2 mg IV or esmolol 25-100 microgm/kg/min IV.
- Monitor the ECG for 4-6 hours

B: Specific drugs and antidotes:
- There is no specific antidote

C: Decontamination
- Inhalation; remove victim from exposure, and give supplemental oxygen if available.
- Ingestion; (a) Prehospital: Administer activated charcoal, if available. **DO NOT** induce vomiting because of rapid absorption and the risk of abrupt onset CNS depression. (b) Hospital: Administer activated charcoal, although the efficacy of charcoal is unknown. Perform gastric lavage only if the ingestion was very large and recent (less than 30 minutes)

D: Enhanced elimination:
- There is no documented efficacy for diuresis, haemodialysis, haemoperfusion, or repeat-dose charcoal.

POISONING and DRUG OVERDOSE, Californian Poison Control System Ed. Kent R Olson; 3rd Edition
- Do not administer sympathomimetic drugs unless absolutely necessary as material may increase myocardial irritability.
- No specific antidote.
- Because rapid absorption may occur through lungs if aspirated and cause systematic effects, the decision of whether to induce vomiting or not should be made by an attending physician.
- If lavage is performed, suggest endotracheal and/or esophageal control.
- Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach.
- Treatment based on judgment of the physician in response to reactions of the patient

For acute or short term repeated exposures to strong acids:
- Airway problems may arise from laryngeal edema and inhalation exposure. Treat with 100% oxygen initially.
- Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling
- Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.
- Strong acids produce a coagulation necrosis characterised by formation of a coagulum (eschar) as a result of the dessicating action of the acid on proteins in specific tissues.

INGESTION:
- Immediate dilution (milk or water) within 30 minutes post ingestion is recommended.
- **DO NOT** attempt to neutralise the acid since exothermic reaction may extend the corrosive injury.
- Be careful to avoid further vomit since re-exposure of the mucosa to the acid is harmful. Limit fluids to one or two glasses in an adult.
- Charcoal has no place in acid management.
- Some authors suggest the use of lavage within 1 hour of ingestion.

SKIN:
- Skin lesions require copious saline irrigation. Treat chemical burns as thermal burns with non-adherent gauze and wrapping.
- Deep second-degree burns may benefit from topical silver sulfadiazine.

EYE:
- Eye injuries require retraction of the eyelids to ensure thorough irrigation of the conjuctival cul-de-sacs. Irrigation should last at least 20-30 minutes. **DO NOT** use neutralising agents or any other additives. Several litres of saline are required.
- Cycloplegic drops, (1% cyclopentolate for short-term use or 5% homatropine for longer term use) antibiotic drops, vasoconstrictive agents or artificial tears may be indicated dependent on the severity of the injury.
- Steroid eye drops should only be administered with the approval of a consulting ophthalmologist).

[Ellenhorn and Barceloux: Medical Toxicology]

SECTION 5 FIREFIGHTING MEASURES

Extinguishing media

- Water spray or fog.
- Foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.

Special hazards arising from the substrate or mixture

Fire Incompatibility	▸ Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result

Advice for firefighters

Continued...

Fire Fighting	▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Wear breathing apparatus plus protective gloves. ▸ Prevent, by any means available, spillage from entering drains or water courses. ▸ Use fire fighting procedures suitable for surrounding area. ▸ **DO NOT** approach containers suspected to be hot. ▸ Cool fire exposed containers with water spray from a protected location. ▸ If safe to do so, remove containers from path of fire. ▸ Equipment should be thoroughly decontaminated after use.
Fire/Explosion Hazard	▸ Non combustible. ▸ Not considered to be a significant fire risk. ▸ Acids may react with metals to produce hydrogen, a highly flammable and explosive gas. ▸ Heating may cause expansion or decomposition leading to violent rupture of containers. ▸ May emit corrosive, poisonous fumes. May emit acrid smoke. carbon dioxide (CO_2) hydrogen chloride phosgene other pyrolysis products typical of burning organic material. May emit poisonous fumes.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Minor Spills	▸ Clean up all spills immediately. ▸ Avoid breathing vapours and contact with skin and eyes. ▸ Control personal contact with the substance, by using protective equipment. ▸ Contain and absorb spill with sand, earth, inert material or vermiculite. ▸ Wipe up. ▸ Place in a suitable, labelled container for waste disposal.
Major Spills	▸ Clear area of personnel and move upwind. ▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Wear breathing apparatus plus protective gloves. ▸ Prevent, by any means available, spillage from entering drains or water courses. ▸ No smoking, naked lights or ignition sources. ▸ Increase ventilation. ▸ Stop leak if safe to do so. ▸ Water spray or fog may be used to disperse / absorb vapour. ▸ Contain or absorb spill with sand, earth or vermiculite. ▸ Collect recoverable product into labelled containers for recycling. ▸ Collect solid residues and seal in labelled drums for disposal. ▸ Wash area and prevent runoff into drains. ▸ After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using. ▸ If contamination of drains or waterways occurs, advise emergency services.

	Personal Protective Equipment advice is contained in Section 8 of the SDS.

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	▸ Avoid all personal contact, including inhalation. ▸ Wear protective clothing when risk of exposure occurs. ▸ Use in a well-ventilated area. ▸ Prevent concentration in hollows and sumps. ▸ **DO NOT** enter confined spaces until atmosphere has been checked. ▸ **DO NOT** allow material to contact humans, exposed food or food utensils. ▸ Avoid contact with incompatible materials. ▸ When handling, **DO NOT** eat, drink or smoke. ▸ Keep containers securely sealed when not in use. ▸ Avoid physical damage to containers. ▸ Always wash hands with soap and water after handling. ▸ Work clothes should be laundered separately. Launder contaminated clothing before re-use. ▸ Use good occupational work practice. ▸ Observe manufacturer's storage and handling recommendations contained within this SDS. ▸ Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained. **Wear impact- and splash-resistant eyewear.**
Other information	▸ Store in original containers. ▸ Keep containers securely sealed. ▸ Store in a cool, dry, well-ventilated area. ▸ Store away from incompatible materials and foodstuff containers. ▸ Protect containers against physical damage and check regularly for leaks. ▸ Observe manufacturer's storage and handling recommendations contained within this SDS. **For optimum analyical performance, store in the dark and at room temperature.**

Conditions for safe storage, including any incompatibilities

Suitable container	▸ **DO NOT** use aluminium or galvanised containers ▸ Lined metal can, lined metal pail/ can. ▸ Plastic pail. ▸ Polyliner drum. ▸ Packing as recommended by manufacturer. ▸ Check all containers are clearly labelled and free from leaks.

Continued...

	For low viscosity materials ▸ Drums and jerricans must be of the non-removable head type. ▸ Where a can is to be used as an inner package, the can must have a screwed enclosure. For materials with a viscosity of at least 2680 cSt. (23 deg. C) and solids (between 15 C deg. and 40 deg C.): ▸ Removable head packaging; ▸ Cans with friction closures and ▸ low pressure tubes and cartridges may be used. - Where combination packages are used, and the inner packages are of glass, there must be sufficient inert cushioning material in contact with inner and outer packages *. - In addition, where inner packagings are glass and contain liquids of packing group I and II there must be sufficient inert absorbent to absorb any spillage *. - * unless the outer packaging is a close fitting moulded plastic box and the substances are not incompatible with the plastic. All inner and sole packagings for substances that have been assigned to Packaging Groups I or II on the basis of inhalation toxicity criteria, must be hermetically sealed.
Storage incompatibility	Chloroform ▸ decomposes in the presence of excess water, high temperature, including hot surfaces, evolving phosgene and hydrogen chloride ▸ on contact with warm water may form hydrogen chloride ▸ decomposes at ordinary temperatures in sunlight, in the absence of air, and in the dark in the presence of air ▸ may form explosive materials when mixed with strong bases, alkali metals, lithium, sodium, potassium, sodium-potassium alloys; these may be heat-, friction-, and/or impact sensitive ▸ reacts violently with light metals, aluminium, magnesium or titanium powder, disilane, potassium tert-butoxide, methylates (methoxides), potassium acetylene-1,2-dioxide, sodium amide, uranium(III) hydride ▸ reacts violently with (acetone + a base), (perchloric acid + phosphorous pentoxide), (KOH + methanol) and (NaOH + methanol). ▸ is incompatible with acetone, beryllium, decaborane, methanol, nitrogen tetroxide, strong oxidisers, fluorine, oxygen, potassium, sodium, strong mineral acids, triisopropylphosphine, chemically active metals (Li, NaK alloy), zinc ▸ attacks many plastics and rubber ▸ attacks iron and other metals in the presence of moisture and elevated temperatures ▸ may generate electrostatic charges due to low conductivity Haloalkanes: ▸ are highly reactive:some of the more lightly substituted lower members are highly flammable; the more highly substituted may be used as fire suppressants, not always with the anticipated results. ▸ may react with the lighter divalent metals to produce more reactive compounds analogous to Grignard reagents. ▸ may produce explosive compounds following prolonged contact with metallic or other azides ▸ may react on contact with potassium or its alloys - although apparently stable on contact with a wide rage of halocarbons, reaction products may be shock-sensitive and may explode with great violence on light impact; severity generally increases with the degree of halocarbon substitution and potassium-sodium alloys give extremely sensitive mixtures . BRETHERICK L.: Handbook of Reactive Chemical Hazards ▸ react with metal halides and active metals, eg. sodium (Na), potassium (K), lithium (Li),calcium (Ca), zinc (Zn), powdered aluminium (Al) and aluminium alloys, magnesium (Mg) and magnesium alloys. ▸ may react with brass and steel. ▸ may react explosively with strong oxidisers ▸ may degrade rubber, and plastics such as methacrylate polymers, polyethylene and polystyrene, paint and coatings ▸ Avoid strong bases.

PACKAGE MATERIAL INCOMPATIBILITIES

Not Available

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
US NIOSH Recommended Exposure Limits (RELs)	chloroform	Methane trichloride, Trichloromethane	Not Available	9.78 mg/m3 / 2 ppm	Not Available	Ca See Appendix A
US ACGIH Threshold Limit Values (TLV)	chloroform	Chloroform	10 ppm	Not Available	Not Available	TLV® Basis: Liver & embryo/fetal dam; CNS impair
US OSHA Permissible Exposure Levels (PELs) - Table Z1	chloroform	Chloroform (Trichloromethane)	Not Available	Not Available	240 mg/m3 / 50 ppm	Not Available
US NIOSH Recommended Exposure Limits (RELs)	sulfuric acid	Battery acid, Hydrogen sulfate, Oil of vitriol, Sulfuric acid (aqueous)	1 mg/m3	Not Available	Not Available	Not Available
US ACGIH Threshold Limit Values (TLV)	sulfuric acid	Sulfuric acid	0.2 mg/m3	Not Available	Not Available	TLV® Basis: Pulm func
US OSHA Permissible Exposure Levels (PELs) - Table Z1	sulfuric acid	Sulfuric acid	1 mg/m3	Not Available	Not Available	Not Available

EMERGENCY LIMITS

Ingredient	Material name	TEEL-1	TEEL-2	TEEL-3
chloroform	Chloroform	2 ppm	Not Available	Not Available
sulfuric acid	Sulfuric acid	Not Available	Not Available	Not Available

Ingredient	Original IDLH	Revised IDLH
chloroform	500 ppm	Not Available
water	Not Available	Not Available

Continued...

sodium phosphate, monobasic, dihydrate	Not Available	Not Available
sulfuric acid	15 mg/m3	Not Available
methylene blue	Not Available	Not Available
Proprietary ingredient	Not Available	Not Available

Exposure controls

Appropriate engineering controls

Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection.
The basic types of engineering controls are:
Process controls which involve changing the way a job activity or process is done to reduce the risk.
Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment. Ventilation can remove or dilute an air contaminant if designed properly. The design of a ventilation system must match the particular process and chemical or contaminant in use.
Employers may need to use multiple types of controls to prevent employee overexposure.

Local exhaust ventilation usually required. If risk of overexposure exists, wear approved respirator. Correct fit is essential to obtain adequate protection.
Supplied-air type respirator may be required in special circumstances. Correct fit is essential to ensure adequate protection.
An approved self contained breathing apparatus (SCBA) may be required in some situations.
Provide adequate ventilation in warehouse or closed storage area. Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.

Type of Contaminant:	Air Speed:
solvent, vapours, degreasing etc., evaporating from tank (in still air).	0.25-0.5 m/s (50-100 f/min.)
aerosols, fumes from pouring operations, intermittent container filling, low speed conveyer transfers, welding, spray drift, plating acid fumes, pickling (released at low velocity into zone of active generation)	0.5-1 m/s (100-200 f/min.)
direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1-2.5 m/s (200-500 f/min.)
grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion).	2.5-10 m/s (500-2000 f/min.)

Within each range the appropriate value depends on:

Lower end of the range	Upper end of the range
1: Room air currents minimal or favourable to capture	1: Disturbing room air currents
2: Contaminants of low toxicity or of nuisance value only.	2: Contaminants of high toxicity
3: Intermittent, low production.	3: High production, heavy use
4: Large hood or large air mass in motion	4: Small hood-local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2 m/s (200-400 f/min) for extraction of solvents generated in a tank 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

Personal protection

Eye and face protection

- Safety glasses with side shields.
- Chemical goggles.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59], [AS/NZS 1336 or national equivalent]

Skin protection

See Hand protection below

Hands/feet protection

- Wear chemical protective gloves, e.g. PVC.
- Wear safety footwear or safety gumboots, e.g. Rubber

Body protection

See Other protection below

Other protection

- Overalls.
- Eyewash unit.
- Barrier cream.
- Skin cleansing cream.

Thermal hazards

Not Available

Recommended material(s)

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:
"Forsberg Clothing Performance Index".
The effect(s) of the following substance(s) are taken into account in the ***computer-generated*** selection:

Respiratory protection

Type AB-P Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

Where the concentration of gas/particulates in the breathing zone, approaches or exceeds the "Exposure Standard" (or ES), respiratory protection is required.
Degree of protection varies with both face-piece and Class of filter; the nature of protection

Continued...

Double-Tipped Ampoules for Detergents CHEMets Kit and Refill and for Detergents Instrumental Test

Material	CPI
BUTYL	C
NATURAL RUBBER	C
NATURAL+NEOPRENE	C
NEOPRENE	C
NEOPRENE/NATURAL	C
NITRILE	C
PE	C
PE/EVAL/PE	C
PVA	C
PVC	C
SARANEX-23	C
TEFLON	C
VITON	C

* CPI - Chemwatch Performance Index
A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion
NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -
* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

varies with Type of filter.

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 10 x ES	AB-AUS P2	-	AB-PAPR-AUS / Class 1 P2
up to 50 x ES	-	AB-AUS / Class 1 P2	-
up to 100 x ES	-	AB-2 P2	AB-PAPR-2 P2 ^

^ - Full-face
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Two phase: Blue / Colorless

Physical state	Liquid	**Relative density (Water = 1)**	1.49 (chloroform layer)
Odour	Characteristic	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	Not Available
pH (as supplied)	1.35 (aqueous layer)	**Decomposition temperature**	Not Available
Melting point / freezing point (°C)	Not Available	**Viscosity (cSt)**	Not Available
Initial boiling point and boiling range (°C)	Not Available	**Molecular weight (g/mol)**	Not Available
Flash point (°C)	Not Applicable	**Taste**	Not Available
Evaporation rate	Not Available	**Explosive properties**	Not Available
Flammability	Not Applicable	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	Not Available	**Surface Tension (dyn/cm or mN/m)**	Not Available
Lower Explosive Limit (%)	Not Available	**Volatile Component (%vol)**	Not Available
Vapour pressure (kPa)	Not Available	**Gas group**	Not Available
Solubility in water (g/L)	Partly miscible	**pH as a solution**	Not Available
Vapour density (Air = 1)	Not Available	**VOC g/L**	Not Available

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7
Chemical stability	▸ Unstable in the presence of incompatible materials. ▸ Product is considered stable. ▸ Hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 TOXICOLOGICAL INFORMATION

Information on toxicological effects

Continued...

Inhaled	Inhalation of vapours or aerosols (mists, fumes), generated by the material during the course of normal handling, may produce toxic effects. The material is not thought to produce respiratory irritation (as classified by EC Directives using animal models). Nevertheless inhalation of vapours, fumes or aerosols, especially for prolonged periods, may produce respiratory discomfort and occasionally, distress. Exposure to vapours of some rare earth salts can cause sensitivity to heat, itching, and increased sensitivity of smell and taste. Other effects include inflamed airways and lung, emphysema, regional narrowing of terminal airways and cell changes. Chloroform concentrations of 1000-2000 parts per million (ppm) may cause dizziness, headache, fatigue, salivation and nausea. 4000 ppm may cause vomiting, serious disorientation and a fainting feeling. 14000-16000 ppm may cause rapid loss of consciousness. More than 20000 ppm may cause breathing failure, heart rhythm disturbances and death. If death does not immediately occur from stoppage of breathing or heart beat, it may occur later from liver and kidney damage. Corrosive acids can cause irritation of the respiratory tract, with coughing, choking and mucous membrane damage. There may be dizziness, headache, nausea and weakness. Acute intoxication by halogenated aliphatic hydrocarbons appears to take place over two stages. Signs of a reversible narcosis are evident in the first stage and in the second stage signs of injury to organs may become evident, a single organ alone is (almost) never involved. Depression of the central nervous system is the most outstanding effect of most halogenated aliphatic hydrocarbons. Inebriation and excitation, passing into narcosis, is a typical reaction. In severe acute exposures there is always a danger of death from respiratory failure or cardiac arrest due to a tendency to make the heart more susceptible to catecholamines (adrenalin)
Ingestion	The material is not thought to produce adverse health effects following ingestion (as classified by EC Directives using animal models). Nevertheless, adverse systemic effects have been produced following exposure of animals by at least one other route and good hygiene practice requires that exposure be kept to a minimum. Symptoms of chloroform ingestion include burning of the mouth, throat, gullet and stomach; diarrhoea and abdominal/lower chest pain; cold, clammy skin, blueness of the extremities and face, muscle cramps, dilated pupils, low blood pressure, blood vessel dilatation on the periphery, irregular breathing, respiratory failure, unconsciousness and liver damage. Ingestion of acidic corrosives may produce burns around and in the mouth, the throat and oesophagus. Immediate pain and difficulties in swallowing and speaking may also be evident.
Skin Contact	The material may accentuate any pre-existing dermatitis condition Skin contact with acidic corrosives may result in pain and burns; these may be deep with distinct edges and may heal slowly with the formation of scar tissue. Open cuts, abraded or irritated skin should not be exposed to this material Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected. The material may cause mild but significant inflammation of the skin either following direct contact or after a delay of some time. Repeated exposure can cause contact dermatitis which is characterised by redness, swelling and blistering.
Eye	If applied to the eyes, this material causes severe eye damage. Direct eye contact with acid corrosives may produce pain, tears, sensitivity to light and burns. Mild burns of the epithelia generally recover rapidly and completely.
Chronic	Repeated or long-term occupational exposure is likely to produce cumulative health effects involving organs or biochemical systems. There has been concern that this material can cause cancer or mutations, but there is not enough data to make an assessment. Ample evidence from experiments exists that there is a suspicion this material directly reduces fertility. Repeated or prolonged exposure to acids may result in the erosion of teeth, swelling and/or ulceration of mouth lining. Irritation of airways to lung, with cough, and inflammation of lung tissue often occurs. Long term exposure to chloroform may produce dizziness, fatigue, drowsiness, memory impairment, increased dreams, loss of appetite, palpitations, liver and kidney damage. There may be depression, confusion, negative changes in behaviour and passive mood states. Chronic abuse of chloroform may cause psychotic behaviour. Repeated exposure may also cause dullness, urinary frequency, gastrointestinal disturbances, dry mouth, thirst, headache, general unwellness, blurred vision, ‘pins and needles’, loss of sense of balance, tremors, memory and anaemia. It may be dangerous to the foetus (unborn baby). It has been shown to induce liver, kidney, intestinal and urinary bladder tumours, including cancer.

	TOXICITY	IRRITATION
Double-Tipped Ampoules for Detergents CHEMets Kit and Refill and for Detergents Instrumental Test		

	TOXICITY	IRRITATION
Double-Tipped Ampoules for Detergents CHEMets Kit and Refill and for Detergents Instrumental Test		

CHLOROFORM	The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin. **WARNING:** This substance has been classified by the IARC as Group 2B: Possibly Carcinogenic to Humans. Tenth Annual Report on Carcinogens: Substance anticipated to be Carcinogen [*National Toxicology Program: U.S. Dep. of Health & Human Services 2002*]
WATER	No significant acute toxicological data identified in literature search.
SODIUM PHOSPHATE, MONOBASIC, DIHYDRATE	Data for anhydride
SULFURIC ACID	Asthma-like symptoms may continue for months or even years after exposure to the material ends. This may be due to a non-allergic condition known as reactive airways dysfunction syndrome (RADS) which can occur after exposure to high levels of highly irritating compound. Main criteria for diagnosing RADS include the absence of previous airways disease in a non-atopic individual, with sudden onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. Other criteria for diagnosis of RADS include a reversible airflow pattern on lung function tests, moderate to severe bronchial hyperreactivity on methacholine challenge testing, and the lack of minimal lymphocytic inflammation, without eosinophilia. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. On the other hand, industrial bronchitis is a disorder that occurs as a result of exposure due to high concentrations of irritating substance (often particles) and is completely reversible after exposure ceases. The disorder is characterized by difficulty breathing, cough and mucus production.

Continued...

	WARNING: For inhalation exposure ONLY: This substance has been classified by the IARC as Group 1: **CARCINOGENIC TO HUMANS** Occupational exposures to strong inorganic acid mists of sulfuric acid:
METHYLENE BLUE	The substance is classified by IARC as Group 3: **NOT** classifiable as to its carcinogenicity to humans. Evidence of carcinogenicity may be inadequate or limited in animal testing. After i.v. administration Methylene Blue may cause nausea, vomiting, abdominal and chest pain, headache, dizziness, mental confusion, profuse sweating, and hypertension; with very high doses methaemoglobinemia and ahemolysis may occur. Methylene Blue activates a normally dormant reductase enzyme system which reduces the methylene blue to leucomethylene blue, which in turn is able to reduce methaemoglobin to haemoglobin. Methylene Blue is absorbed from the gastrointestinal tract. It is believed to be reduced in the tissues to the leuco form which is slowly excreted, mainly in the urine together with some unchanged drug. Methylene Blue imparts a blue color to urine and faeces. In large doses Methylene Blue can produce methaemoglobinaemia. Although intra-amniotic injection of Methylene Blue has been used to diagnose premature rupture of fetal membranes or to identify separate amniotic sacs in twin pregnancies, there have been several reports of hemolytic anemia (Heinz-body anemia) and hyperbilirubinemia in neonates exposed to Methylene Blue in the amniotic cavity. In most cases, exchange transfusions and/or phototherapy are required to control the jaundice. Methylene Blue should be used with caution in the treatment of toxic methemoglobinemia; high doses can cause hemolytic anemias and patients with glucose-6-phosphate dehydrogenase (G6PD) deficiencies are particularly susceptible. A rapid disappearance of cyanosis in response to Methylene Blue would be expected within one hour but might not occur if the patient has erythrocyte G6PD or NADPH-diaphorase deficiency or if methemoglobinemia is due to the ingestion of compounds such as aniline or dapsone. A second dose has been recommended if cyanosis does not disappear within 1 hour of Methylene Blue administration but results of a study in animals and of a patient with aniline poisoning indicated that an increased dosage of Methylene Blue might be of no additional benefit and could be potentially dangerous in that it could enhance Heinz body formation. Methylene Blue should not be injected s.c. as it may cause necrotic abscesses. It should not be given by intrathecal injection as neural damage has occurred. Methylene Blue should be used with caution in patients with glucose-6-phosphate dehydrogenase deficiency.

Acute Toxicity	✔	**Carcinogenicity**	✔
Skin Irritation/Corrosion	✔	**Reproductivity**	✔
Serious Eye Damage/Irritation	✔	**STOT - Single Exposure**	⊘
Respiratory or Skin sensitisation	⊘	**STOT - Repeated Exposure**	✔
Mutagenicity	⊘	**Aspiration Hazard**	⊘

Legend: ✔ *– Data available to make classification*
✘ *– Data available but does not fill the criteria for classification*
⊘ *– Data Not Available to make classification*

CMR STATUS

Not Applicable

REPROTOXIN	Double-Tipped Ampoules for Detergents CHEMets Kit and Refill and for Detergents Instrumental Test	Not Available	Not Available
CARCINOGEN	Double-Tipped Ampoules for Detergents CHEMets Kit and Refill and for Detergents Instrumental Test	Not Available	Not Available
MUTAGEN	Double-Tipped Ampoules for Detergents CHEMets Kit and Refill and for Detergents Instrumental Test	Not Available	Not Available
EYE	Double-Tipped Ampoules for Detergents CHEMets Kit and Refill and for Detergents Instrumental Test	Not Available	Not Available
RESPIRATORY	Double-Tipped Ampoules for Detergents CHEMets Kit and Refill and for Detergents Instrumental Test	Not Available	Not Available
SKIN	Double-Tipped Ampoules for Detergents CHEMets Kit and Refill and for Detergents Instrumental Test	Not Available	Not Available

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

NOT AVAILABLE

Ingredient	Endpoint	Test Duration (hr)	Effect	Value	Species	BCF
Double-Tipped Ampoules for Detergents CHEMets Kit and Refill and for Detergents Instrumental Test	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
chloroform	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
water	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
sodium phosphate, monobasic, dihydrate	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
sulfuric acid	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available
methylene blue	Not Available	Not Available	Not Available	Not Available	Not Available	Not Available

For Haloalkanes:
Atmospheric Fate: Fully, or partially, fluorinated haloalkanes released to the air can restrict heat loss from the Earth's atmosphere by absorbing infrared emissions from the surface. The major fate of haloalkanes in the atmosphere is via breakdown by hydroxyl radicals. These substances react with atmospheric ozone and nitrates, which also causes them to change, (transform). Chlorofluorocarbons, (CFC), haloalkanes can break down into chlorine atoms in the air, which also contribute to ozone destruction.
Terrestrial Fate: Biological breakdown of these substances is expected to be faster than non-biological breakdown, provided that there are sufficient substrates, nutrients and microbial populations. However, because haloalkane-degrading microorganisms are not easily found, biological breakdown of these substances is rare. Several methane-utilizing bacteria have been identified that may use haloalkanes. Biological breakdown may occur through various pathways.
Aquatic Fate: Haloalkanes do not easily break down in water. Biological breakdown of these substances is expected to be faster than non-biological breakdown, provided that there are sufficient substrates, nutrients and microbial populations. In general, alpha- and alpha, omega-chlorinated haloalkanes are de-halogenated by water. Alpha- and alpha, omega-haloalkanes with longer chains, may be de-halogenated by the addition of oxygen, (oxidized). Haloalkanes may break down in water, if certain sulfur ions are present, such as bisulfide ions.

Continued...

Ecotoxicity: Haloparaffins C12 to C18 may be incorporated into fatty acids in bacteria, yeasts, and fungi, resulting in their build up in the food chain. Haloalkanes are persistent and toxic to fish and wildlife.

Ecotoxicity:
The tolerance of water organisms towards pH margin and variation is diverse. Recommended pH values for test species listed in OECD guidelines are between 6.0 and almost 9. Acute testing with fish showed 96h-LC50 at about pH 3.5
For Chloroform:
log Kow: 1.97; Koc: 34; Half-life (hr) air: 1920; Half-life (hr) H2O surface water: 28 744; Henry's atm m3/mol: 4.35E-03; BOD 5: 0.02; ThOD: 0.33,1.346; BCF: 1.9-10.35. Drinking Water Standard - Hydrocarbon total: 10 ug/l (UK max.); Chloroform: 200 ug/l (WHO guideline); Soil Guidelines - Dutch criteria: 0.001 mg/kg.
Atmospheric Fate: Chloroform will generally evaporate to atmosphere; however, transportation may occur over long distances and photo-oxidization will occur (half-life 80 days). Chloroform is expected to exist almost entirely in the vapor phase in the atmosphere. Large amounts of chloroform in the atmosphere may be removed during precipitation; however, most chloroform removed in precipitation is likely to re-enter the atmosphere by volatilization. Long-range atmospheric transport of chloroform is possible. The major degradation process in the air involves reactions with free radicals such as hydroxyl groups. Breakdown products include phosgene and hydrogen chloride. Chloroform is more reactive in photochemical smog conditions where the approximate half-life is 11 days.
Aquatic Fate: Direct photolysis of chloroform will not be a significant degradation process in surface waters and the dominant fate process for chloroform in surface waters is volatilization. Chloroform present in surface water is expected to volatilize rapidly to the atmosphere. A half-life of 44 hours for volatilization has been estimated.
Terrestrial Fate: Spills and releases on land will evaporate quickly or leach into groundwater where they persist for long periods. Chloroform is not expected to adsorb significantly to sediment or suspended organic matter in surface waters. In soil, the dominant transport mechanism for chloroform near the surface will probably be volatilization with relatively constant rates over a wide variety of soil types.
Ecotoxicity: Chloroform is not expected to concentrate in the food chain. Chloroform does not appear to bioconcentrate in higher aquatic organisms including bluegill sunfish but, has a moderate tendency to concentrate in nonvascular aquatic plants such as green algae. Significant degradation of chloroform under aerobic conditions has been reported in tests. Under the proper conditions, chloroform appears to be much more susceptible to anaerobic biodegradation. Above certain dosage levels, chloroform becomes toxic to anaerobic and aerobic microorganisms. This is especially noticeable for biological treatment facilities that use anaerobic digestion systems, where sustained inputs with chloroform concentrations approaching 100 mg/L can all but eliminate methane fermenting bacteria.
For Cerium:
Environmental Fate: Despite their name, rare earth elements are relatively plentiful in the Earth's crust, with cerium being the 25th most abundant element. Cerium compounds include cerium oxide, cerium carbonate, and cerium chloride.
Atmospheric Fate: Cerium oxidizes very readily at room temperature, especially in moist air. Except for europium, cerium is the most reactive of the rare-earth metals.
Terrestrial Fate: Soil ◆ Cerium is found in minerals including allanite, monazite, cerite, and bastnaesite. Plants ◆ Crops can take up cerium.
Aquatic Fate: Cerium oxide and cerium carbonate are insoluble in water, while cerium chloride is soluble in water. Cerium has affinity for humic substances, which may alter its availability in aquatic systems. The substance slowly decomposes in cold water, and rapidly decomposes in hot water. Alkali solutions and dilute/concentrated acids attack the metal rapidly.
Ecotoxicity: Current fate and transport studies are limited and may not adequately address long term environmental exposure risks to both humans and other living organisms. Although cerium has low acute toxicity, long term health and environmental effects are less well understood. The form cerium takes can also influence its biological and environmental fate. Oxides and hydroxides of cerium are poorly soluble in body fluids thus are slow to clear from the organism. Cerium can affect the respiratory tract and associated lymph nodes, (inhalation exposure), and, once in the circulatory system, can partition to the skeleton, liver, kidney and spleen. Studies subjecting animals to large dosages of cerium show evidence of neurological effects, possibly due to cerium competing with calcium binding sites in the brain. Long term human expose to cerium is correlated with rare earth pneumoconiosis, but, the precise role of cerium in this disease is not well characterized.

DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
chloroform	HIGH (Half-life = 1800 days)	HIGH (Half-life = 259.63 days)
water	LOW	LOW

Bioaccumulative potential

Ingredient	Bioaccumulation
chloroform	LOW (BCF = 13)
water	LOW (LogKOW = -1.38)

Mobility in soil

Ingredient	Mobility
chloroform	LOW (KOC = 35.04)
water	LOW (KOC = 14.3)

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

Product / Packaging disposal	▸ ▸ ▸ **Dispose of according to federal, state, and local regulations.** ▸

SECTION 14 TRANSPORT INFORMATION

Labels Required

	
Marine Pollutant	NO

Continued...

Land transport (DOT)

UN number	3316
Packing group	II
UN proper shipping name	Chemical kits; First aid kits
Environmental hazard	No relevant data
Transport hazard class(es)	Class: 9
Special precautions for user	Hazard Label: 9 Special provisions: 15

Air transport (ICAO-IATA / DGR)

UN number	3316
Packing group	II
UN proper shipping name	Chemical kit; First aid kit
Environmental hazard	No relevant data
Transport hazard class(es)	ICAO/IATA Class: 9 ICAO / IATA Subrisk: Not Applicable ERG Code: 9L
Special precautions for user	Special provisions: A44 A163 Cargo Only Packing Instructions: 960 Cargo Only Maximum Qty / Pack: 10 kg Passenger and Cargo Packing Instructions: 960 Passenger and Cargo Maximum Qty / Pack: 10 kg Passenger and Cargo Limited Quantity Packing Instructions: Y960 Passenger and Cargo Limited Maximum Qty / Pack: 1 kg

Sea transport (IMDG-Code / GGVSee)

UN number	3316
Packing group	II
UN proper shipping name	CHEMICAL KIT or FIRST AID KIT
Environmental hazard	Not Applicable
Transport hazard class(es)	IMDG Class: 9 IMDG Subrisk: Not Applicable
Special precautions for user	EMS Number: F-A , S-P Special provisions: 251 340 Limited Quantities: See SP251

Transport in bulk according to Annex II of MARPOL and the IBC code

Source	Ingredient	Pollution Category
	Double-Tipped Ampoules for Detergents CHEMets Kit and Refill and for Detergents Instrumental Test	

SECTION 15 REGULATORY INFORMATION

Safety, health and environmental regulations / legislation specific for the substance or mixture

chloroform(67-66-3) is found on the following regulatory lists	"International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs","US - Alaska Limits for Air Contaminants","US - California - Proposition 65 - Priority List for the Development of MADLs for Chemicals Causing Reproductive Toxicity","US - California OEHHA/ARB - Acute Reference Exposure Levels and Target Organs (RELs)","US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)","US - California Permissible Exposure Limits for Chemical Contaminants","US - California Proposition 65 - Carcinogens","US - California Proposition 65 - No Significant Risk Levels (NSRLs) for Carcinogens","US - California Proposition 65 - Reproductive Toxicity","US - Hawaii Air Contaminant Limits","US - Idaho - Limits for Air Contaminants","US - Massachusetts - Right To Know Listed Chemicals","US - Michigan Exposure Limits for Air Contaminants","US - Minnesota Permissible Exposure Limits (PELs)","US - New Jersey Right to Know - Special Health Hazard Substance List (SHHSL): Carcinogens","US - Oregon Permissible Exposure Limits (Z-1)","US - Pennsylvania - Hazardous Substance List","US - Rhode Island Hazardous Substance List","US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants","US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants","US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants","US - Washington Permissible exposure limits of air contaminants","US - Washington Toxic air pollutants and their ASIL, SQER and de minimis emission values","US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants","US ACGIH Threshold Limit Values (TLV)","US ACGIH Threshold Limit Values (TLV) - Carcinogens","US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)","US Clean Air Act - Hazardous Air Pollutants","US CWA (Clean Water Act) - List of Hazardous Substances","US CWA (Clean Water Act) - Priority Pollutants","US CWA (Clean Water Act) - Toxic Pollutants","US EPA Carcinogens Listing","US EPCRA Section 313 Chemical List","US List of Active Substances Exempt from the TSCA Inventory Notifications (Active-Inactive) Rule","US National Toxicology Program (NTP) 14th Report Part B. Reasonably Anticipated to be a Human Carcinogen","US NIOSH Recommended Exposure Limits (RELs)","US Office of Environmental Health Hazard Assessment Proposition 65 No Significant Risk Levels (NSRLs) for Carcinogens and Maximum Allowable Dose Levels (MADLs) for Chemicals Causing Reproductive Toxicity","US

Continued...

	OSHA Permissible Exposure Levels (PELs) - Table Z1","US SARA Section 302 Extremely Hazardous Substances","US Spacecraft Maximum Allowable Concentrations (SMACs) for Airborne Contaminants","US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory","US TSCA Chemical Substance Inventory - Interim List of Active Substances","US TSCA New Chemical Exposure Limits (NCEL)"
water(7732-18-5) is found on the following regulatory lists	"US List of Active Substances Exempt from the TSCA Inventory Notifications (Active-Inactive) Rule","US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory","US TSCA Chemical Substance Inventory - Interim List of Active Substances"
sodium phosphate, monobasic, dihydrate(13472-35-0) is found on the following regulatory lists	"US List of Active Substances Exempt from the TSCA Inventory Notifications (Active-Inactive) Rule","US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory","US TSCA Chemical Substance Inventory - Interim List of Active Substances"
sulfuric acid(7664-93-9) is found on the following regulatory lists	"International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs","International Air Transport Association (IATA) Dangerous Goods Regulations - Prohibited List Passenger and Cargo Aircraft","US - Alaska Limits for Air Contaminants","US - California OEHHA/ARB - Acute Reference Exposure Levels and Target Organs (RELs)","US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)","US - California Permissible Exposure Limits for Chemical Contaminants","US - Hawaii Air Contaminant Limits","US - Idaho - Limits for Air Contaminants","US - Massachusetts - Right To Know Listed Chemicals","US - Michigan Exposure Limits for Air Contaminants","US - Minnesota Permissible Exposure Limits (PELs)","US - New Jersey Right to Know - Special Health Hazard Substance List (SHHSL): Carcinogens","US - Oregon Permissible Exposure Limits (Z-1)","US - Pennsylvania - Hazardous Substance List","US - Rhode Island Hazardous Substance List","US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants","US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants","US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants","US - Washington Permissible exposure limits of air contaminants","US - Washington Toxic air pollutants and their ASIL, SQER and de minimis emission values","US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants","US ACGIH Threshold Limit Values (TLV)","US ACGIH Threshold Limit Values (TLV) - Carcinogens","US CWA (Clean Water Act) - List of Hazardous Substances","US Drug Enforcement Administration (DEA) List I and II Regulated Chemicals","US EPCRA Section 313 Chemical List","US List of Active Substances Exempt from the TSCA Inventory Notifications (Active-Inactive) Rule","US National Toxicology Program (NTP) 14th Report Part A Known to be Human Carcinogens","US NIOSH Recommended Exposure Limits (RELs)","US OSHA Permissible Exposure Levels (PELs) - Table Z1","US SARA Section 302 Extremely Hazardous Substances","US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory","US TSCA Chemical Substance Inventory - Interim List of Active Substances"
methylene blue(61-73-4) is found on the following regulatory lists	"International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs","US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory"
Proprietary ingredient() is found on the following regulatory lists	"Not Applicable"

SECTION 16 OTHER INFORMATION

Other information

Ingredients with multiple cas numbers

Name	CAS No
Not Available	Not Available

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

The SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

Simplicity in Water Analysis

Cover Page for Safety Data Sheet

Thank you for choosing CHEMetrics, Inc. We appreciate your business. In order to best serve your needs for accurate and complete Safety Data, we offer the following information as supplemental to the attached SDS.

SDS No.: R1001

Version No.: 2.2

Product Name: CHEMets® Ampoules for Filming Amines CHEMets® Kit & Refill (R-1001) and for Detergents CHEMets® Kit & Refill (R-9401)

Component of water analysis reagent sets: Refills R-1000, R-1000E, R-9400, R-9404 and Test Kits K-1001, K-1001E, K-9400, K-9404

Product Descriptions:

CHEMets Ampoules: Sealed glass ampoules, 7 mm OD, for visual colorimetric water analysis. Each CHEMet™ ampoule contains approximately 0.25 mL of liquid reagent sealed under vacuum. The refills and kits contain 20 CHEMets ampoules.

Addendum to Section 14 Transport Information:

Shipping container markings and labels for this product, as received, may vary from the contents of section 14 of the SDS for one or both of the following reasons:

- CHEMetrics has packaged this product as Dangerous Goods in Excepted Quantities according to IATA, US DOT, and IMDG regulations.
- CHEMetrics has packaged this product as part of a test kit or reagent set composed of various chemical reagents and elected to ship as UN 3316 Chemical Kit, Hazard Class 9, Packing Group II or III.

In case of reshipment, it is the responsibility of the shipper to determine appropriate labels and markings in accordance with applicable transportation regulations.

Additional Information:

- "Print Date" = Revision Date (expressed as DD/MM/YYYY)
- Test kits and reagents sets may contain additional chemical reagents. See separate SDS(s).

4295 Catlett Road, Midland, VA 22728 ▪ P: 800.356.3072 ▪ F: 540.788.4856 ▪ www.chemetrics.com

CHEMets Ampoules for Filming Amines CHEMets Kit & Refill (R-1001) and for Detergents CHEMets Kit & Refill (R-9401)

CHEMetrics, Inc.

Chemwatch Hazard Alert Code: 3

Chemwatch: **9-92655**
SDS No: **R1001**
Version No: **2.2**
Safety Data Sheet according to OSHA HazCom Standard (2012) requirements

Issue Date: **03/11/2014**
Print Date: **12/03/2015**
Initial Date: **05/11/2014**
S.GHS.USA.EN

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Identifier

Product name	CHEMets Ampoules for Filming Amines CHEMets Kit & Refill (R-1001) and for Detergents CHEMets Kit & Refill (R-9401)
Synonyms	Not Available
Proper shipping name	Chemical kits|First aid kits
Chemical formula	Not Applicable
Other means of identification	Not Available
CAS number	Not Applicable

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	Component of water analysis reagent sets: refills R-1000, R-1000E, R-9400, R-9404 and test kits K-1001, K-1001E, K-9400, K-9404

Details of the manufacturer/importer

Registered company name	CHEMetrics, Inc.
Address	4295 Catlett Road, Midland, VA. 22728 United States
Telephone	1-540-788-9026
Fax	1-540-788-4856
Website	www.chemetrics.com
Email	technical@chemetrics.com

Emergency telephone number

Association / Organisation	ChemTel Inc.
Emergency telephone numbers	1-800-255-3924
Other emergency telephone numbers	+01-813-248-0585

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

GHS Classification	Flammable Liquid Category 3, Serious Eye Damage Category 1, STOT - SE (Narcosis) Category 3

Label elements

GHS label elements	
SIGNAL WORD	**DANGER**

Hazard statement(s)

H226	Flammable liquid and vapour
H318	Causes serious eye damage
H336	May cause drowsiness or dizziness

Precautionary statement(s) Prevention

Continued...

P101	If medical advice is needed, have product container or label at hand.
P102	Keep out of reach of children.
P103	Read label before use.
P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
P240	Ground/bond container and receiving equipment.

Precautionary statement(s) Response

P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTER/doctor/physician/first aider
P370+P378	In case of fire: Use alcohol resistant foam or fine spray/water fog for extinction.
P303+P361+P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304+P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing.

Precautionary statement(s) Storage

P403+P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P403+P233	Store in a well-ventilated place. Keep container tightly closed.

Precautionary statement(s) Disposal

P501	Dispose of contents/container to authorised chemical landfill or if organic to high temperature incineration

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
71-23-8	98	n-propanol
7732-18-5	2	water

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact	If this product comes in contact with the eyes: ▸ Immediately hold eyelids apart and flush the eye continuously with running water. ▸ Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. ▸ Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes. ▸ Transport to hospital or doctor without delay. ▸ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	If skin or hair contact occurs: ▸ Flush skin and hair with running water (and soap if available). ▸ Seek medical attention in event of irritation.
Inhalation	▸ If fumes, aerosols or combustion products are inhaled remove from contaminated area. ▸ Other measures are usually unnecessary.
Ingestion	▸ Immediately give a glass of water. ▸ First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor. ▸ If spontaneous vomiting appears imminent or occurs, hold patient's head down, lower than their hips to help avoid possible aspiration of vomitus.

Indication of any immediate medical attention and special treatment needed

To treat poisoning by the higher aliphatic alcohols (up to C7):

- Gastric lavage with copious amounts of water.
- It may be beneficial to instill 60 ml of mineral oil into the stomach.
- Oxygen and artificial respiration as needed.
- Electrolyte balance: it may be useful to start 500 ml. M/6 sodium bicarbonate intravenously but maintain a cautious and conservative attitude toward electrolyte replacement unless shock or severe acidosis threatens.
- To protect the liver, maintain carbohydrate intake by intravenous infusions of glucose.
- Haemodialysis if coma is deep and persistent. [GOSSELIN, SMITH HODGE: Clinical Toxicology of Commercial Products, Ed 5)

BASIC TREATMENT

- Establish a patent airway with suction where necessary.
- Watch for signs of respiratory insufficiency and assist ventilation as necessary.
- Administer oxygen by non-rebreather mask at 10 to 15 l/min.
- Monitor and treat, where necessary, for shock.
- Monitor and treat, where necessary, for pulmonary oedema.
- Anticipate and treat, where necessary, for seizures.

Continued...

- **DO NOT** use emetics. Where ingestion is suspected rinse mouth and give up to 200 ml water (5 ml/kg recommended) for dilution where patient is able to swallow, has a strong gag reflex and does not drool.
- Give activated charcoal.

ADVANCED TREATMENT

- Consider orotracheal or nasotracheal intubation for airway control in unconscious patient or where respiratory arrest has occurred.
- Positive-pressure ventilation using a bag-valve mask might be of use.
- Monitor and treat, where necessary, for arrhythmias.
- Start an IV D5W TKO. If signs of hypovolaemia are present use lactated Ringers solution. Fluid overload might create complications.
- If the patient is hypoglycaemic (decreased or loss of consciousness, tachycardia, pallor, dilated pupils, diaphoresis and/or dextrose strip or glucometer readings below 50 mg), give 50% dextrose.
- Hypotension with signs of hypovolaemia requires the cautious administration of fluids. Fluid overload might create complications.
- Drug therapy should be considered for pulmonary oedema.
- Treat seizures with diazepam.
- Proparacaine hydrochloride should be used to assist eye irrigation.

EMERGENCY DEPARTMENT

- Laboratory analysis of complete blood count, serum electrolytes, BUN, creatinine, glucose, urinalysis, baseline for serum aminotransferases (ALT and AST), calcium, phosphorus and magnesium, may assist in establishing a treatment regime. Other useful analyses include anion and osmolar gaps, arterial blood gases (ABGs), chest radiographs and electrocardiograph.
- Positive end-expiratory pressure (PEEP)-assisted ventilation may be required for acute parenchymal injury or adult respiratory distress syndrome.
- Acidosis may respond to hyperventilation and bicarbonate therapy.
- Haemodialysis might be considered in patients with severe intoxication.
- Consult a toxicologist as necessary. BRONSTEIN, A.C. and CURRANCE, P.L. EMERGENCY CARE FOR HAZARDOUS MATERIALS EXPOSURE: 2nd Ed. 1994

For C8 alcohols and above.
Symptomatic and supportive therapy is advised in managing patients.

SECTION 5 FIREFIGHTING MEASURES

Extinguishing media

	▸ Alcohol stable foam. ▸ Dry chemical powder. ▸ BCF (where regulations permit). ▸ Carbon dioxide. ▸ Water spray or fog - Large fires only.

Special hazards arising from the substrate or mixture

Fire Incompatibility	▸ Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result

Advice for firefighters

Fire Fighting	▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Wear full body protective clothing with breathing apparatus. ▸ Prevent, by any means available, spillage from entering drains or water course. ▸ Use water delivered as a fine spray to control fire and cool adjacent area. ▸ Avoid spraying water onto liquid pools.
Fire/Explosion Hazard	▸ Combustible. ▸ Slight fire hazard when exposed to heat or flame. ▸ Heating may cause expansion or decomposition leading to violent rupture of containers. ▸ On combustion, may emit toxic fumes of carbon monoxide (CO). ▸ May emit acrid smoke.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Minor Spills	▸ Remove all ignition sources. ▸ Clean up all spills immediately. ▸ Avoid breathing vapours and contact with skin and eyes. ▸ Control personal contact with the substance, by using protective equipment. ▸ Contain and absorb small quantities with vermiculite or other absorbent material.
Major Spills	Moderate hazard. ▸ Clear area of personnel and move upwind. ▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Wear breathing apparatus plus protective gloves. ▸ Prevent, by any means available, spillage from entering drains or water course.

	Personal Protective Equipment advice is contained in Section 8 of the MSDS.

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	▸ **DO NOT** allow clothing wet with material to stay in contact with skin ▸ Avoid all personal contact, including inhalation. ▸ Wear protective clothing when risk of exposure occurs. ▸ Use in a well-ventilated area. ▸ Prevent concentration in hollows and sumps. ▸ **DO NOT** enter confined spaces until atmosphere has been checked.

Continued...

	Wear impact- and splash-resistant eyewear. Break the ampoule tip only when it is completely immersed in sample. Breaking the tip in air may cause the glass ampoule to shatter.
Other information	▸ Store in original containers. ▸ Keep containers securely sealed. ▸ Store in a cool, dry, well-ventilated area. ▸ Store away from incompatible materials and foodstuff containers. ▸ Protect containers against physical damage and check regularly for leaks. **For optimum analytical performance, store in the dark and at room temperature.**

Conditions for safe storage, including any incompatibilities

Suitable container	▸ Metal can or drum ▸ Packaging as recommended by manufacturer. ▸ Check all containers are clearly labelled and free from leaks.
Storage incompatibility	Alcohols ▸ are incompatible with strong acids, acid chlorides, acid anhydrides, oxidising and reducing agents. ▸ reacts, possibly violently, with alkaline metals and alkaline earth metals to produce hydrogen ▸ react with strong acids, strong caustics, aliphatic amines, isocyanates, acetaldehyde, benzoyl peroxide, chromic acid, chromium oxide, dialkylzincs, dichlorine oxide, ethylene oxide, hypochlorous acid, isopropyl chlorocarbonate, lithium tetrahydroaluminate, nitrogen dioxide, pentafluoroguanidine, phosphorus halides, phosphorus pentasulfide, tangerine oil, triethylaluminium, triisobutylaluminium ▸ should not be heated above 49 deg. C. when in contact with aluminium equipment

PACKAGE MATERIAL INCOMPATIBILITIES

Not Available

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
US OSHA Permissible Exposure Levels (PELs) - Table Z1	n-propanol	n-Propyl alcohol	500 mg/m3 / 200 ppm	Not Available	Not Available	Not Available
US ACGIH Threshold Limit Values (TLV)	n-propanol	n-Propanol (n-Propyl alcohol)	100 ppm	Not Available	Not Available	TLV® Basis: Eye & URT irr
US NIOSH Recommended Exposure Limits (RELs)	n-propanol	Ethyl carbinol, 1-Propanol, n-Propanol, Propyl alcohol	500 mg/m3 / 200 ppm	625 mg/m3 / 250 ppm	Not Available	[skin]

EMERGENCY LIMITS

Ingredient	Material name	TEEL-1	TEEL-2	TEEL-3
n-propanol	Propyl alcohol, n-; (n-Propanol)	250 ppm	250 ppm	4000 ppm

Ingredient	Original IDLH	Revised IDLH
n-propanol	4,000 ppm	800 ppm
water	Not Available	Not Available

Exposure controls

Appropriate engineering controls	Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection. The basic types of engineering controls are: Process controls which involve changing the way a job activity or process is done to reduce the risk. Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment. Ventilation can remove or dilute an air contaminant if designed properly.
Personal protection	
Eye and face protection	▸ Safety glasses with side shields. ▸ Chemical goggles. ▸ Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience.
Skin protection	See Hand protection below
Hands/feet protection	The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application. The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and.has to be observed when making a final choice. Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: ▸ frequency and duration of contact, ▸ chemical resistance of glove material, ▸ glove thickness and ▸ dexterity

Continued...

	Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739, AS/NZS 2161.1 or national equivalent).
Body protection	See Other protection below
Other protection	▸ Overalls. ▸ P.V.C. apron. ▸ Barrier cream. ▸ Skin cleansing cream.
Thermal hazards	Not Available

Recommended material(s)

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:
"Forsberg Clothing Performance Index".
The effect(s) of the following substance(s) are taken into account in the ***computer-generated*** selection:
CHEMets Ampoules for Filming Amines CHEMets Kit & Refill (R-1001) and for Detergents CHEMets Kit & Refill (R-9401)

Material	CPI
NEOPRENE	A
VITON	B
BUTYL	C
NATURAL RUBBER	C
NATURAL+NEOPRENE	C
NEOPRENE/NATURAL	C
NITRILE	C
NITRILE+PVC	C
PVA	C
PVC	C
TEFLON	C

* CPI - Chemwatch Performance Index
A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion
NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -
* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

Respiratory protection

Type A Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

Where the concentration of gas/particulates in the breathing zone, approaches or exceeds the "Exposure Standard" (or ES), respiratory protection is required.
Degree of protection varies with both face-piece and Class of filter; the nature of protection varies with Type of filter.

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 10 x ES	Air-line*	A-2	A-PAPR-2 ^
up to 20 x ES	-	A-3	-
20+ x ES	-	Air-line**	-

* - Continuous-flow; ** - Continuous-flow or positive pressure demand
^ - Full-face
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	colorless, may contain black particles

Physical state	Liquid	**Relative density (Water = 1)**	0.8
Odour	Characteristic	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	413
pH (as supplied)	Not Available	**Decomposition temperature**	Not Available
Melting point / freezing point (°C)	-127	**Viscosity (cSt)**	Not Available
Initial boiling point and boiling range (°C)	97	**Molecular weight (g/mol)**	Not Available
Flash point (°C)	23	**Taste**	Not Available
Evaporation rate	Not Available	**Explosive properties**	Not Available
Flammability	Flammable.	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	13.5	**Surface Tension (dyn/cm or mN/m)**	Not Available
Lower Explosive Limit (%)	2.1	**Volatile Component (%vol)**	Not Available
Vapour pressure (kPa)	Not Available	**Gas group**	Not Available
Solubility in water (g/L)	Miscible	**pH as a solution**	8.5
Vapour density (Air = 1)	Not Available	**VOC g/L**	Not Available

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7

Continued...

Chemical stability	▸ Unstable in the presence of incompatible materials. ▸ Product is considered stable. ▸ Hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 TOXICOLOGICAL INFORMATION

Information on toxicological effects

Inhaled	The material is not thought to produce adverse health effects or irritation of the respiratory tract (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting. Inhalation of vapours may cause drowsiness and dizziness. This may be accompanied by sleepiness, reduced alertness, loss of reflexes, lack of co-ordination, and vertigo. Subjects unacclimatised to n-propanol exposure experienced mild irritation of the eyes, nose and throat at a concentration of 400 parts per million.
Ingestion	Overexposure to non-ring alcohols causes nervous system symptoms. These include headache, muscle weakness and inco-ordination, giddiness, confusion, delirium and coma. The material has **NOT** been classified by EC Directives or other classification systems as "harmful by ingestion". This is because of the lack of corroborating animal or human evidence.
Skin Contact	The material is not thought to produce adverse health effects or skin irritation following contact (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting. The calculated human skin permeability coefficient for n-propanol by the U.S. Environment Protection Agency is 1.3 x 10-3 cm/hr. Most liquid alcohols appear to act as primary skin irritants in humans. Significant percutaneous absorption occurs in rabbits but not apparently in man.
Eye	If applied to the eyes, this material causes severe eye damage.
Chronic	Long-term exposure to the product is not thought to produce chronic effects adverse to the health (as classified by EC Directives using animal models); nevertheless exposure by all routes should be minimised as a matter of course. N-propanol is shown to cause dose dependent severe liver injury, malignant tumours (blood and liver cancers) and benign tumours in rats. There has been some concern that this material can cause cancer or mutations but there is not enough data to make an assessment.

CHEMets Ampoules for Filming Amines CHEMets Kit & Refill (R-1001) and for Detergents CHEMets Kit & Refill (R-9401)	**TOXICITY**	**IRRITATION**
CHEMets Ampoules for Filming Amines CHEMets Kit & Refill (R-1001) and for Detergents CHEMets Kit & Refill (R-9401)	**TOXICITY**	**IRRITATION**

CHEMets Ampoules for Filming Amines CHEMets Kit & Refill (R-1001) and for Detergents CHEMets Kit & Refill (R-9401)	No significant acute toxicological data identified in literature search. The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis. The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.
N-PROPANOL	The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis. The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.
WATER	No significant acute toxicological data identified in literature search.

Acute Toxicity	⊘	**Carcinogenicity**	⊘
Skin Irritation/Corrosion	⊘	**Reproductivity**	⊘
Serious Eye Damage/Irritation	✔	**STOT - Single Exposure**	✔
Respiratory or Skin sensitisation	⊘	**STOT - Repeated Exposure**	⊘
Mutagenicity	⊘	**Aspiration Hazard**	⊘

Legend: ✔ *– Data required to make classification available*
✘ *– Data available but does not fill the criteria for classification*
⊘ *– Data Not Available to make classification*

CMR STATUS

SKIN	n-propanol	US - Hawaii Air Contaminant Limits - Skin Designation|US NIOSH Recommended Exposure Limits (RELs) - Skin|US - Washington Permissible exposure limits of air contaminants - Skin|US - California Permissible Exposure Limits for Chemical Contaminants - Skin	X|[skin]|S

Continued...

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

For n-Propanol: log Kow: 0.25-0.34;
Half-life (hr) air: 6.7;
Half-life (hr) H2O surface water: 6.5;
Henry's atm m3 /mol: 6.85E-06;
BOD 5: 1.43-1.6 g O2/g;
BOD 20: <2 g O2/g;
COD : 91%;
ThOD : 1.8 g;
O2/gBCF: 0.7.
Aquatic Fate: High biochemical oxygen demand and a potential to cause oxygen depletion in aqueous systems, a low potential to affect aquatic organisms, a low potential to affect secondary waste treatment microbial metabolism. n-Propanol is expected to biodegrade and is not expected to persist for long periods in aquatic environments. When diluted with a large amount of water, n-propanol is not expected to have a significant impact.
DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
n-propanol	LOW	LOW
water	LOW	LOW

Bioaccumulative potential

Ingredient	Bioaccumulation
n-propanol	LOW (LogKOW = 0.25)
water	LOW (LogKOW = -1.38)

Mobility in soil

Ingredient	Mobility
n-propanol	HIGH (KOC = 1.325)
water	LOW (KOC = 14.3)

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

Product / Packaging disposal	**Dispose of according to federal, state, and local regulations.**

SECTION 14 TRANSPORT INFORMATION

Labels Required

	
Marine Pollutant	NO

Land transport (DOT)

UN number	3316
Packing group	II
UN proper shipping name	Chemical kits; First aid kits
Environmental hazard	No relevant data
Transport hazard class(es)	Class: 9
Special precautions for user	Special provisions: 15

Air transport (ICAO-IATA / DGR)

UN number	3316
Packing group	II
UN proper shipping name	Chemical kit †; First aid kit †
Environmental hazard	No relevant data
Transport hazard class(es)	ICAO/IATA Class: 9 ICAO / IATA Subrisk: Not Applicable ERG Code: 9L

Continued...

Special precautions for user	Special provisions	A44 A163
	Cargo Only Packing Instructions	960
	Cargo Only Maximum Qty / Pack	10 kg
	Passenger and Cargo Packing Instructions	960
	Passenger and Cargo Maximum Qty / Pack	10 kg
	Passenger and Cargo Limited Quantity Packing Instructions	Y960
	Passenger and Cargo Limited Maximum Qty / Pack	1 kg

Sea transport (IMDG-Code / GGVSee)

UN number	3316
Packing group	II
UN proper shipping name	CHEMICAL KIT or FIRST AID KIT
Environmental hazard	Not Applicable
Transport hazard class(es)	IMDG Class: 9 IMDG Subrisk: Not Applicable
Special precautions for user	EMS Number: F-A , S-P Special provisions: 251 340 Limited Quantities: See SP251

Transport in bulk according to Annex II of MARPOL 73 / 78 and the IBC code

Source	Ingredient	Pollution Category
IMO MARPOL 73/78 (Annex II) - List of Noxious Liquid Substances Carried in Bulk	n-propanol	Y

SECTION 15 REGULATORY INFORMATION

Safety, health and environmental regulations / legislation specific for the substance or mixture

n-propanol(71-23-8) is found on the following regulatory lists	"US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants","US - Idaho - Limits for Air Contaminants","US - Hawaii Air Contaminant Limits","US - California Permissible Exposure Limits for Chemical Contaminants","US ACGIH Threshold Limit Values (TLV) - Carcinogens","US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants","US - Oregon Permissible Exposure Limits (Z-1)","US - Michigan Exposure Limits for Air Contaminants","US NIOSH Recommended Exposure Limits (RELs)","US - Alaska Limits for Air Contaminants","US - Washington Permissible exposure limits of air contaminants","US - Minnesota Permissible Exposure Limits (PELs)","US ACGIH Threshold Limit Values (TLV)","US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants","US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory","US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants","US OSHA Permissible Exposure Levels (PELs) - Table Z1"
water(7732-18-5) is found on the following regulatory lists	"US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory"

SECTION 16 OTHER INFORMATION

Other information

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references

The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.