Lower Charles River Illicit Discharge Detection & Elimination (IDDE) Protocol Guidance for Consideration - November 2004

Purpose/Goal

This document provides a common framework from which lower Charles River communities can develop and implement a comprehensive plan to identify and eliminate dry and wet weather illicit discharges to their separate storm sewer systems. Adopted from BWSC (2004) and Pitt (2004), the protocol relies primarily on visual observations and the use of field test kits and portable instrumentation during dry weather to complete a thorough inspection of the communities' storm sewers in a prioritized manner. The protocol is applicable to most typical storm sewer systems, however modifications to materials and methods may be required to address situations such as open channels, systems impacted by sanitary sewer overflows or sanitary sewer system under drains, or situations where groundwater or backwater conditions preclude adequate inspection. The primary focus of the protocol is sanitary waste, however, toxic and nuisance discharges may also be identified. Implementation of the protocol would satisfy the relevant conditions under Minimum Control Measure No. 3 (IDDE) of the communities' NPDES Small MS4 General Permit.

Drainage Area/Outfall Prioritization

Areas to consider for prioritizing investigative work include:

- Areas suspected to have significant problems (documented by EPA, the community, or others)
- Direct discharges to sensitive or critical waters (e.g. water supplies, town beach)
- Areas with inadequate sewer LOS or subject of numerous/chronic customer complaints
- Areas served by common manholes or underdrains
- Remaining areas prioritized through an outfall screening & ranking process

Drainage Area Investigations

1. Public Notification/Outreach Program

Provide letter/mailer to residents and building owners located within subject drainage basin and/or sewershed notifying them of scope and schedule of investigative work, and the potential need to gain access to their property to inspect plumbing fixtures. Where necessary, notification of property owners through letter, door hanger, or otherwise will be required to gain entry. Assessors records will provide property owner identification.

2. Field verification and correction of subarea storm sewer mapping

Adequate storm and sanitary sewer mapping is a prerequisite to properly execute an illicit discharge detection and elimination program. As necessary and to the extent possible,

infrastructure mapping should be verified in the field and corrected prior to investigations. This effort affords an opportunity to collect additional information such as latitude and longitude coordinates using a global position system (GPS) unit if so desired. To facilitate subsequent investigations (see Part 5. below), tributary area delineations should be confirmed and junction manholes should be identified during this process. Orthophoto coverages (available from source sources as MassGIS, MapQuest, and TerraServer) will also facilitate investigations by providing building locations and land use features.

3. Infrastructure cleaning requirements

To facilitate investigations, storm drain infrastructure should be evaluated for the need to be cleaned to remove debris or blockages that could compromise investigations. Such material should be removed to the extent possible prior to investigations, however, some cleaning may occur concurrently as problems manifest themselves.

4. Dry weather criteria

In order to limit or remove the influence of stormwater generated flows on the monitoring program, antecedent dry weather criteria need to be established. An often used rule of thumb is to wait two (2) days after cessation of a precipitation event prior to monitoring activities. This duration can be adjusted to shorter or longer periods dependent upon the relative extent, slope, and storage of the system under investigation.

5. Manhole inspection and flow monitoring methodology

Beginning at the uppermost junction manhole(s) within each tributary area, drainage manholes are opened and inspected for visual evidence of contamination after antecedent dry weather conditions are satisfied (e.g. after 48 hours of dry weather). Where **flow is observed**, and determined to be contaminated through visual observation (e.g. excrement or toilet paper present) or field monitoring (see Parts 5. & 6. below), the tributary storm sewer alignment is isolated for investigation (e.g. dye testing, CCTV; see Part 7. below). No additional downstream manhole inspections are performed unless the observed flow is determined to be uncontaminated or until all upstream illicit connections are identified and removed. Where **flow is not observed** in a junction manhole, all inlets to the structure are partially dammed for the next 48 hours when no precipitation is forecasted. Inlets are damned by blocking a minimal percentage (approximately 20% +/- depending on pipe slope) of the pipe diameter at the invert using sandbags, caulking, weirs/plates, or other temporary barriers. The manholes are thereafter reinspected (prior to any precipitation or snow melt) for the capture of periodic or intermittent flows behind any of the inlet dams. The same visual observations and field testing is completed on any captured flow, and where contamination is identified, abatement is completed prior to inspecting downstream manholes.

In addition to documenting investigative efforts in written and photographic form, it is recommended that information and observations regarding the construction, condition, and operation of the structures also be compiled.

6. Field Measurement/Analysis:

Where flow is observed and does not demonstrate obvious olfactory evidence of contamination, samples are collected and analyzed with field instruments identified in Table 1. Measured values are then compared with benchmark values using the flow chart in Figure 1 to determine the likely prominent source of the flow. This information facilitates the investigation of the upstream stormsewer alignment described in Part 7. Benchmark values may be refined over the course of investigations when compared with the actual incidences of observed flow sources.

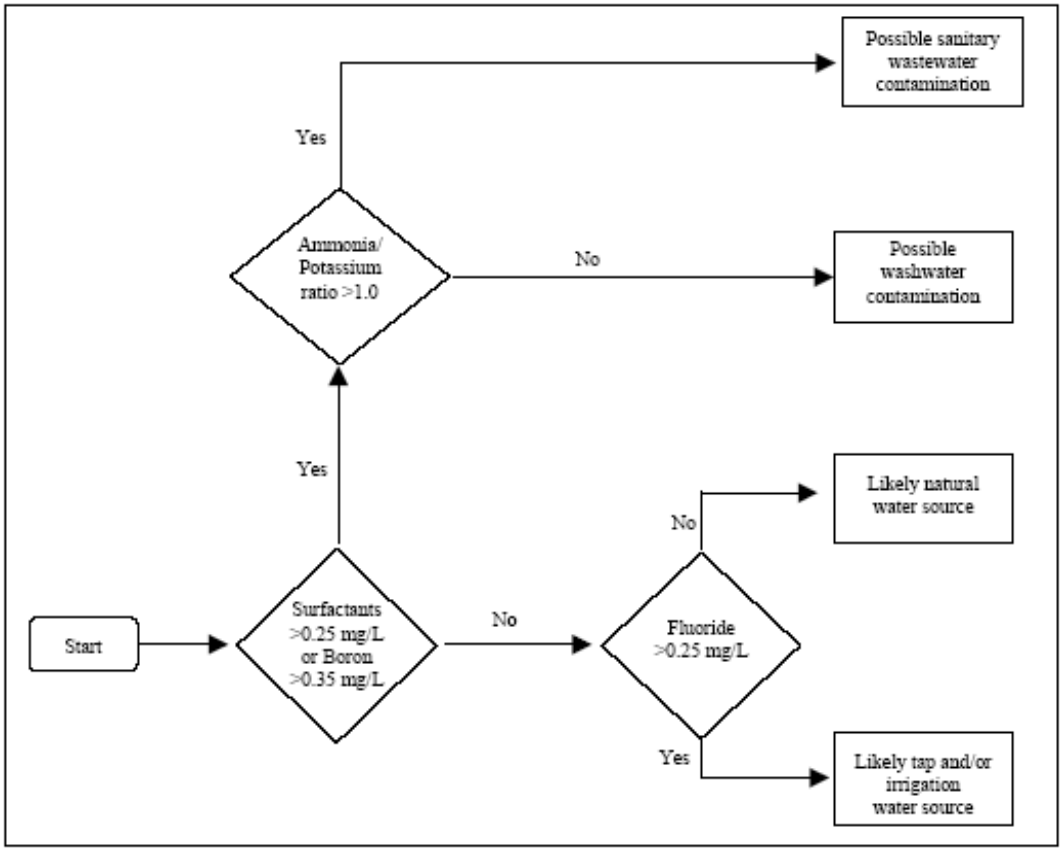
In those manholes where periodic or intermittent flow is captured through damming inlets, additional laboratory testing (e.g. toxicity, metals, etc.) should be considered where an industrial batch discharge is suspected for example.

Table 1 - Field Measurements, Benchmarks, and Instrumentation

Analyte	Benchmark	Instrumentation[1]
Surfactants (as MBAS)	>0.25 mg/L	MBAS Test Kit (e.g. CHEMetrics K-9400)
Potassium (K)	(ratio below)	Portable Ion Meter (e.g. Horiba Cardy C-131)
Ammonia (NH_3)	$NH_3/K > 1.0$	Portable Colorimeter or Photometer (e.g. Hach DR/890, CHEMetrics V-2000)
Fluoride (F)	>0.25 mg/L	Portable Colorimeter or Photometer (e.g. Hach DR/890, CHEMetrics V-2000)
Temperature	Abnormal	Thermometer
pH	Abnormal	pH Meter

[1] Instrumentation manufacturers and models provided for informational purposes only. Mention of specific products does not constitute or imply EPA endorsement of same.

Figure 1. Flow Chart for Determining Likely Source of Discharge (Pitt, 2004)



7. Isolation and confirmation of illicit sources

Where field monitoring has identified storm sewer alignments to be influence by sanitary flows or washwaters, the tributary area is isolated for implementation of more detailed investigations. Additional manholes along the tributary alignment are inspected to refine the longitudinal location of potential contamination sources (e.g. individual or blocks of homes). Targeted internal plumbing inspections/dye testing or CCTV inspections are then employed to more efficiently confirm discrete flow sources.

Post-Removal Confirmation

After completing the removal of illicit discharges from a subdrainage area and before beginning the investigation of downstream areas, the subdrainage area is reinspected to verify corrections. Depending on the extent and timing of corrections, verification monitoring can be done at the initial junction manhole or the closet downstream manhole to each correction. Verification is accomplished by using the same visual inspection, field monitoring, and damming techniques as described above.

Work Progression & Schedule

Since the IDDE Protocol requires the verified removal of illicit discharges prior to progressing downstream through the storm sewer system, preparations should be made to initiate investigations in other subareas to facilitate progress while awaiting completion of corrections. Since work progress will be further constrained by the persistence of precipitation and snow melt events, consideration must be given to providing adequate staffing and equipment resources to perform concurrent investigations in several subareas.

Program Evaluation

The progress of the IDDE Program should be evaluated by tracking metrics such as:

- Number/% of manholes/structures inspected
- Number/% of outfalls screened
- Number/% of illicit discharges identified through:
    - visual inspections
    - field testing results
    - temporary damming
- Number/% of homes inspected/dye tested
- Footage/% of pipe inspected by CCTV
- Number/% of illicit discharges removed
- Estimated flow/volume of illicit discharges removed
- Footage and location of infrastructure jetting/cleaning required
- Infrastructure defects identified and repaired
- Water main breaks identified and repaired
- Cost of illicit discharge removals (total, average unit costs)

References Cited

Boston Water & Sewer Commission, 2004, *A systematic Methodology for the Identification and Remediation of Illegal Connections.* 2003 Stormwater Management Report, chap. 2.1.

Pitt, R. 2004 *Methods for Detection of Inappropriate Discharge to Storm Drain Systems. Internal Project Files*. Tuscaloosa, AL, *in* The Center for Watershed Protection and Pitt, R., *Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments*: Cooperative Agreement X82907801-0, U.S. Environmental Protection Agency, variously paged. Available at: http://www.cwp.org.

Instrumentation Cited (Manufacturer URLs)

MBAS Test Kit - CHEMetrics K-9400: http://www.chemetrics.com/Products/Deterg.htm

Portable Photometer - CHEMetrics V-2000: http://www.chemetrics.com/v2000.htm

Portable Colorimeter - Hach DR/890: http://www.hach.com/

Portable Ion Meter: Horiba Cardy C-131: http://www.wq.hii.horiba.com/c.htm