EPA Region 1 MS4 Stormwater General Permits and LID Training Clinic

Track B: Technical

New Illicit Discharge Detection & Elimination (IDDE) and Monitoring Requirements

MWRA

Chelsea, MA

April 27, 2011

Horsley Witten Group, Inc.

Topics to cover

- What is IDDE?
- What's new in the draft permit?
- System mapping
- Catchment delineation and prioritization
- Outfall inventory
- Written IDDE Program
- Systematic procedures for locating and removing sources
- Outfall monitoring
- Resources

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What is an illicit discharge?

- Any discharge to MS4 storm sewer that is not stormwater
  - leaking sanitary sewers or water mains
  - illegal sewage connections
  - illegal floor drain connections
  - seasonal draining of swimming pools
  - break-out from failing septic systems
  - spills and dumping
- Flows can be continuous, intermittent, or transitory
- Direct or indirect entry into system

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What non-stormwater discharges may be excluded?

- Excluded sources *(Section 1.4 of Draft MA North Coastal Permit)* may include:
  - Flows from fire fighting
  - Water line flushing
  - Uncontaminated pumped groundwater
  - Flow from footing drains
  - Runoff from lawn irrigation
- Unless identified as significant pollutant
- Permittees to determine and document if these discharges are not significant

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Common Sources of Illicit Discharges

- Illegal dumping practices (95%)
- Broken sanitary sewer line (81%)
- Cross-connections (71%)
- Connection of floor drains to storm sewer (62%)
- Sanitary sewer overflows (52%)
- Inflow / infiltration (48%)
- Straight pipe sewer discharge (38%)
- Failing septic systems (33%)
- Improper RV/boat waste disposal (33%)
- Pump station failure (14%)

% of programs reporting confirming sources from CWP 2003 survey of IDDE programs

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Your IDDE program should already include:

- Regulatory authority to prohibit discharges and implement enforcement actions
- MS4 map showing all outfall locations and receiving waters
- IDDE plan with procedures to locate discharges, sources, and document removal
- Education of town employees and public

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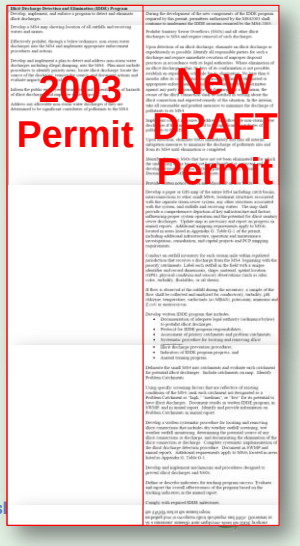
What's New in the Draft Permit

- SSO inventory
- Updates and additional detail to storm sewer map
- Outfall inventory
- Detailed written IDDE program/procedures
- Catchment prioritization & assessment
- Detection and elimination procedures and milestones
- Annual training
- Additional reporting requirements
- Outfall monitoring
- Additional requirements for Charles River/TMDL watersheds

Excerpt: EPA's summary table of major permit changes



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What's New: SSOs

2.4.4.5 Inventory of known Sanitary Sewer Overflows (SSOs) discharging to the MS4

- Locations of SSOs;
- Dates & times of known discharges;
- Estimated discharge volume;
- Description with known or suspected sources;
- Mitigation & corrective measures planned, implemented, or implementation schedule established

- Complete inventory within **60 days** of effective permit
- Report new SSOs to EPA/state & fix immediately
- Report progress and update inventory annually

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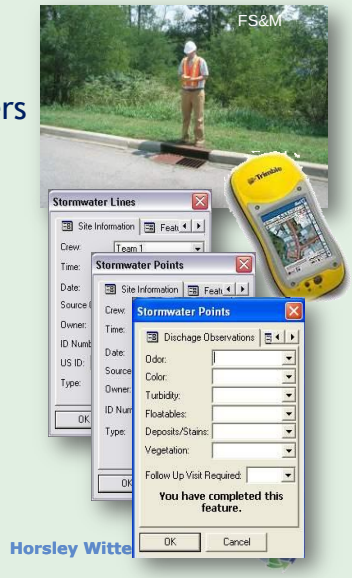
What's New: System Mapping

2.4.4.6 MS4 system maps must also include:

- All outfalls and named receiving waters
- Outfall catchments
- Storm drainage infrastructure (catch basins, manholes, pipes, BMPs)
- Key sanitary sewer info including combined sewers, if any
- Recommended:
  - Additional water resource information;
  - water table
  - topography
  - O&M and inspection/remediation info



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What's New: System Mapping

2.4.4.6(d) Additional mapping requirements for MS4s in the **Charles River/stormwater TMDLs Watersheds:**

- Infrastructure
  - sewer flow direction and type; select rim and invert elevations
  - separate storm sewer catchments; sanitary & combined sewersheds
  - sewer alignments; lift stations; etc
- O&M, Investigations/Remediation, Capital Projects
  - Sewer cleaning and repair; septic system information; planned roadway or utility projects
- Phosphorus Control Mapping Components
  - Land uses; soils; parking lots >5,000 sf; greenspace where turf is fertilized; municipal land for potential retrofits; nutrient loading locations

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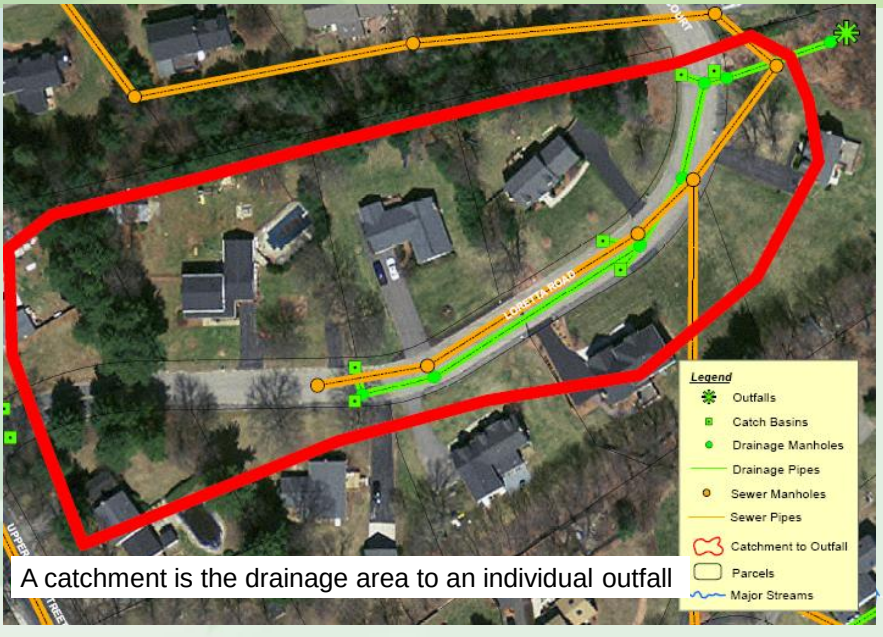
Catchment Delineation: Franklin, MA



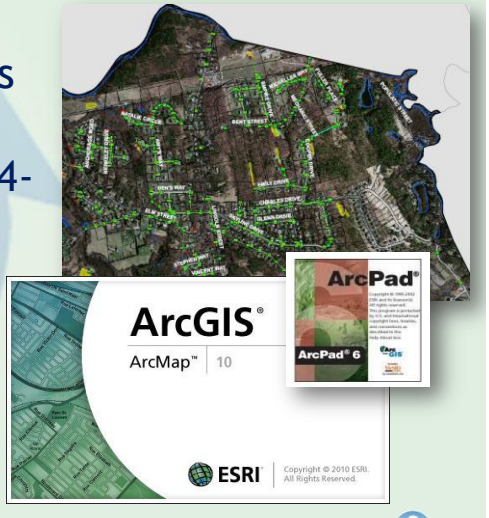
A catchment is the drainage area to an individual outfall

The importance of Connectivity

What's New: System Mapping

Schedule:

- Complete within 2 yrs of permit (3 years if started not under MS4-2003)
- Annual reporting of status of map completion



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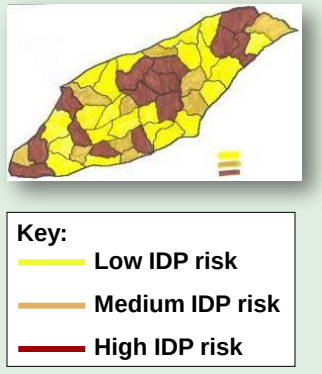
What's New: Catchment Assessments

2.4.4.8(c)(ii) Use screening factors to prioritize/assess illicit potential:

- Past discharge complaints/reports
- Poor dry weather water quality
- Density of generating sites
- Outfall density
- Age of surrounding development
- Past sewer conversions (from septic)
- Former combined sewers
- Density of older industrial operations
- Density of aging or failing sewers or septic systems
- Presence of culverted streams
- Water resource priorities



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Prioritize Catchments for Systematic Field Investigation

- Early ID of Problem Catchments
  - Where there are known or suspected illicits
  - Continue and/or initiate isolation and removal procedures
- High, medium, low risk catchments
  - Conduct outfall inventories and catchment investigations of drainage network starting in high risk catchments

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What's New: Outfall Inventory

2.4.4.7 Inventory of all MS4 outfalls

- Location and condition;
- Each outfall labeled with a unique identifier;
- 25% of all outfalls inventoried in each year during permit years 2-5; beginning with priority catchments; and
- Sampling of outfalls with dry weather flow.

Information collected under MS4-2003 permit can possibly be used to fulfill requirement if consistent with part 2.4.4.7

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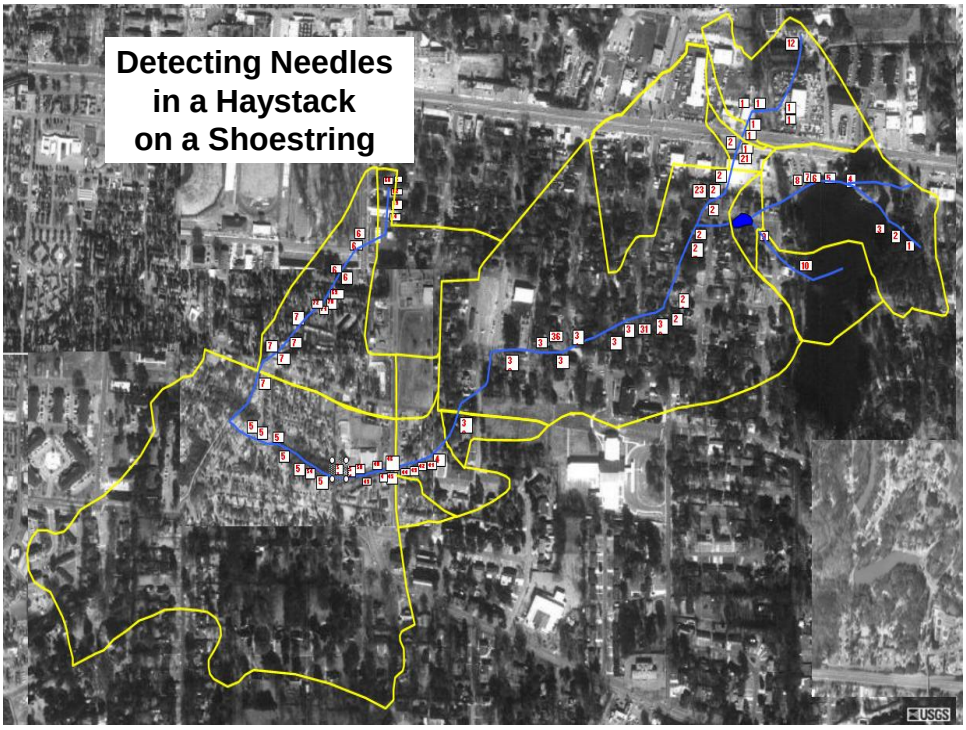
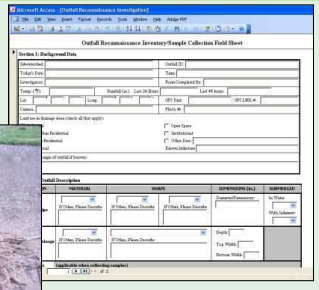


Most Common Approach to Outfall Inventory

- **Visual inspection** of the outfall
- **Qualitative** assessment of any flow present, including examination of water color, odor, turbidity, floatables, & sedimentation
- Follow-up grab sample for **quantitative** analysis, either using more sophisticated field equipment or a laboratory

Physical Indicators for Flowing & Non-Flowing

- Outfall Damage
- Deposits/Stains
- Abnormal Vegetation
- Poor Pool Quality
- Pipe Benthic Growth
- Floatables
- Turbidity
- Odor
- Color
- Flow rate




Sampling at Flowing Outfalls

2.4.4.7 (c)

- pH
- temperature
- surfactants
- ammonia
- conductivity
- turbidity
- chlorine
- potassium
- bacteria




Special Indicators for Intermittent Discharges

- Optical brightener monitoring
- Toxicity testing
- Outfall damming (caulk dams)
- Pool sampling
- Odd hour sampling
- Automatic samplers

What's New: Written IDDE Program

2.4.4.8 complete written program (YR 1)

a) Legal authority *(should be done already; by YR 4 for those not under MS4-2003)*
b) Protocol to clearly identify responsibilities for ID elimination
c) Assessment of Priority and Problem catchments
d) Systematic procedures for locating and removing illicit connections
e) Illicit discharge prevention procedures
f) Indicators of IDDE Program progress
g) Required program milestones
h) Annual employee training

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What's New: Locating Sources

- MS4-2003 left it up to permittees
- Outfall investigations not enough
- Draft permit requires:
  - Systematic stormdrain network investigation
  - Opening and inspection of manholes in all MS4 catchments
  - Sampling of flows
  - Measures to isolate source
- Documentation

What's New: Locating Sources

2.4.8.8 (d)Draft permit explicitly stipulates minimum procedures:

- Systematic inspection of junction manholes in continuous upstream or downstream manner
- Key junction manholes must be opened and visual/olfactory inspections performed
- If flow is observed, sample must be taken for ammonia and surfactants, at minimum
- Inspect more manholes, as necessary
- Isolate to a single pipe between two manholes

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Manholes

- Junction manhole = a manhole or structure with two or more inlets accepting flow from two or more MS4 alignments
- Key junction manholes = junction manholes that can represent one or more junction manholes without compromising adequate implementation of IDDE program

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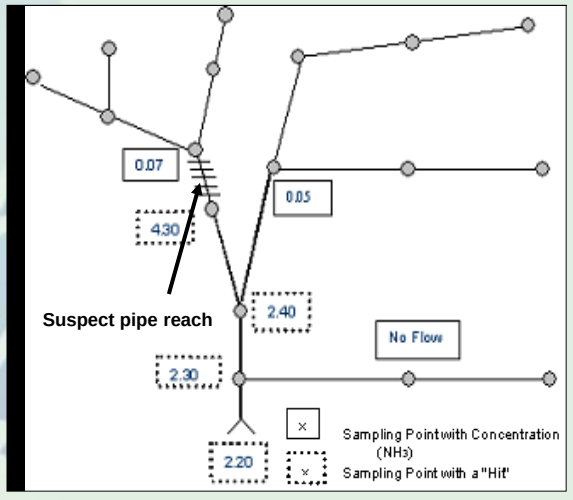
Isolating discharges in the stormdrain network:

Must sample flows with field kits for ammonia and surfactants at a minimum

Recommended screening thresholds:

≥ 0.25 mg/L surfactants

≥ 0.5 mg/L NH_3



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What's New: Locating Sources

For MS4s in the **Charles River**/stormwater TMDL **Watersheds**, additional procedures include:

- Determine if storm drains must be cleaned prior to investigations;
- Where no dry-weather flow is observed in a suspected junction manholes, dam inflow pipes for 48 hours to capture intermittent flows; and
- Where dry-weather flow is observed, samples taken
  - Under dry weather criteria (< 0.1 inches rain within 24 hour period)
  - May require additional parameter analysis if below surfactant threshold

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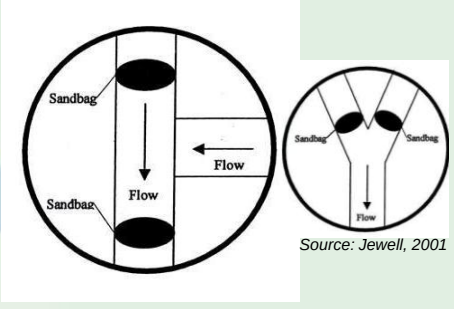
Isolating transitory flows in the stormdrain network:

In suspect manholes

- Preferred: Placement of sandbags within key junction manholes to temporarily dam flows (48 hours)
- Anchor OBM absorbent pads in storm drains to capture dry weather flows and determine presence of flow and/or detergents



Source: Jewell, 2001


Source: R. Pitt

Source: Sargent and Castonguay, 1998

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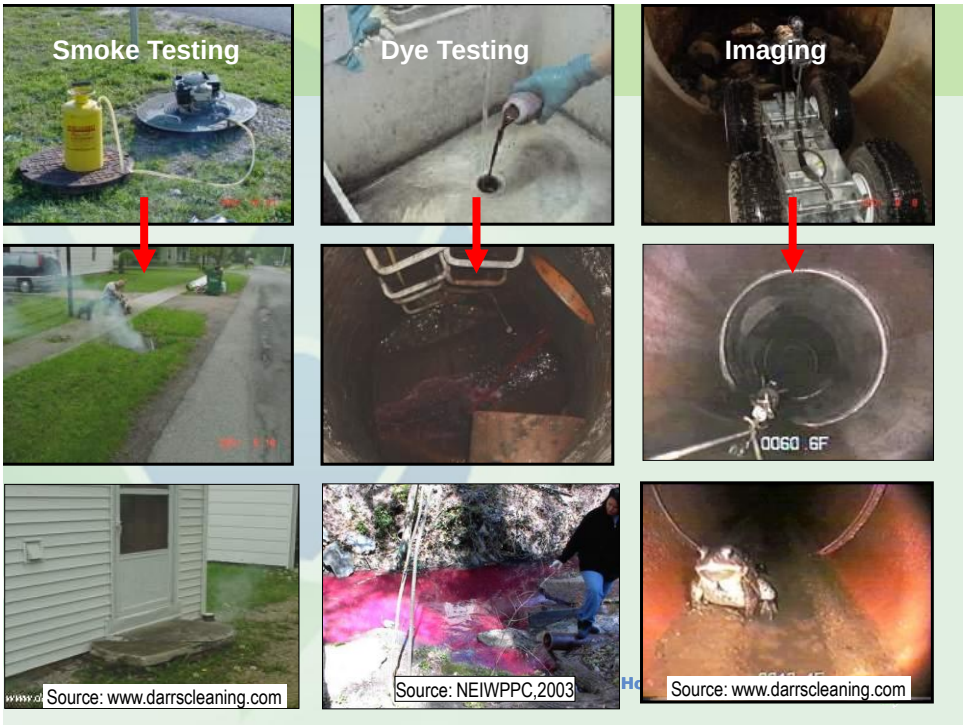
Smoke Testing
Dye Testing
Imaging
Source: www.darrscleaning.com
Source: NEIWPPC,2003
Source: www.darrscleaning.com


Obstruction
Cross-Connection
Illicit Discharge
Groundwater Infiltration

Additional Upland Analysis

- Use MS4 mapping to pinpoint likely generating sources
- Infrared Photography with gray or color scales representing differences in temperature and emissivity of objects used to locate sewage discharge

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"Lucky IDDE" (Tom Lawrence, City of Memphis, TN)

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Catchment Assessment Milestones

2.4.4.8(g) MS4 IDDE investigations:

- Problem catchments and "high" &"medium" risk priority catchments
  - 50% completed by Yr 3
  - 100% completed by Yr 5
- "Low" priority risk catchments
  - as soon as possible, but no later than Yr 7

2.4.4.8(d)(vi)(7) In Charles River/TMDL watersheds:

- at least 50% of MS4 junction manholes, or 50% of all MS4 catchments by Yr 3

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Proposed IDDE Milestones	Years from Effective Permit						
	60 days	1	2	3	4	5	7
Completion of known SSO inventory	x						
Filing of annual report—due August 1		x	x	x	x	x	x
• Completed ID risk assessment /prioritization for all MS4 catchments • Completed inventory of Problem Catchments • Submittal of written Systematic Procedures for Locating & Removing Illicit Connections		x					
• 25% of the outfall inventory completed • Completion of MS4 Mapping			x				
• 50% of the outfall inventory completed • 50% of Problem Catchments and catchments with High or Medium ID risk investigated				x			
75% of the outfall inventory completed					x		
• 100% of the outfall inventory completed • 100% of Problem Catchments and catchments with High or Medium ID risk investigated						x	
Investigation protocol completed in all catchments							x

Discharge Removal

When the source is identified and confirmed:

- Record location and source
- Describe discharge and estimated flow volume
- Method and date of discovery
- Date of removal, repair, or enforcement action

- Eliminate discharge within 30 days of detection *(Draft Permit Section 2.4.4.2)*
  - *Enforcement actions to be taken within 6 months*
- Report annually

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Methods to Fix and Confirm?

Fixing:

- Varies depending on type and location
- Develop a pre-approved list of certified/licensed contractors
- Use in-house contractors/staff to repair as part of routine maintenance activities

Confirming:

- At source
- Downstream (sampling or sand bagging to ensure only local discharge present)
- Dye testing if internal plumbing or lateral connection

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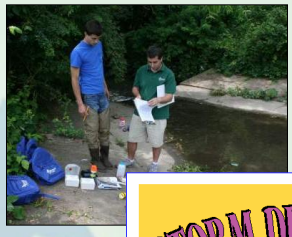
Illicit Discharge Prevention and Employee Training

- 2.4.4.8 (h) conduct annual employee training on how to recognize illicit discharges and SSOs
- 2.4.4.8(e) develop procedures to prevent discharges:
  - -spill prevention;
  - -public awareness and education;
  - -reporting hotlines



Source: City of Phoenix, AZ

IDDE Reporting Req.

- Update on SSO inventory/elimination. Upon discovery, additional SSOs to be reported, in writing, to EPA/MassDEP
- Update on status of mapping, outfall inventory, and inventory of problem catchments;
- Update on status of Protocol & Responsibilities and Systematic Procedure for Locating & Removing Illicit Connections;
- Update on MS4 catchment investigations and details of elimination of IDs in problem catchments; and
- Evaluation of overall effectiveness of the IDDE Program

Indicators for Tracking Program Success

2.4.4.8(f) At minimum, include measures that demonstrate:

- Efforts to locate discharges (e.g., # junction manholes inspected)
- An elimination of pollutant sources (e.g., volume of sewage removed)
- The # of illicit connections found/removed
- % and area in MS4 evaluated using systematic procedures

What's New: Outfall Monitoring

(Section 3.1) MS4s must implement outfall monitoring program starting Yr 2

- Begin with highest priority catchments
- Not required for outfalls identified in Problem Catchments
- Can link with outfall inventory
- Within 5 years of effective permit date :
  - 1 dry weather screening/analytical monitoring (if necessary)
  - 1 wet weather analytical monitoring at each outfall

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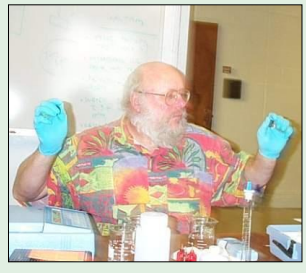
Dry weather monitoring (Section 3.2)

- Conduct when <0.1 inches of rain in 24 hr period
- Complete 25% of outfalls/year starting in YR 2
- If flowing, sample:
  - temperature,
  - conductivity,
  - turbidity, pH
  - chlorine,
  - surfactants,
  - potassium, and ammonia
  - E. coli (freshwater) or enterococcus (salt water)



- Screen for pollutants causing impairments
- Note odor, color, sheen, turbidity
- If signs of flow only, revisit within a week

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Fingerprints of Major Sources

Sewage
- E. Coli
- Detergents (various)
- High Ammonia/ Potassium Ratio

Wash Water
- Detergents (various)

Shallow Groundwater
- Hardness, pH

Tap Water
- Fluoride
- Sometimes Hardness

Septage
- E. Coli
- Fluorescence
- High Ammonia/Potassium

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APPENDIX I – FIELD MEASUREMENTS, BENCHMARKS, AND INSTRUMENTATION

ANALYTE	BENCHMARK	INSTRUMENTATION[1]
Surfactants (as MBAS)	> 0.25 mg/l ≥ 0.25 mg/L	MBAS Test Kit (e.g. CHEMetrics K-9400)
Potassium (K)	See ratio below	Portable Ion Meter (e.g. Horiba Cardy C-131)
Ammonia (NH_3) ≥ 0.05 mg/L	$NH_3/K > 1.0$	Portable Colorimeter or Photometer (e.g. Hack DR/890, CHEMetrics V-2000)
Fluoride (F)	> 0.25 mg/l	Portable Colorimeter or Photometer (e.g. Hack DR/890, CHEMetrics V-2000)
Temperature	Abnormal	Thermometer
pH	Abnormal	pH Meter

Region's recommended screening thresholds for samples processed with field equipment

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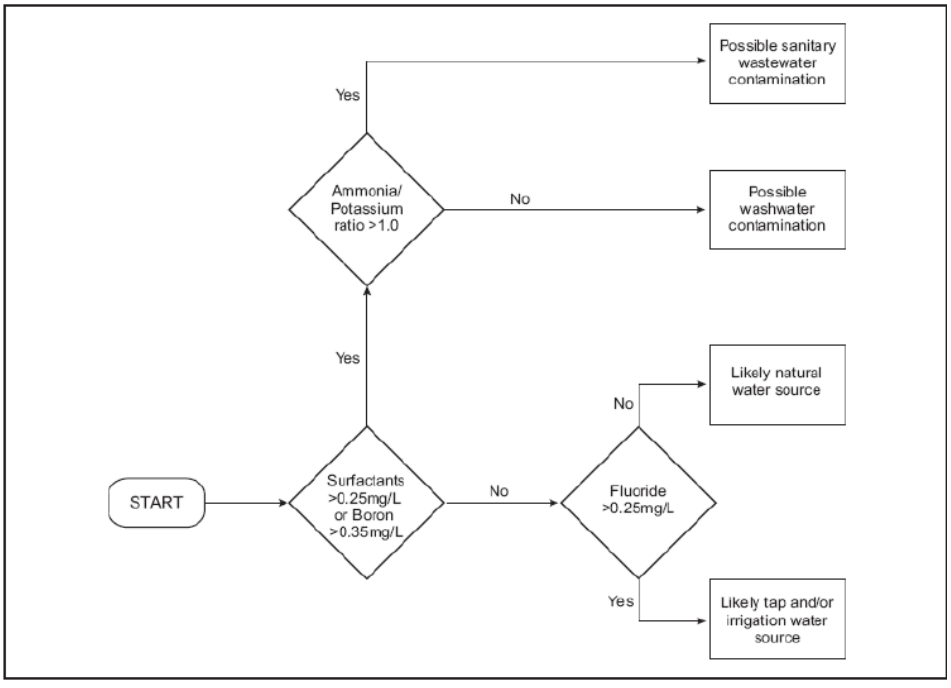
Flow Chart for Determining Likely Source of Discharge (Pitt, 2004)



Wet weather monitoring (Section 3.3)

- Performed after/during any rain event that produces a discharge
- 25% of outfalls/year starting in Yr 2
- Sample same outfalls for same parameters as dry weather and screen for pollutants of concern in impaired waters
- Can reduce # outfalls sampled if:
  - Prepare a permittee-specific monitoring plan meeting one or more conditions
  - Complete monitoring within 5 years

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Wet weather monitoring

Conditions:

1. Completed outfall monitoring under MS4-2003 consistent with part 3.3.1
2. Outfall in a Problem Catchment
3. Impervious cover draining to outfall is <10% of the catchment area
4. Catchment drains 1 acre or less of low density residential or forest
5. Has or will conduct in-stream monitoring representative of discharges

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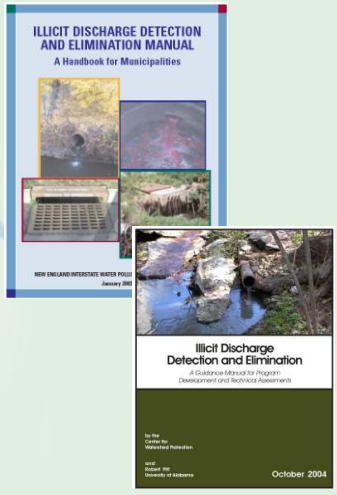
Resources

- NEIWPCC 2003 IDDE Manual www.neiwpcc.org/iddemanual.asp
- CWP 2004 IDDE Manual www.cwp.org/categoryblog/99-idde-and-septics.html
- EPA NPDES IDDE Training Webinar cfpub2.epa.gov/npdes/outreach.cfm?program_id=0&otype=1



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