

Illicit Discharge Detection
and Elimination (IDDE) 301:

Finding and Fixing Illicit Discharges and Connections

U.S. EPA Stormwater Program's Webcast Series

September 30, 2009

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Presentation Overview

IDDE Basics

Tracking Illicit Discharges

Removing and Fixing Illicit Discharges

Controlling Illicit Discharges from Food Service Facilities

IDDE 301

Finding and Fixing Illicit Discharges and Connections

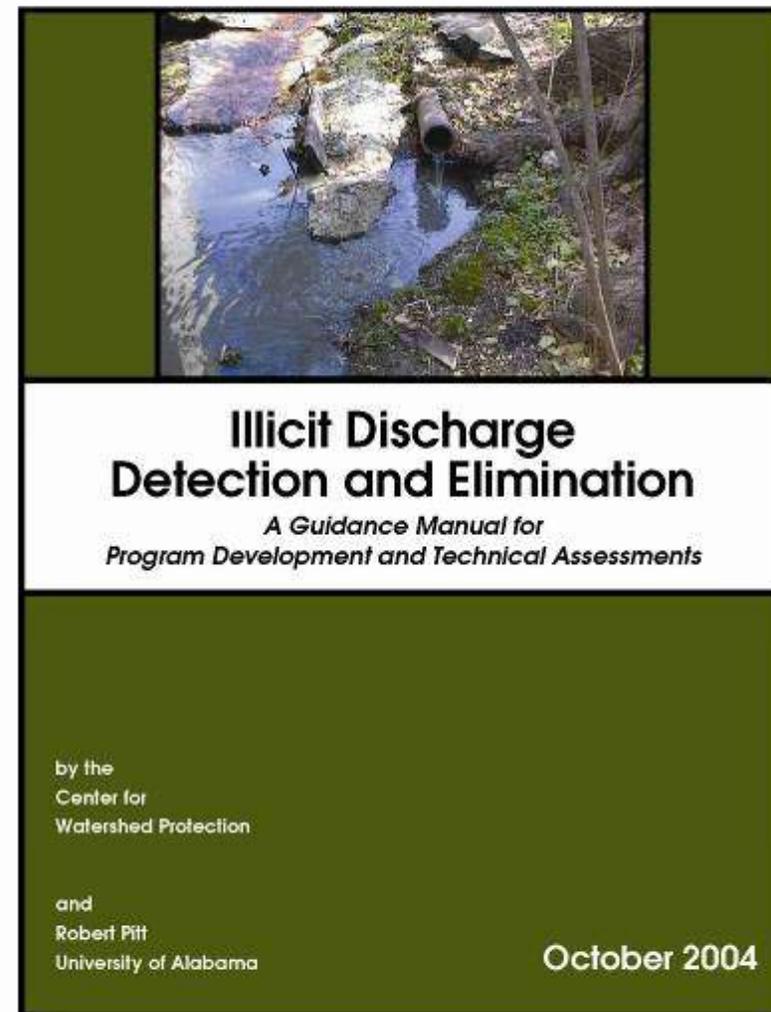
IDDE Guidance Manual

- Joint CWP and University of Alabama project
- Funded by U.S. EPA
- Eight Program Elements
- Desktop Methods
- Field and Lab Protocols
- Model Ordinance
- Technical Appendices

www.cwp.org

OR

www.epa.gov/npdes



Resources on the U.S. EPA Website

National Pollutant Discharge Elimination System (NPDES)

Illicit Discharge Detection and Elimination (IDDE)

Developed by the [Center for Watershed Protection](#) and Dr. Robert Pitt, University of Alabama under an EPA grant, the manual *Illicit Discharge Detection and Elimination (IDDE): A Guidance Manual for Program Development and Technical Assistance* is intended to provide support and guidance to stormwater Phase II communities developing IDDE programs. This comprehensive manual discusses all aspects of an IDDE Program including:

- Components of an effective IDDE program
- Auditing existing programs
- Identifying and preventing illicit discharges
- Field screening using the Outfall Reconnaissance Inventory (ORI)
- Techniques to track and fix illicit discharges

An electronic copy of the guide, along with many of the tools, supporting resources, and examples of other IDDE manuals are available below:

- [Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assistance](#) PDF - 9.3 MB - 376 pp
- For slower internet connections, [click here to download the individual chapters and technical appendices](#)

Additional IDDE documents

Electronic Resources Associated with the Manual

- [Outfall Reconnaissance Inventory \(ORI\) Form](#) (WORD - 117 KB - 2 pp)
- [ORI Database](#) (access - 15.4 MB) - Use to record and manage ORI data (Note: Please download to your personal desktop, do not open and work from file)
- [Hotspot Site Investigation Form](#) (PDF - 16 KB - 2 pp)
- [Chemical Mass Balance Model \(CMBM\) Setup](#) (EXE - 2.57 MB) - Executable file for sophisticated technique used to differentiate among flow types at outfalls with blended flows
- [CMBM Sample Input File \(XLS\)](#) - 15 KB
- [Hotspot Tracking Form](#) (WORD - 74 KB - 2 pp)

IDDE Supporting Material

- [Methods for Detection of Inappropriate Discharges to Storm Drainage Systems, Background Literature and Summary of Findings](#) (PDF - 10 MB - 431 pp)
- [Source Verification of Inappropriate Discharges to Storm Drainage Systems](#) (PDF - 368 KB - 27 pp)
- [Quantification of Recharge to Wet and Saturated Soils at Wet Weather and Dry Weather Phases](#) (PDF - 285 KB - 26 pp)
- [Inappropriate Discharge Detection and Elimination: What Phase II Communities Are Doing to Address the Problem](#) (PDF - 100 KB - 16 pp)

IDDE Webcasts

- [Developing Your IDDE Program \(IDDE 101\)](#)
- [Conducting Illicit Discharge Detection and Elimination Investigations \(IDDE 201\)](#)

<http://www.epa.gov/npdes/stormwater/idde>

Past Webcasts

US EPA Stormwater Program's Webcast Series
Developing Your IDDE Program with Jennifer Zielinski of the Center for Watershed Protection

Illicit Discharge Detection and Elimination (IDDE) 101: Program Development
U.S. EPA Stormwater Program's Webcast Series
September 12, 2006

Speakers:
Jennifer Zielinski, P.E., Program Director, Center for Watershed Protection
Darrin Peine, QEP, City of Charlotte, Stormwater Services Division
Nikos Singelis, US EPA, Office of Wastewater Management

Tuesday, September 12, 2006
Eastern: 12:00 pm / Central: 11:00 am
Mountain: 10:00 am / Pacific: 9:00 am

US EPA Stormwater Program's Webcast Series
Conducting Illicit Discharge Detection and Elimination Investigations

Illicit Discharge Detection and Elimination (IDDE) 201: Conducting IDDE Investigations
U.S. EPA Stormwater Webcast Series
July 11, 2007

Speakers:
Jennifer Zielinski, P.E., Program Director, Center for Watershed Protection
Harry Stark, RS, MPA, Cuyahoga County Board of Health
Nikos Singelis, US EPA, Office of Wastewater Management

Wednesday, July 11, 2007
Eastern: 12:00 pm / Central: 11:00 am
Mountain: 10:00 am / Pacific: 9:00 am

<http://www.epa.gov/npdes/stormwater/idde>

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What is an Illicit Discharge?

A discharge to an MS4 that is not composed entirely of stormwater

except permitted discharges and fire fighting related discharges

40 CFR 122.26(b)(2)



- Unique frequency, composition & mode of entry
- Interaction of the sewage disposal system & the storm drain system
- Produced from “generating sites”

What is a Storm Sewer?

A municipal separate storm sewer system is...

A conveyance or system of conveyances owned by a state, city, town, or other public entity that discharges to waters of the U.S. and is:

- designed or used for collecting or conveying stormwater
- not a combined sewer
- not part of a Publicly Owned Treatment Works (POTW)



Discharge Frequency

Continuous discharges

- Occur most or all of the time

Intermittent discharges

- Occur over a shorter period of time
(e.g., a few hours per day or a few days per year)

Transitory discharges

- Occur rarely, usually in response to a singular event
(e.g., an industrial spill, ruptured tank, sewer break, transport accident or illegal dumping episode)

Discharge Flow Types

- Sewage & septage flows
- Washwater flows
- Liquid wastes
- Tap water *
- Landscape irrigation flows *
- Groundwater & spring water flows *

* Not typically considered illicit



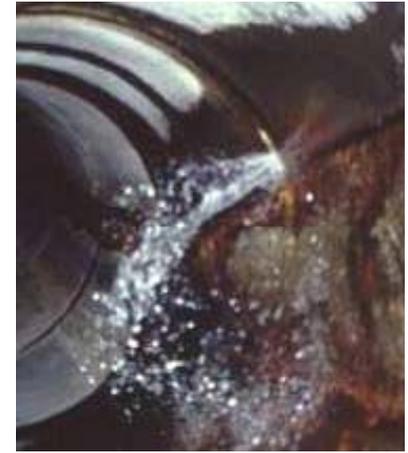
Mode of Entry

Direct entry

- Sewage, industrial, commercial cross-connection
- Straight pipe

Indirect entry

- Groundwater seepage
- Spills
- Dumping
- Outdoor washing activities
- “Nuisance” or non-target water



Land Use & Potential Generating Sites



Residential
Commercial

Industrial

Institutional

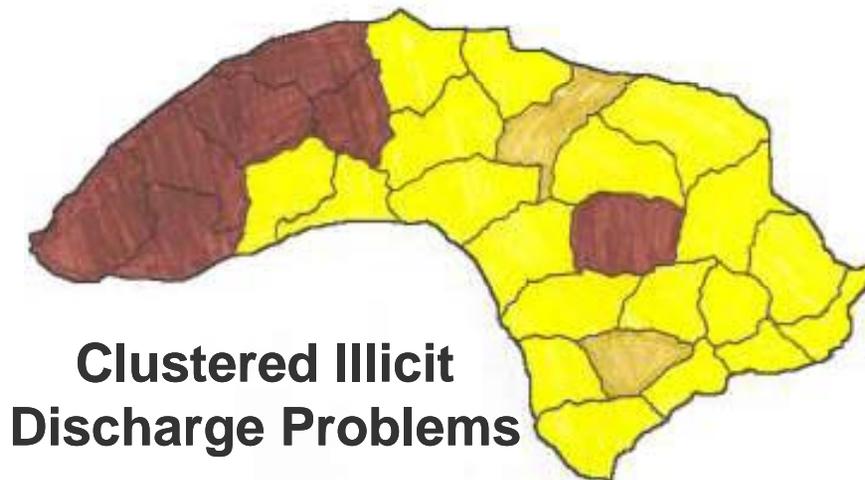
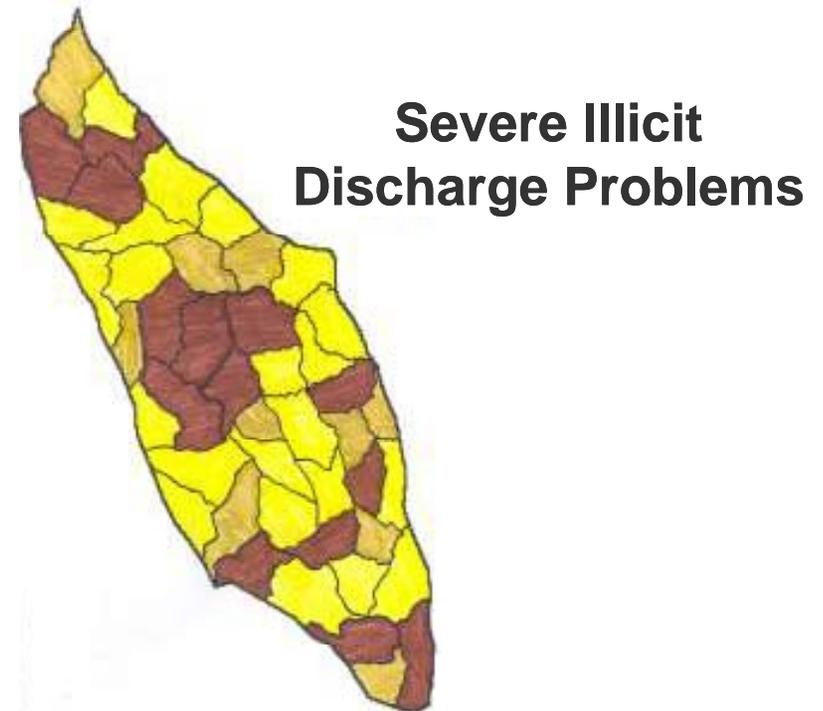
Municipal



IDDE Program Components

1. Audit Existing Resources & Programs
2. Establish Responsibility & Authority
3. Complete Desktop Assessment of Illicit Discharge Potential
4. Develop Program Goals & Strategies
5. Search for Illicit Discharge Problems in the Field
6. Isolate & Fix Individual Discharges
7. Prevent Illicit Discharges
8. Evaluate the Program

Tailoring the Program and Prioritizing Investigations



Key:

- Low IDP risk
- Medium IDP risk
- High IDP risk

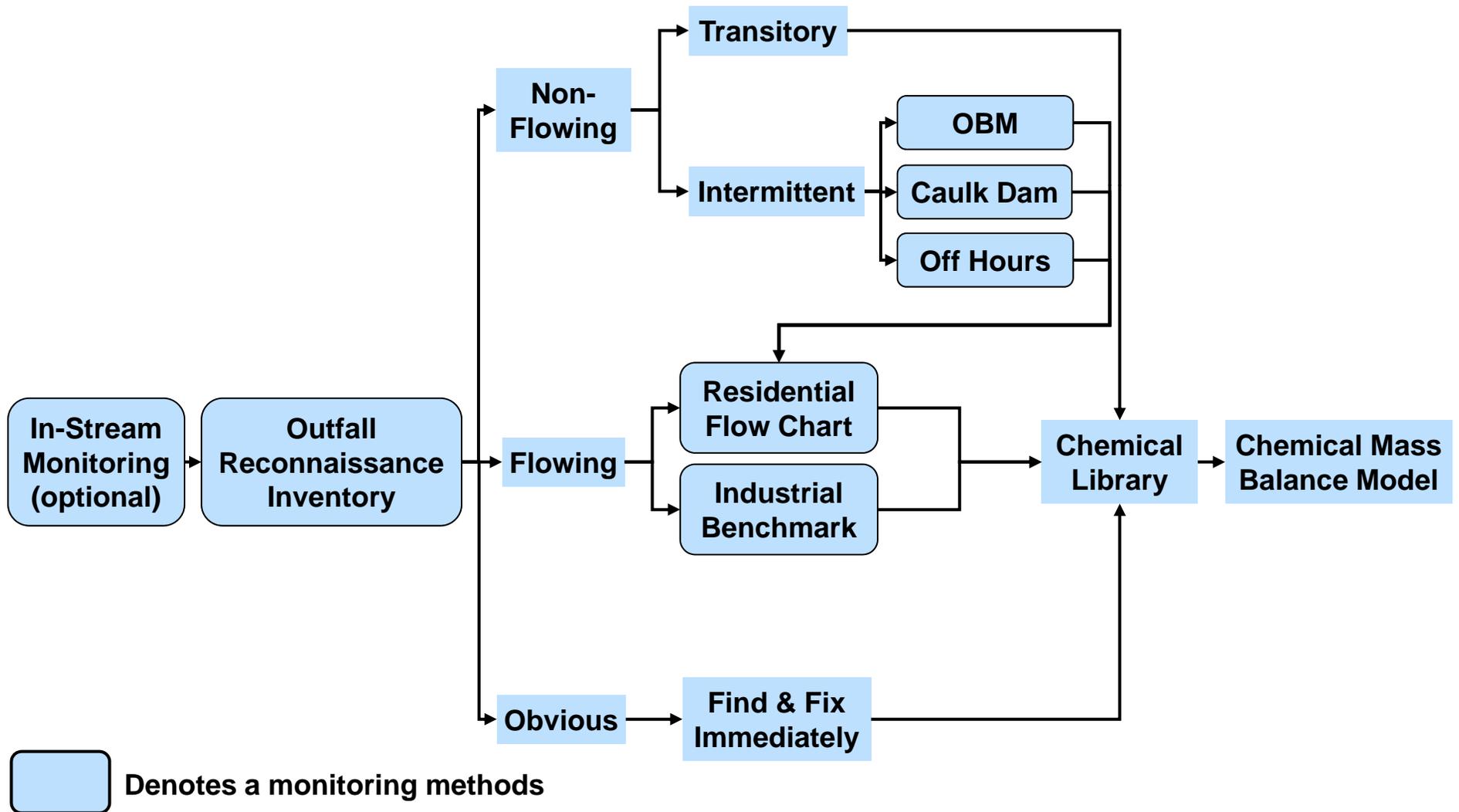
Outfall Reconnaissance Inventory (ORI)

Conduct rapid field screening of all outfalls:

- Map, mark & photograph outfalls
- Record basic characteristics
- Look for physical indicators
- Conduct simple monitoring at flowing outfalls



IDDE Monitoring Framework



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Finding and Fixing Illicit Discharges and Connections

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Tracking Discharges to a Source



Pollution Complaint Hotline

Storm Drain Network
Investigations

Drainage Area Investigations

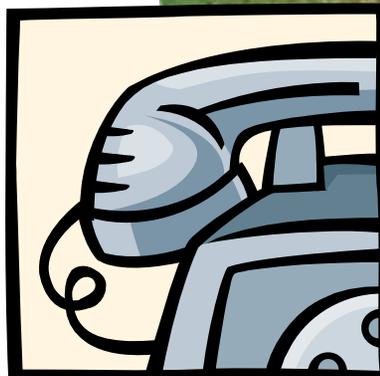
On-Site Investigations

Septic System Investigations

Pollution Complaint Hotline

Phone number or website where citizens can easily report illicit discharges and pollution concerns

- Useful for intermittent or transitory discharges
- Follow-up within 24 hours



Pollution Complaint Hotline

Establishment and Maintenance

- Define the scope
- Create a tracking and reporting system
- Train personnel
- Advertise
- Respond to complaints
- Track Incidents

Benefits

- Early detection
- Public stewardship
- Identify intermittent flows

Challenges

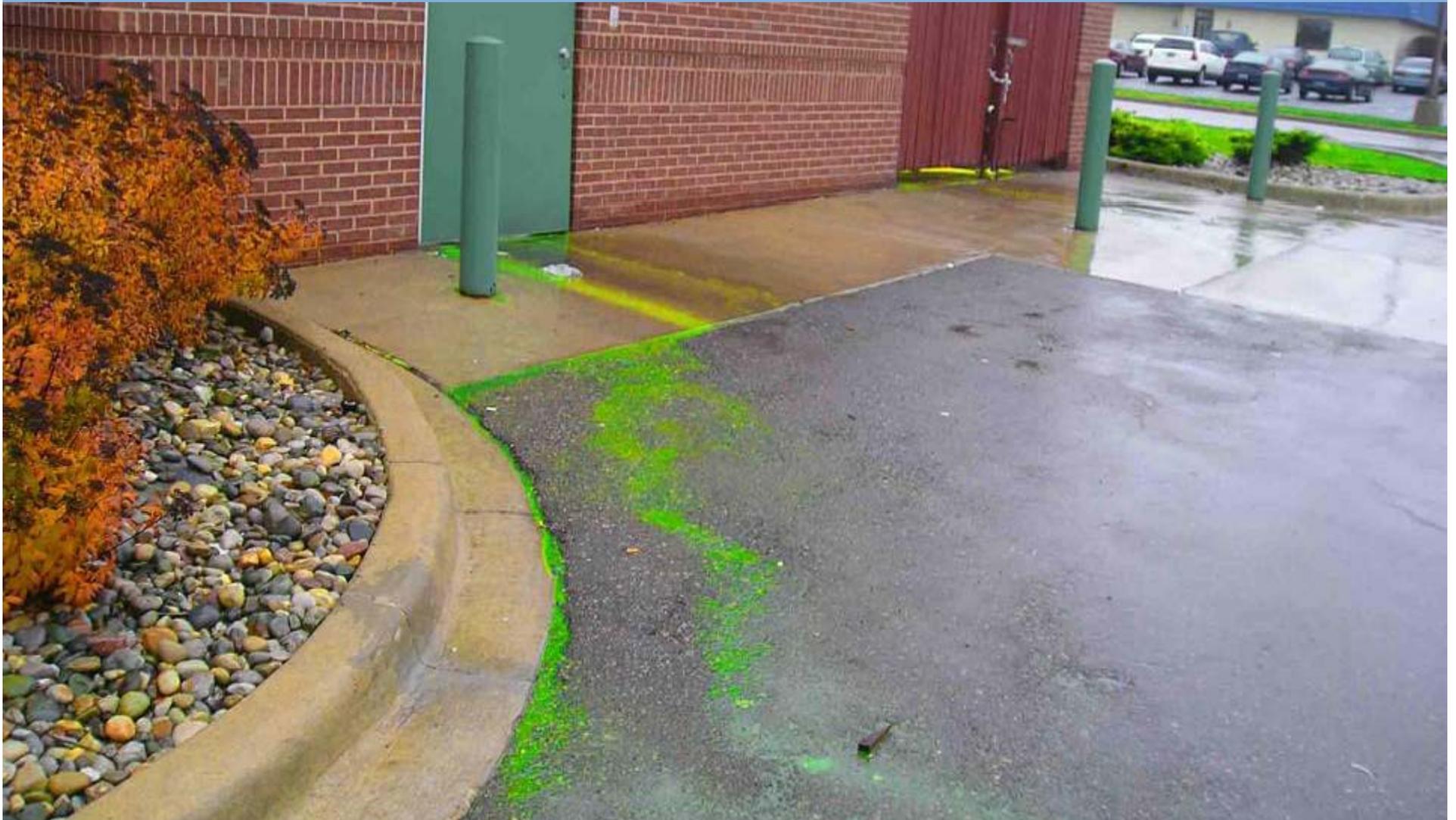
- Time and money
- Marketing
- Establishing inter/intra department process



Source: Ft. Worth DEM

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Finding and Fixing Illicit Discharges and Connections

Exterior Power Wash Detergent



Transformer Oil Dumping

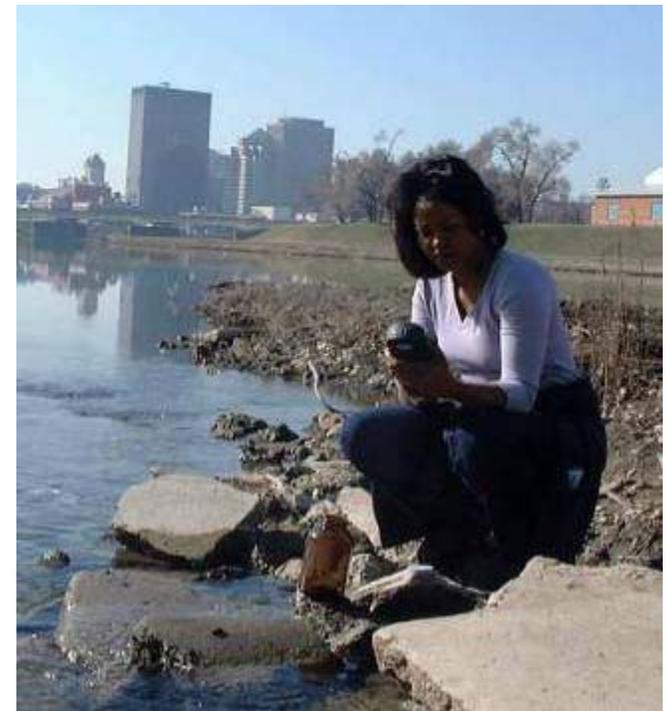


Storm Drain Network Investigations

Narrow source to a single segment of a storm sewer

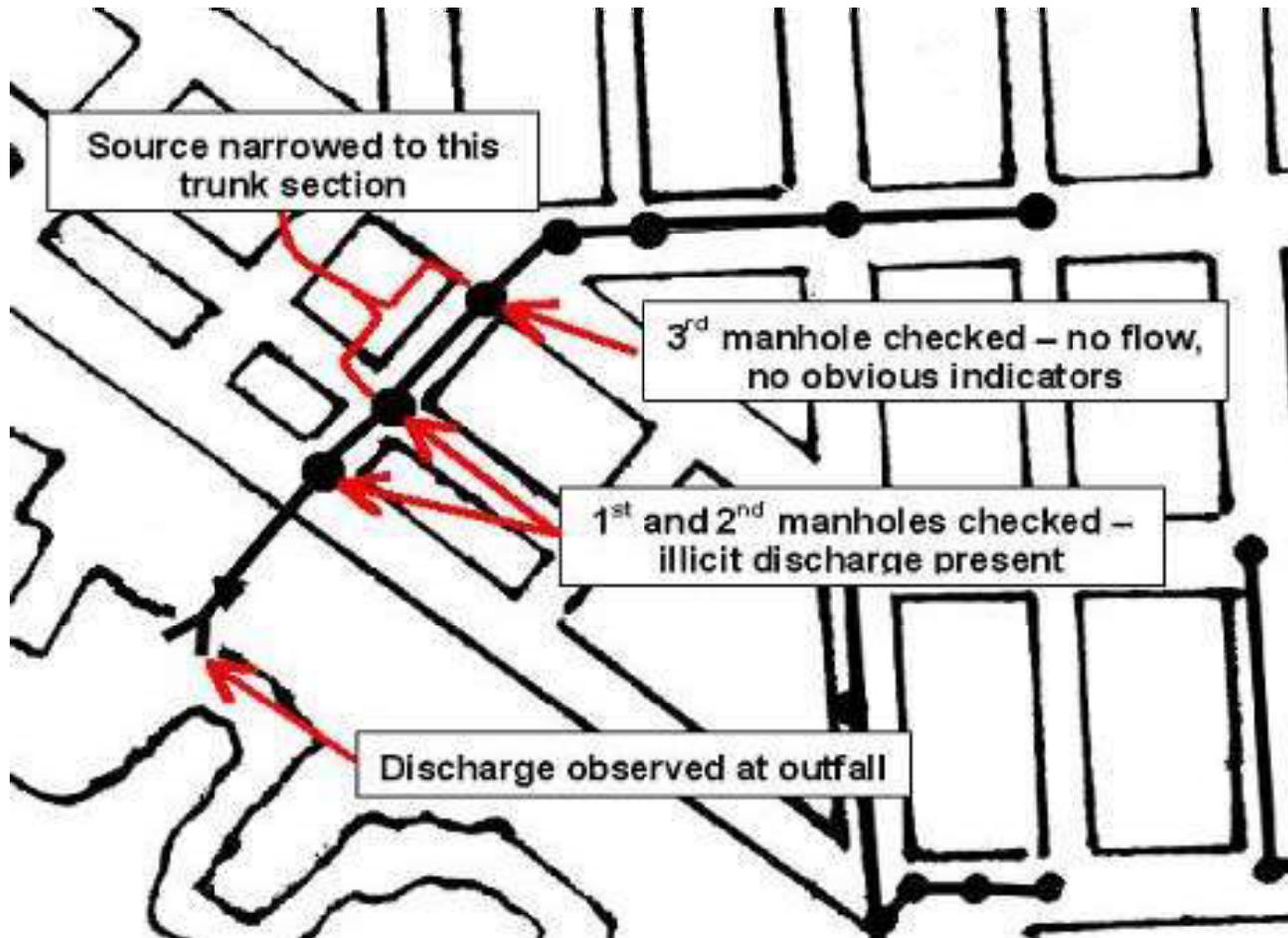
Three methods for how to explore network:

- Move up the trunk
- Split the storm drain network
- Move down the storm drain network



Storm Drain Network Investigations

Option 1: Move up the Trunk



Storm Drain Network Investigations Option 3: Move Down Network



Start inspection at
“headwaters”
moving
progressively
down the pipe

Storm Drain Network Investigations Manhole Inspections

Methods:

- Visual observations
- Indicator sampling

Considerations:

- Need crew of two
- Dry weather conditions
- Traffic diversion
- Proper lifting



Source: Ft. Worth DEM

Storm Drain Network Investigations Manhole Inspections

Visual Observations

Work best for obvious illicit discharges that are not masked by groundwater or other “clean” discharges.

- Presence of flow
- Colors
- Odors
- Floatable materials
- Deposits or stains



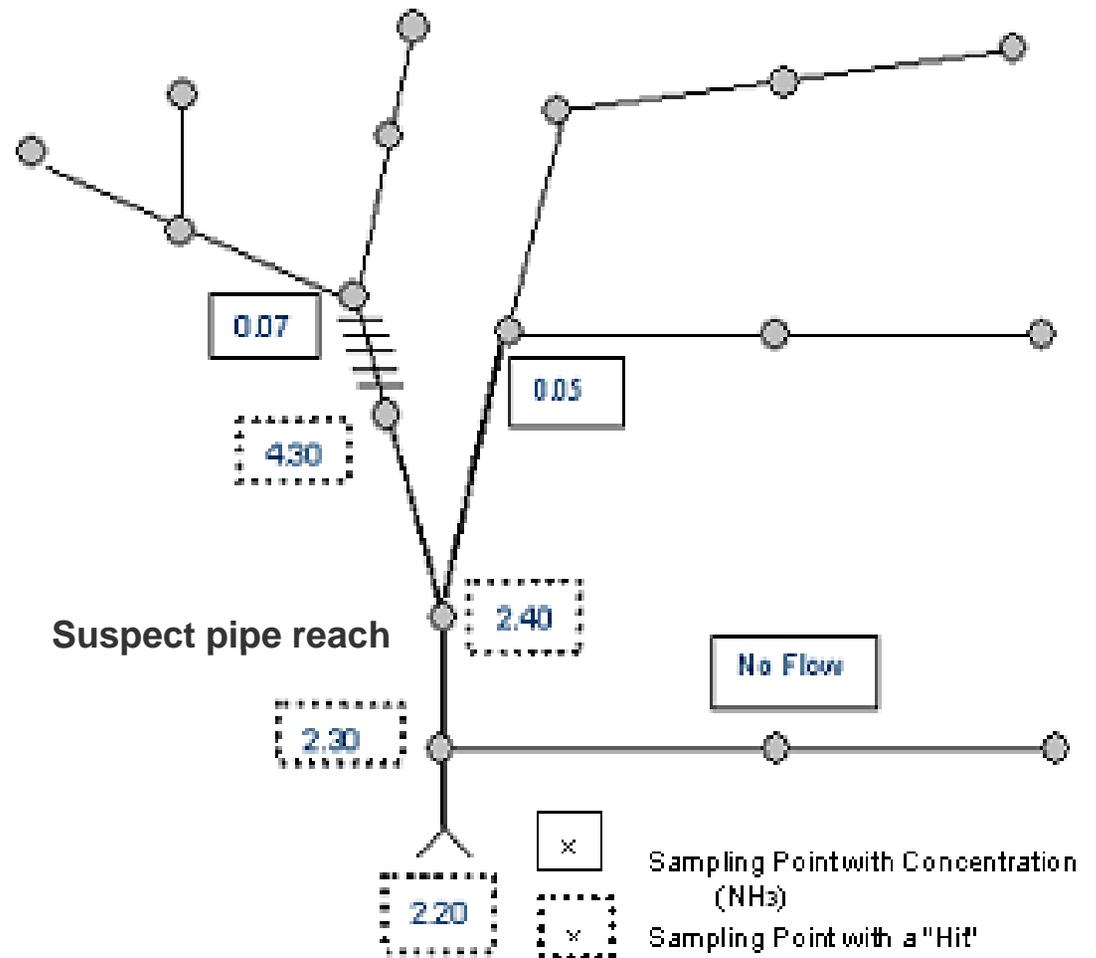
Storm Drain Network Investigations

Manhole Inspections

Indicator Sampling

If flow is observed it can be sampled immediately to determine if it is clean or dirty

Look for trends in stormwater concentrations throughout the storm drain network



Storm Drain Network Investigations

Isolating Intermittent Discharges

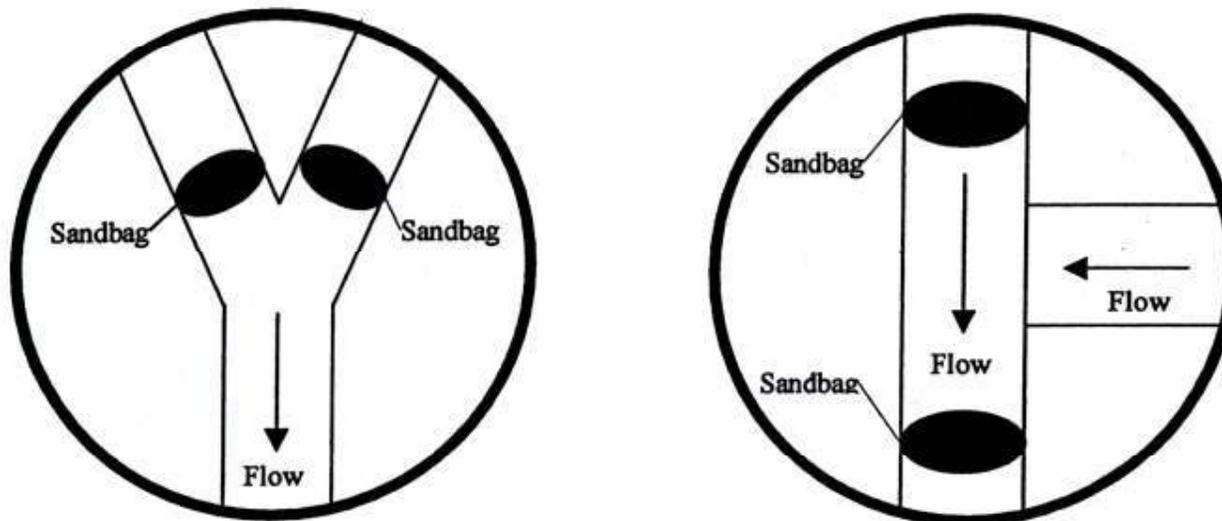


- Sandbags
- Optical Brightener Monitoring (OBM) Traps
- Automatic Samplers
- Observation of Outfall Conditions

Storm Drain Network Investigations Isolating Intermittent Discharges

Sandbags

Placement of sandbags within strategic manholes to temporarily dam flows for visual or indicator monitoring



Source: Jewell, 2001

Storm Drain Network Investigations Isolating Intermittent Discharges

Optical Brightener Monitoring (OBM) Traps

Anchor OBM absorbent pads in storm drains to capture dry weather flows and determine presence of flow and/or detergents



Source: Sargent and Castonguay, 1998



Source: R. Pitt

Storm Drain Network Investigations

Isolating Intermittent Discharges

Automatic Samplers

Automatic samplers trigger during dry weather flows to collect a sample

- Expensive
- Good for complex drainages
- Good for severe intermittent discharge problems
- Pinpoints specific date/hour discharges occur
- Identifies chemical fingerprint of generating source

Storm Drain Network Investigations Isolating Intermittent Discharges

Observation of Outfall Conditions

Staining or cracked rock may indicate an intermittent discharge. Stains can be hard to see within storm drain network.



Residential Connection to Storm Sewer



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Broken Sanitary Sewer Running Through Storm Sewer Manhole



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Sanitary Sewer Overflow from Backed Up System



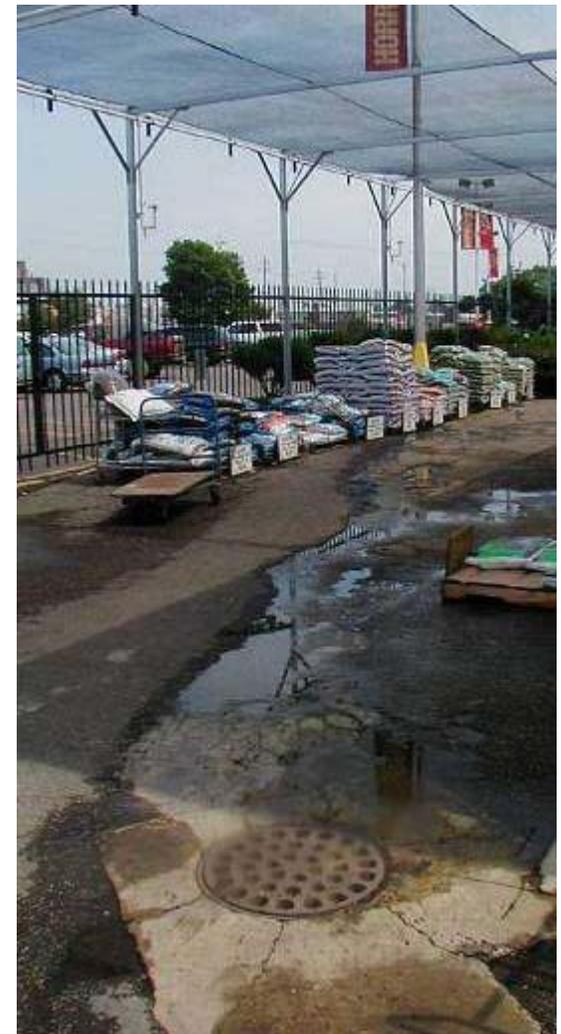
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Finding and Fixing Illicit Discharges and Connections

Sanitary Sewer Overflow from Backed Up System



Runoff of Manure from Home Center



Grocery store grease dump



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Finding and Fixing Illicit Discharges and Connections

Questions?

Drainage Area Investigations

- Survey of drainage area with problem outfall:
 - Rapid Windshield Survey
 - Detailed Investigation
- Effective if illicit discharge has unique characteristics allowing crews to quickly ascertain probable cause



Source: R. Frymire

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Finding and Fixing Illicit Discharges and Connections

Apartment Complex Laundry Facilities Discharge



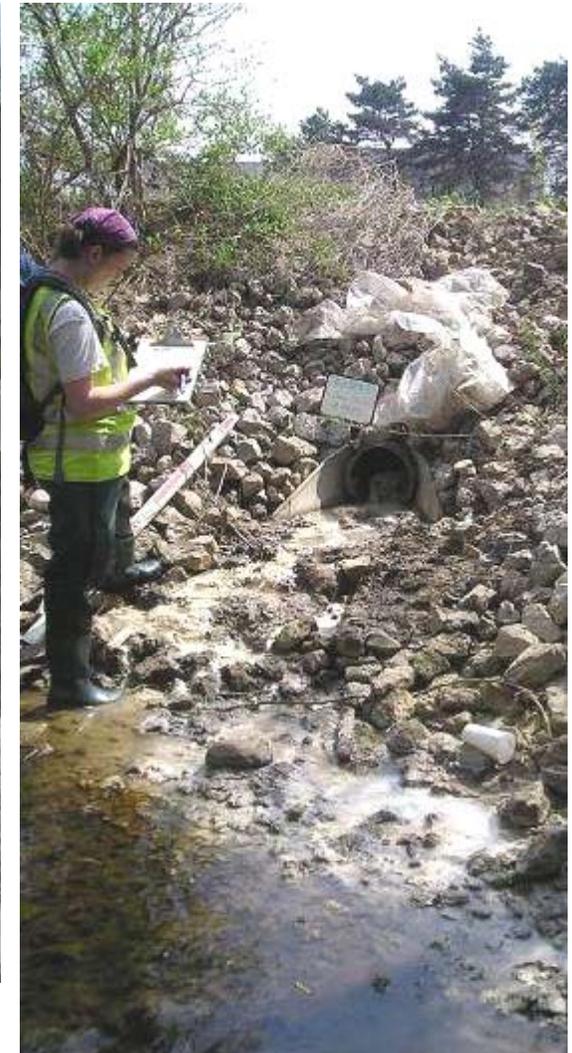
Rapid Canine Scent Tracking Illicit Discharges



Car Wash Water



Construction Site Concrete Washout



On-Site Investigations

- Used to pinpoint the exact source or connection producing a discharge within a storm drain network
- Three Basic Approaches:
 - Dye
 - Video
 - Smoke

On-Site Investigations Dye Testing

- Introduce non-toxic dye into plumbing fixtures – if it appears in storm drain then an illicit connection exists
- Useful when:
 - Very small drainage area (<10 properties)
 - Source from an individual property
 - Commercial or industrial land use



Source: NIWPC, 2003

On-Site Investigations

Dye Testing

Before Commencing

- Review sewer and storm drain maps
- Notify property owners
- Notify local agencies
- Determine staffing needs



Method

- Flush or wash dye down the drain, fixture, or manhole
- Monitor down gradient manholes for dye
- If no dye appears check manholes further down gradient

On-Site Investigations Video Testing

- Guide a mobile video camera to locate connections producing illicit discharge

Useful when:

- Continuous discharge
- Discharge limited to single pipe segment
- Communities own equipment for other investigations



Source: www.darrscleaning.com

On-Site Investigations Video Testing

Before Commencing

- Review sewer and storm drain maps
- Visit site
- Select camera size / type
- If water present in pipe attach camera to a raft

Method

- Launch video into storm sewer
- Keep lens close to center of pipe
- Inspect pipe for illicit discharge
- Create video recording of inspection



On-Site Investigations Smoke Testing

- Introduce smoke into storm drain system and observe where smoke surfaces.

Useful when:

- Cross-connection with sanitary sewer exists
- Identifying other underground sources caused by storm drain damage
- Discharge confined to upper reaches of storm drain network



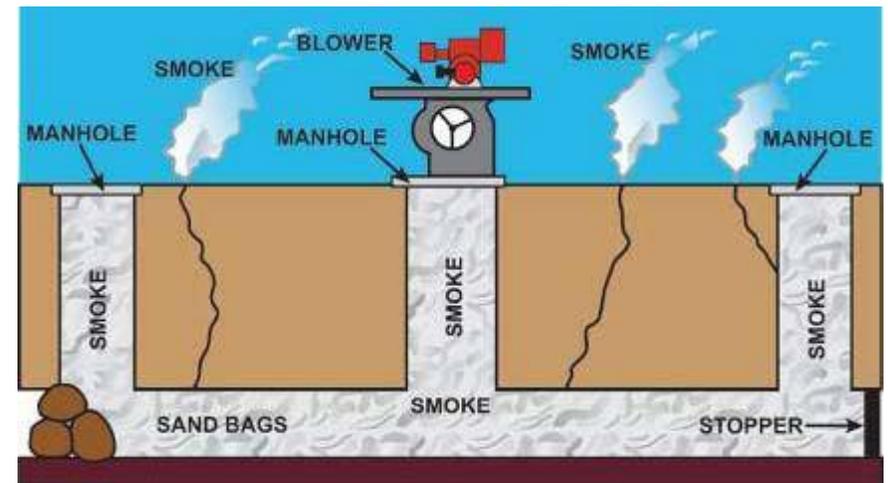
Source: www.darrscleaning.com

On-Site Investigations

Smoke Testing

Before Commencing

- Notify public (2 weeks prior), media (if extensive testing) and local fire, police, 911 call center (day of)
- Include date, reason, precautions, appropriate actions, phone number to relay concerns



Source: www.usabluebook.com

Method

- Plug storm drain inlets (sandbags, beach balls, expandable plugs)
- Release smoke – force by blower through storm drain
- Look for smoke escape above ground (internal plumbing fixtures, sewer vents)

Septic System Investigations

- Used to identify indirect illicit discharges in rural or low-density residential neighborhoods.

Two Basic Approaches:

- On-Site Septic Investigations
- Infrared Imagery



Source: Anish Jantrania

Source: Snohomish County, WA

Source: King County, WA

Septic System Investigations

On-Site Septic Investigations

Homeowner Survey

- A brief interview with property owner to determine potential for current or future septic system failure
- Resident behaviors, system performance, and maintenance activity

Surface Conditions Analysis

- Rapid site assessment looking for indicators of illicit discharge from septic systems
- Foul odors, wet, spongy ground, algal blooms, and burnt grass

Detailed System Inspection

- Thorough inspection of performance and function by a certified professional
- Structural integrity, depth of solids in septic tank, system sketch, and distance to groundwater, surface water, or drinking water sources

Septic System Investigations Infrared Imagery

Photography with gray or color scales representing differences in temperature and emissivity of objects used to locate sewage discharge

Infrared Thermography

- Uses the temperature difference of sewage as a marker to detect illicit discharges and failing septic systems

Color Infrared Aerial Photography

- Looks for changes in plant growth, differences in soil moisture, or presence of standing water to identify failing septic systems



Rerouted Pump Station to Drain Instead of Drain Field



Temporary “Septic System” for New Residential Development



Tracking Discharges to a Source



Pollutant Complaint Hotline

Storm Drain Network Investigations

Drainage Area Investigations

On-Site Investigations

Septic System Investigations

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Removing and Fixing Illicit Discharges

Key Elements of Success:

- Well defined legal authority
- Strong enforcement
- Follow-up measures

Four Questions:

- Who is responsible?
- Methods to fix?
- How long should it take?
- How is removal or correction confirmed?

Who is Responsible?

The property owner or municipality / utility?

Generally:

- Internal plumbing connection
→ property owner
- Service lateral cross-connection
→ property owner
- Infrastructure failure within sanitary sewer or MS4
→ municipality / utility
- Transitory discharge
→ property owner / discharger

Methods to Fix?

- 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



How Long Should it Take?

Varies depending on type and location – though local ordinance should provide time frame for removing discharge and repairing

Generally:

- If illicit discharge is significant health or environmental threat
 - fix immediately
- After notification by municipality
 - Stop discharge w/in 7 days
 - Repair w/in 30 days

How is Removal or Correction Confirmed?

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

Examples on Time to Fix

Municipal Problem

- Typically corrected very quickly
- Failed bulkhead in sanitary interceptor chamber
 - Fixed in less than 24-hours by city crews
- Improperly constructed diversion structure
 - 25+ years to realize
 - Fixed within weeks (complicated system)

Private Connection to Municipal System

- Often multiple letters and meetings
- Typically corrected within a month

Private Septic Systems

- Commonly take longer to correct
- Often high expense to homeowner causes delays



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City of Alexandria, LA Illicit Discharge Program Controlling Illicit Discharges from Food Service Facilities



Presented By: Ann Wilson

View of City of Alexandria from Red River



Presentation Outline

- Background of Alexandria, LA
- IDDE Detection Method
 - Identifying the problem at the source
 - Using existing laws to achieve compliance
 - Developing minimum standards



Alexandria, Louisiana



Source: Louisianatimes.com, Alexandria Town Talk



Understanding the Regulations

- Food Safety Regulations regulated by FDA and each State
 - <http://www.fda.gov/Food/FoodSafety/RetailFoodProtection/FederalStateCooperativePrograms/ucm122814.htm>



Local Regulations

- Storm Water Ordinance
- Discharge from Dumpster Area
 - New construction of commercial facilities requiring cleaning must meet the following requirements:
 - Cannot be discharged into the MS4 without valid NPDES permit
 - Or discharge to sanitary sewer
 - **No storm water is allowed into sanitary sewer**
 - **Discharges must meet local discharge limits**



Dumpster Enclosures



Involve the People

- Notify each user by mail
 - Purpose
 - Potential Sources of Pollution
 - BMPs
 - Inspection Form
 - Evaluation Criteria



Best Management Practices

- Dumpster and Compactor Areas
 - Minimize liquid waste
 - Keep dumpster lids closed
 - Inspect areas regularly
- Cleaning and Washing Areas
 - Sweep and use blower
 - Minimize use of water
 - Clean equipment in designated area, no discharge
- Spill Control
 - Develop spill control procedures



Grease Handling and Disposal



- Is there a container?
- Is there spillage?
 - Minor
 - Major
- Is grease entering the storm drain?

Dumpster Area



- ❑ Dumpster area enclosed?
- ❑ Dumpster lids closed?
- ❑ Hot/cold water?
- ❑ Liquid waste or leaky garbage bags?
- ❑ Discharge from dumpster?
- ❑ Clean up materials?

Closer Examination

Photo No. 1



Photo No. 2



Equipment Cleaning Area



- ❑ Is equipment being cleaned in a designated area?
- ❑ Is equipment cleaned outdoors in any area where water may flow to a street, gutter, storm drain, or grassy area?

Surface Cleaning Area

- ❑ Is litter, debris, saturated material, oil, grease found in the area?
- ❑ Is area wet cleaned?
- ❑ Is there evidence wastewater with soaps or other pollutants being discharged?



Illicit Discharge To Storm Drain

Photo No. 1

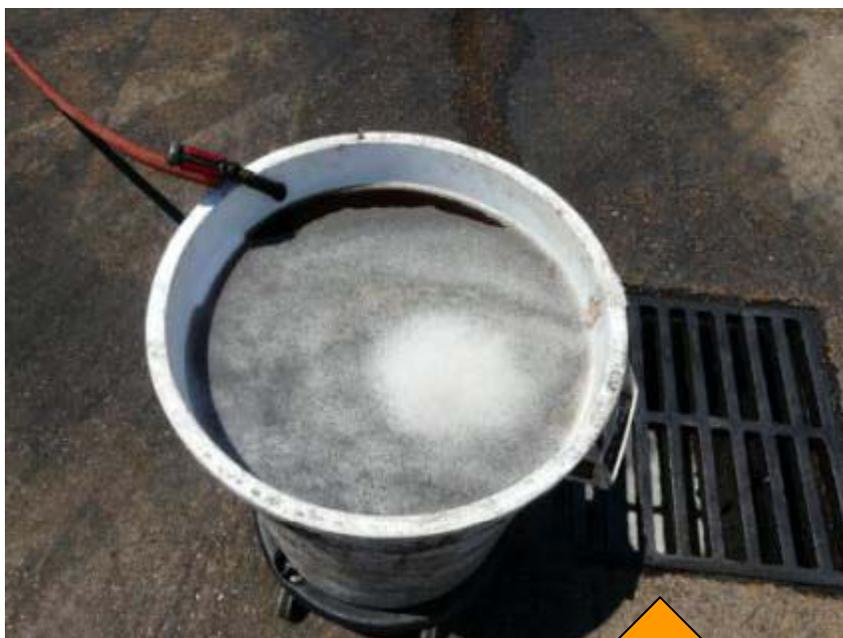


Photo No. 2



Housekeeping

- Overall Housekeeping
 - Good, Fair, Poor
- Dumpster Area
- Outside Area
- Waste Grease Container
- Equipment Cleaning Area



Follow Up Inspection

Before



After



Follow Up Inspection

Before



After



Follow Up Inspection

Before



After



Follow Up Inspection

Before



After



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Questions

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