NPDES MS4 Permits

Path to Compliance

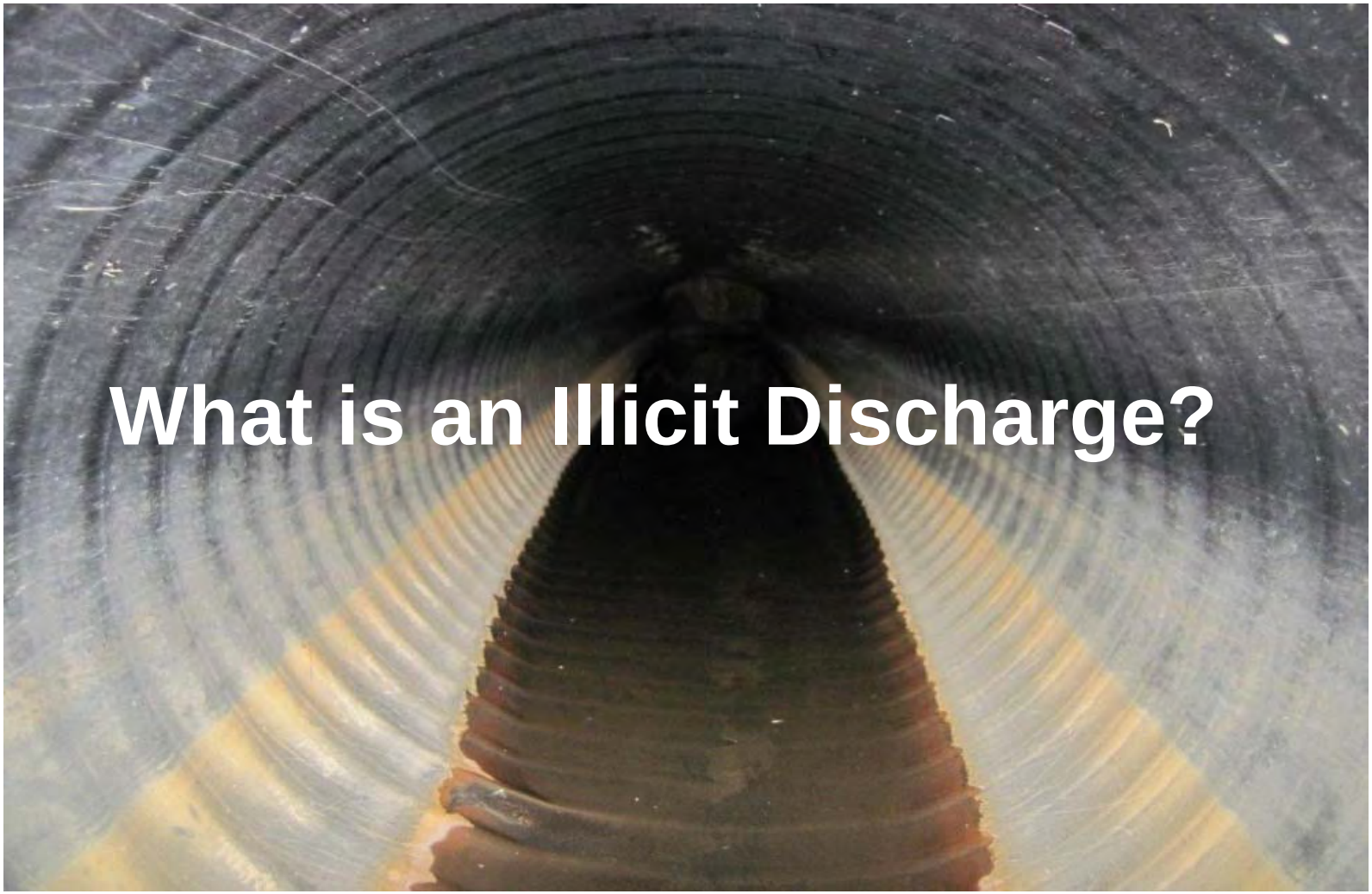
Illicit Discharge Detection and Elimination (IDDE)

Pennoni

Agenda

- IDDE Basics
- What is an Illicit Discharge?
- Components of an Effective IDDE Program

MS4: IDDE



What is an Illicit Discharge?

140 CFR 122.26(b)(2) defines an illicit discharge as:

- Any discharge to an MS4 that is not composed entirely of storm water, except allowable discharges pursuant to an NPDES permit, including those resulting from fire fighting activities.

Illicit Discharge Quiz

1. Sanitary Sewer Backup

1. Sanitary Sewer Backup

YES

2. Groundwater Seepage Into Road Drainage System

2. Groundwater Seepage Into Road Drainage System

NO

3. Car Wash Wastewater

3. Car Wash Wastewater

YES

MS4: IDDE

4. Oil Disposal

MS4: IDDE

4. Oil Disposal

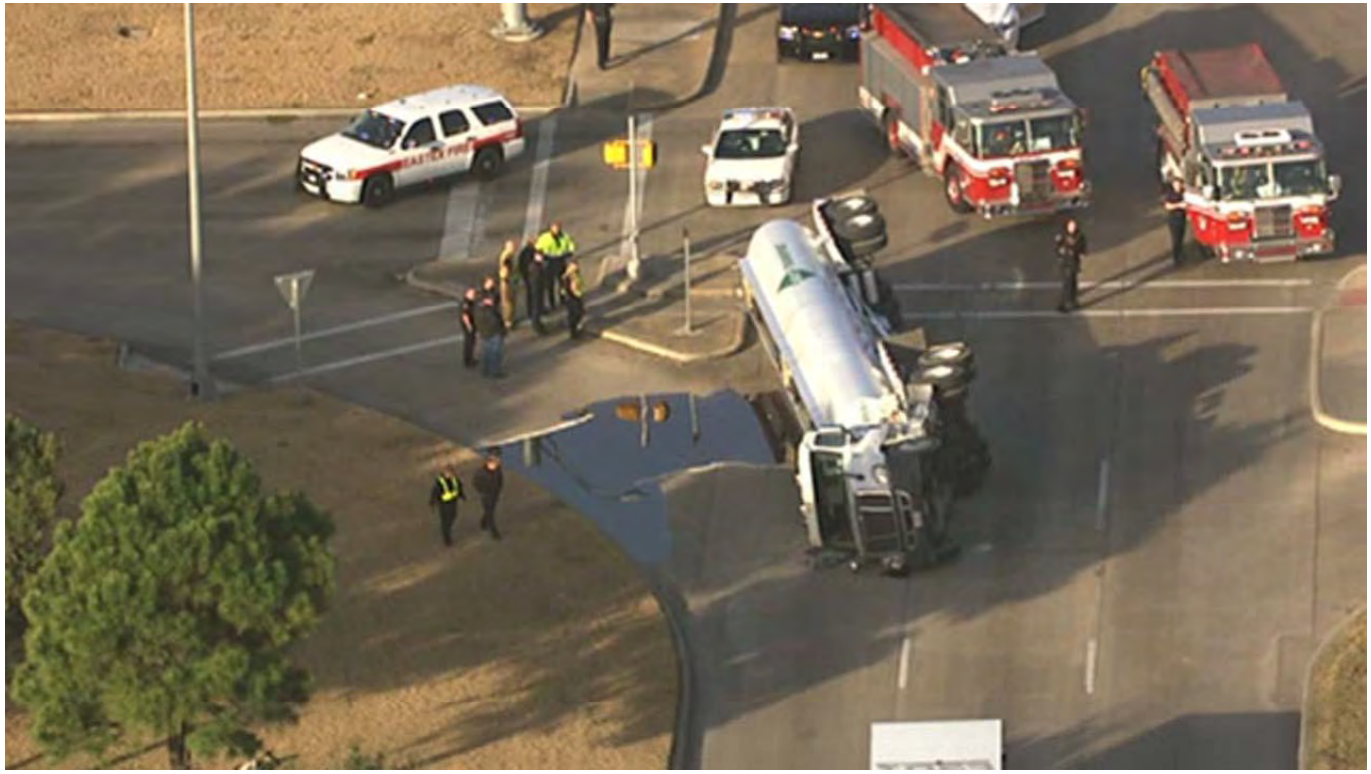
YES

5. Foundation Drain Discharge

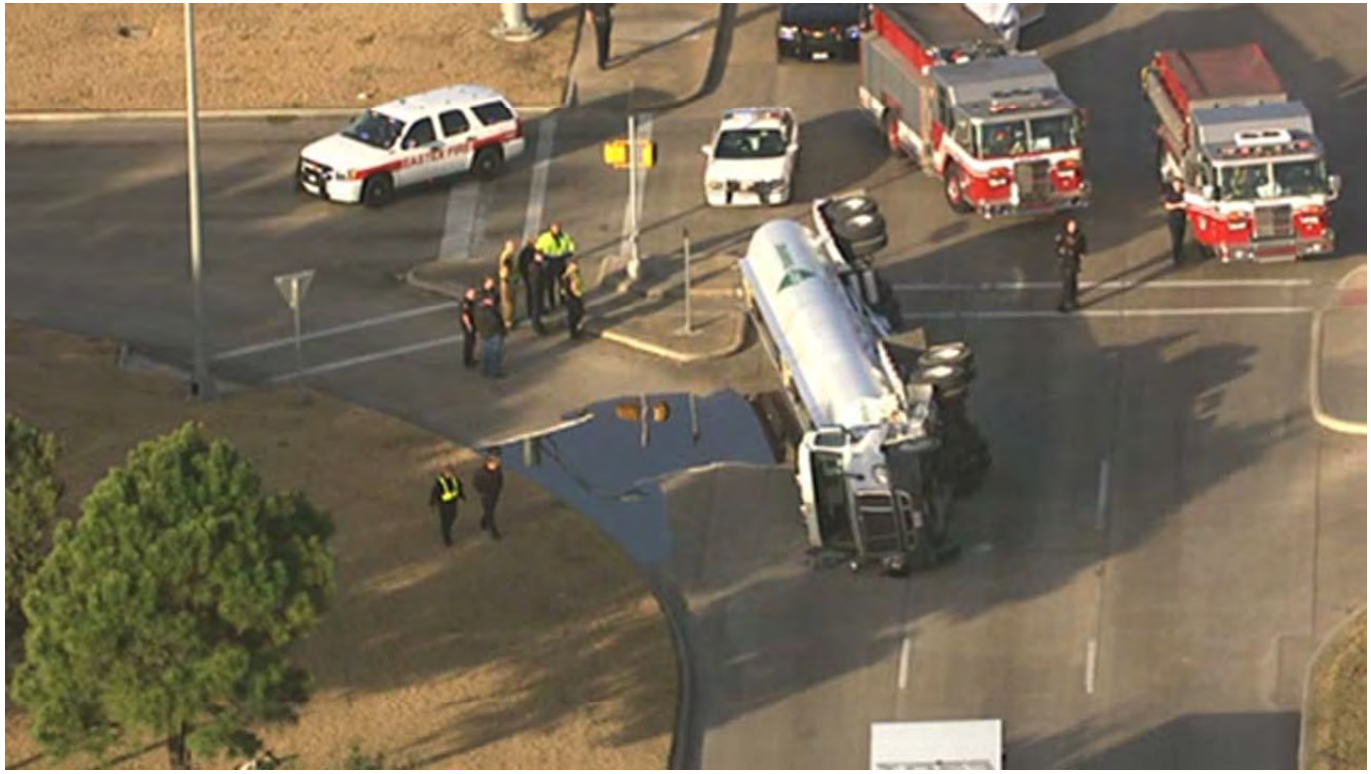
5. Foundation Drain Discharge

NO

6. Spill from Roadway Accident



6. Spill from Roadway Accident



YES

7. Leaky Septic Tank

7. Leaky Septic Tank

YES

MS4: IDDE

The Basics:

Illicit Discharge Detection and Elimination

Pennoni

MS4: IDDE

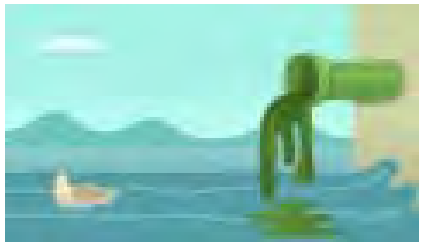
Federal regulations require municipalities designated to obtain a **National Pollutant Discharge Elimination System (NPDES) permit (Municipal Separate Storm Sewer System (MS4) Permit)** to develop and implement a **Stormwater Management Program (SWMP)** addressing **six (6) Minimum Control Measures (MCMs):**

1. Public education and outreach
2. Public participation / involvement
3. **Illicit discharge detection and elimination**
4. Construction site runoff control
5. Post-construction runoff control
6. Pollution prevention / good housekeeping

MCM #3: Illicit Discharge Detection & Elimination (IDDE)

MCM #3: Illicit Discharge Detection & Elimination (IDDE)

Relative to **Illicit Discharge Detection & Elimination (IDDE)** and the corresponding Municipal SWMP



- Develop program
- Map MS4 (entire system)
- Conduct screening; identify and remove sources
- Enact ordinance
- Do educational outreach on IDDE

PAG-13 requires implementation and facilitation of six (6) BMPs under MCM #3 for the municipal SWMP

MCM #3: Illicit Discharge Detection & Elimination (IDDE)

- **BMP #1**
  - Develop and implement a *written* program for the detection, elimination, and prevention of illicit discharges into your regulated MS4s

  - The program shall include the following:
    1. Procedures for identifying priority areas.
    2. Procedures for screening outfalls
    3. Procedures for identifying the source of an illicit discharge
    4. Procedures for eliminating an illicit discharge
    5. Procedures for assessing the potential for illicit discharges caused by the interaction of sewage disposal systems with storm drain systems
    6. Mechanisms for gaining access to private property to inspect outfalls (e.g., land easements, consent agreements)
    7. Procedures for program documentation, evaluation and assessment

MCM #3: Illicit Discharge Detection & Elimination (IDDE)

- **BMP #2**
  - Develop and maintain a map of your regulated MS4. Map must show the location of all outfalls and the locations and names of all surface waters that receive discharges from those outfalls
  - Measurable Goals
    1. Update map each permit year and revise as needed
- **BMP #3**
  - In conjunction with the map(s) created under BMP #2, include roads, inlets, piping, swales, catch basins, channels, basins, and other features
  - Measurable Goals
    1. Update map each permit year and revise as needed

MCM #3: Illicit Discharge Detection & Elimination (IDDE)

- **BMP #4**
  - Conduct outfall field screening (pursuant to BMP #1) identify the source of any illicit discharges, and remove or correct any illicit discharges

  - Measurable Goals
    1. In each permit coverage year, at least forty percent of the total number of outfalls should be screened
    2. Keep records in accord with plan

MCM #3: Illicit Discharge Detection & Elimination (IDDE)

- **BMP #5**
  - Enact IDDE Ordinance. Generally one stormwater ordinance (for IDDE, Construction, BMP maintenance and Act 167). Required content described in DEP “model ordinance”

  - Measurable Goals
    1. Update existing ordinance each permit year, if necessary

MCM #3: Illicit Discharge Detection & Elimination (IDDE)

- **BMP #6**
  - Provide educational outreach to public employees, business owners and employees, property owners, the general public and elected officials

Questions

More Basics:
What is an Illicit Discharge?
Expanded Definition/Description

1. Illicit discharges are defined as a storm drain that has measurable flow during dry weather containing pollutants and/or pathogens.

   A storm drain with measurable flow but containing no pollutants is simply considered a discharge.

2. Each illicit discharge has a unique frequency, composition and mode of entry in the storm drain system.

What is an Illicit Discharge?

Expanded Definition

3. Illicit discharges are frequently caused when a sewage disposal system interacts with the storm drain system.

4. Illicit discharges of other pollutants are produced from specific source areas and operations known as “generating sites.”

What is a Storm Drain?

- Enclosed pipe
  - Major storm drains = diameter ≥ 36 inches
  - Minor storm drains = diameter < 36 inches

- Open channel
  - Major storm drains = drain more than 50 acres
  - Minor storm drains = drain less than 50 acres

What is a Storm Drain?

- Some “pipes” found in urban areas may look like storm drains but actually serve other purposes
  - Foundation drains, weep holes, etc.

What is a Storm Drain?

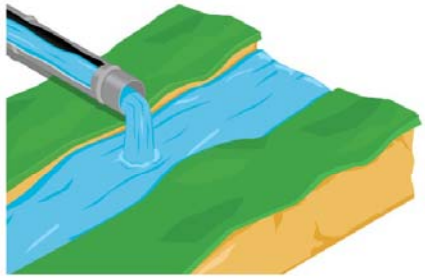
- Some “pipes” found in urban areas may look like storm drains but actually serve other purposes
  - Foundation drains, weep holes, etc. (not regulated)
  - Small diameter “straight pipes,” however, are a common source of illicit discharges
    - should be investigated to determine if they are a pollutant source

Storm Drains

- Not all dry weather storm drain flow contains pollutants or pathogens.
  - Springs, groundwater seepage, or leaks from water distribution pipes
  - Feld testing and/or water quality sampling are needed to confirm whether pollutants are actually present in dry weather flow

Discharge Frequency

- Continuous
  - Occur most or all of the time
  - Are usually easier to detect
  - Typically produce the greatest pollutant load



- Intermittent
  - Occur over a shorter period of time (e.g., a few hours per day or a few days per year)
  - Because infrequent, harder to detect
  - Can still represent a serious water quality problem
- Transitory
  - Occur rarely, usually in response to a singular event such as an industrial spill, ruptured tank, sewer break, transport accident or illegal dumping episode
  - Extremely hard to detect with routine monitoring
  - Can exert severe water quality problems

Discharge Flow Types

- Sewage and Septage
  - Sewer pipes and septic systems
- Wash Water
  - Generated from a wide variety of activities and operations:
    - discharges of gray water (laundry) from homes
    - commercial carwash wastewater & fleet washing
    - commercial laundry wastewater
    - floor washing to shop drains
- Liquid wastes
  - Wide variety of flows, such as oil, paint, and process water (radiator flushing water, plating bath wastewater, etc.)

Discharge Flow Types

- Tap Water
  - Flows are derived from leaks and losses that occur during the distribution of drinking water in the water supply system
- Landscape Irrigation
  - Flows occur when excess potable water used for residential or commercial irrigation ends up in the storm drain system
- Groundwater and Spring Water
  - Flows occur when the local water table rises above the bottom elevation of the storm drain and enters the storm drain either through cracks and joints
  - Where open channels intercept seeps and springs

Discharge Flow Types

- Water quality testing is used to conclusively identify flow types
- Each flow type has a distinct chemical fingerprint
- Develop your own “fingerprint” library by sampling each flow type
- Chemical libraries
  - sewage
  - septage
  - washwater
  - common industrial flows

Mode of Entry

- Direct
  - Directly connected to the storm drain pipe through a sewage pipe, shop drain, or other kind of pipe
  - Usually produces discharges that are continuous or intermittent
  - 3 main modes of direct entry
    - Sewage cross-connections
    - Straight pipe
      relatively small diameter pipes that intentionally bypass the sanitary connection or septic drain fields, producing a direct discharge into open channels or streams
    - Industrial and commercial cross connections

Mode of Entry

- Direct

Mode of Entry

- Indirect
  - flows generated outside the storm drain - enter through storm drain inlets or by infiltrating through the joints of the pipe
  - Generally, produce intermittent or transitory discharges *(exception of groundwater seepage)*
  - 5 main modes of indirect entry
    - Groundwater seepage – enters pipe - Continuous or intermittent
    - Spills - enters at inlet – transitory
    - Dumping - into a storm drain inlet - transitory
    - Outdoor washing activities - enters at inlet
      (Outdoor washing may or may not be an illicit discharge)
    - Non-target irrigation - enters at inlet – intermittent
      (from landscaping or lawns that reaches the storm drain system)

Mode of Entry

- Indirect

Land Use and "Potential Generating Sites"

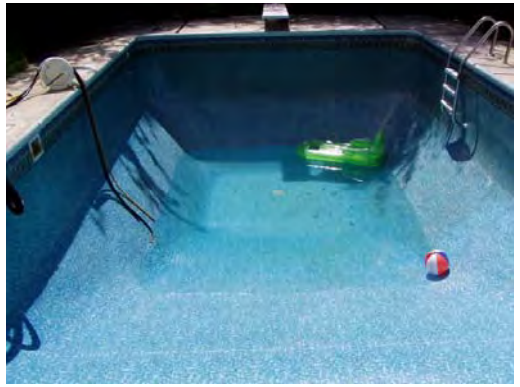
- Land use can predict the potential for indirect discharges
  often intermittent or transitory
- Many indirect discharges can be identified and prevented using the concept of "generating sites,"

Land Use and Potential Generating Sites

Land Use	Generating Site	Activity that Produces Discharge
Residential	• Apartments • Multi-family • Single Family Detached	• Car Washing • Driveway Cleaning • Equipment Washdowns • Lawn/Landscape Irrigation • Septic System Maintenance • Swimming Pool Discharges • Dumping/Spills (e.g., leaf litter and RV/boat holding tank effluent)

Land Use and Potential Generating Sites

- Residential



Land Use and Potential Generating Sites

Land Use	Generating Site	Activity that Produces Discharge
Commercial	• Campgrounds/RV parks • Car Dealers/Rental Car Companies • Car Washes • Commercial Laundry/Dry Cleaning • Gas Stations/Auto Repair Shops • Marinas • Nurseries and Garden Centers • Oil Change Shops • Restaurants • Swimming Pools	• Building Maintenance (power washing) • Dumping/Spills • Landscaping/Grounds Care (irrigation) • Outdoor Fluid Storage • Parking Lot Maintenance (power washing) • Vehicle Fueling • Vehicle Maintenance/Repair • Vehicle Washing • Washdown of greasy equipment and grease traps

Land Use and Potential Generating Sites

- Commercial

Land Use and Potential Generating Sites

Land Use	Generating Site	Activity that Produces Discharge
Industrial	• Auto recyclers • Beverages and brewing • Construction vehicle washouts • Distribution centers • Food processing • Garbage truck washouts • Marinas, boat building and repair • Metal plating operations • Paper and wood products • Petroleum storage and refining • Printing	• Industrial process water or rinse water • Loading and un-loading area washdowns • Outdoor material storage (fluids)

Land Use and Potential Generating Sites

- Industrial

Land Use and Potential Generating Sites

Land Use	Generating Site	Activity that Produces Discharge
Institutional	• Cemeteries • Churches • Corporate Campuses • Hospitals • Schools and Universities	• Building Maintenance (e.g., power washing) • Dumping/Spills • Landscaping/Grounds Care (irrigation) • Parking Lot Maintenance (power washing) • Vehicle Washing

Land Use and Potential Generating Sites

- Institutional

Land Use and Potential Generating Sites

Land Use	Generating Site	Activity that Produces Discharge
Municipal	• Airports • Landfills • Maintenance Depots • Municipal Fleet Storage Areas • Ports • Public Works Yards • Streets and Highways	• Building Maintenance (power washing) • Dumping/Spills • Landscaping/Grounds Care (irrigation) • Outdoor Fluid Storage • Parking Lot Maintenance (power washing) • Road Maintenance • Spill Prevention/Response • Vehicle Fueling • Vehicle Maintenance/Repair • Vehicle Washing

Land Use and Potential Generating Sites

- Municipal

Questions

Illicit Discharge
Storm Drains
Discharge Frequency
Discharge Flow type
Mode of Entry
Potential Generating Sites

Components of an Effective IDDE Program

Components of an Effective IDDE Program

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

Component 1 - Auditing Existing Resources and Programs

- *Purpose*:
  - to identify the most capable local agency to staff and administer the IDDE program,
  - analyze staffing and resource gaps, and
  - search for all available local resources and expertise
- *Method*: performance of a local IDDE "audit,"
  - Internal/external research,
  - Agency interviews, and
  - Interagency meetings

to determine existing resources and program gaps

MS4: IDDE

Component 1 - Auditing Existing Resources and Programs

Program Component	Key Tasks	Products
1. Audit existing programs	• Infrastructure Profile • Existing Legal Authority • Available Mapping • Experienced Field Crews • Access to Lab Services • Education and Outreach Outlets • Discharge Removal Capability • Program Budget and Financing	• Agreement on Lead Agency • 5 year Program Development Plan • First Year Budget and Scope of Work

Component 1 - Auditing Existing Resources and Programs

- Develop Infrastructure Profile
  - Number of storm drain outfalls
  - Miles of storm drain pipe
  - Total stream and channel miles
  - Total area serviced by storm drains
  - Total area serviced by sewers
  - Total area serviced by septic systems

MS4: IDDE

Component 1 - Auditing Existing Resources and Programs

- Infrastructure Profile – Borough of Kennett Square

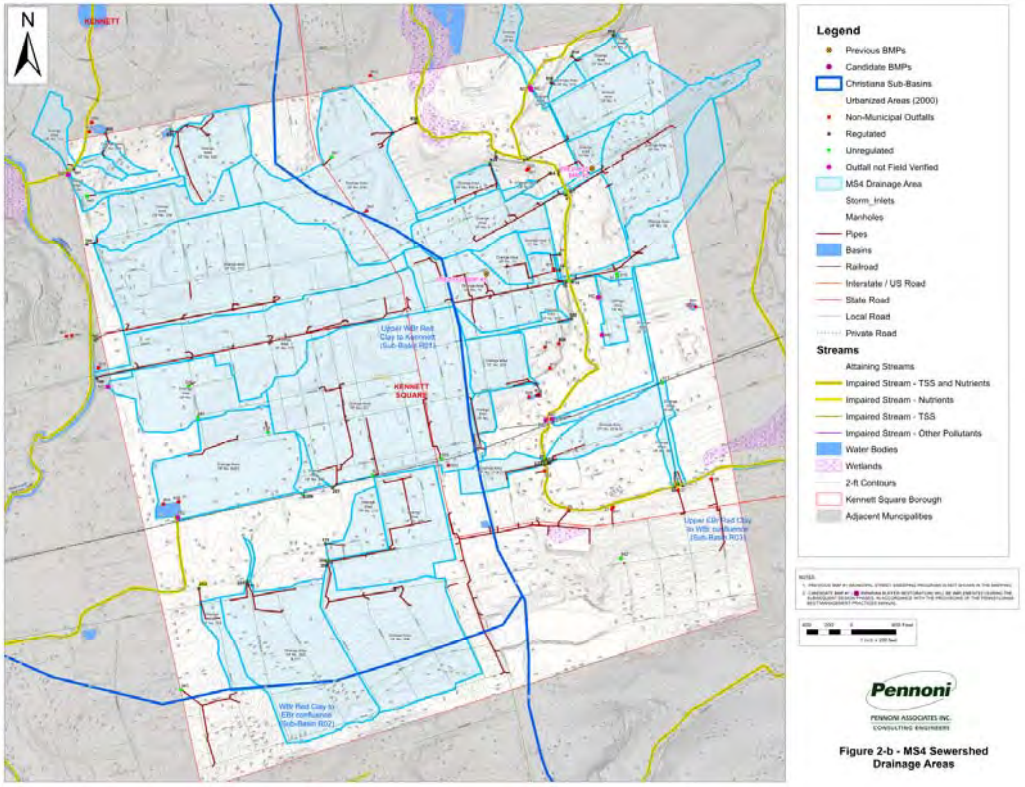
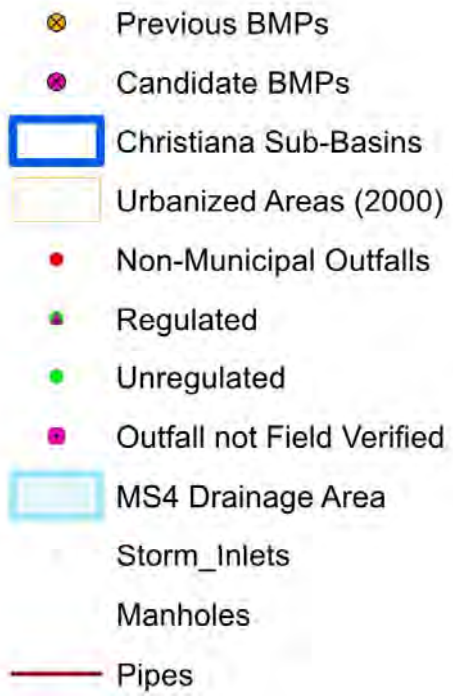


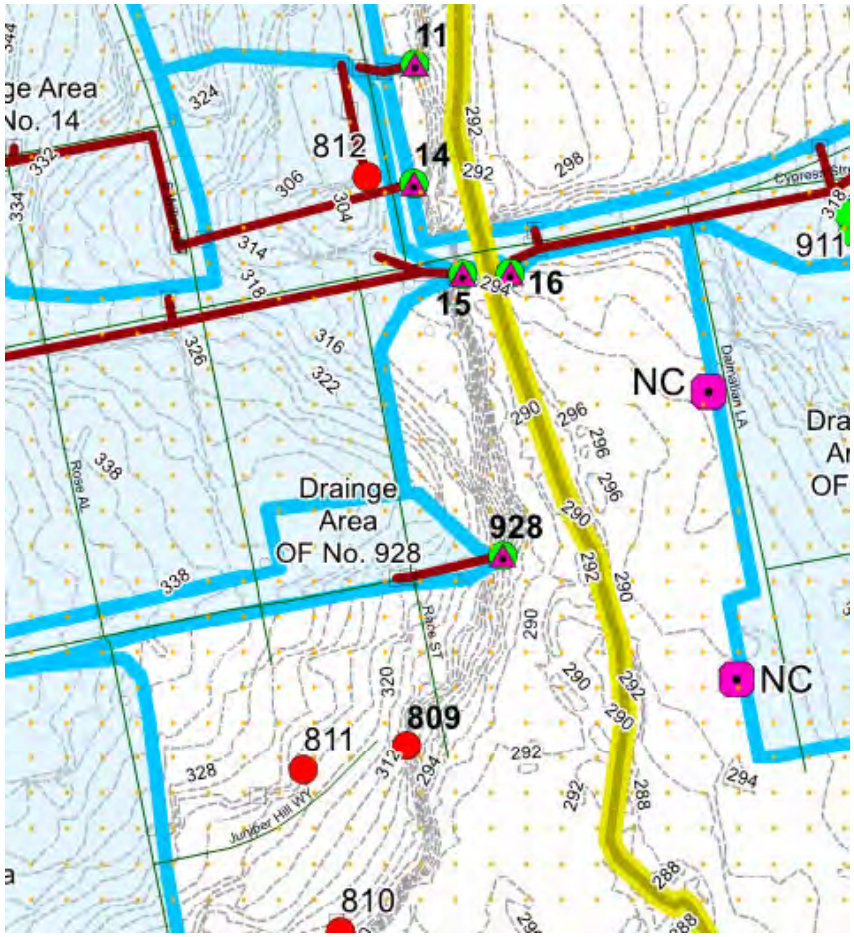
Figure 2-b - MS4 Sewershed Drainage Areas

MS4: IDDE

Component 1 - Auditing Existing Resources and Programs

- Infrastructure Profile – Borough of Kennett Square





MS4: IDDE

Component 1 - Auditing Existing Resources and Programs

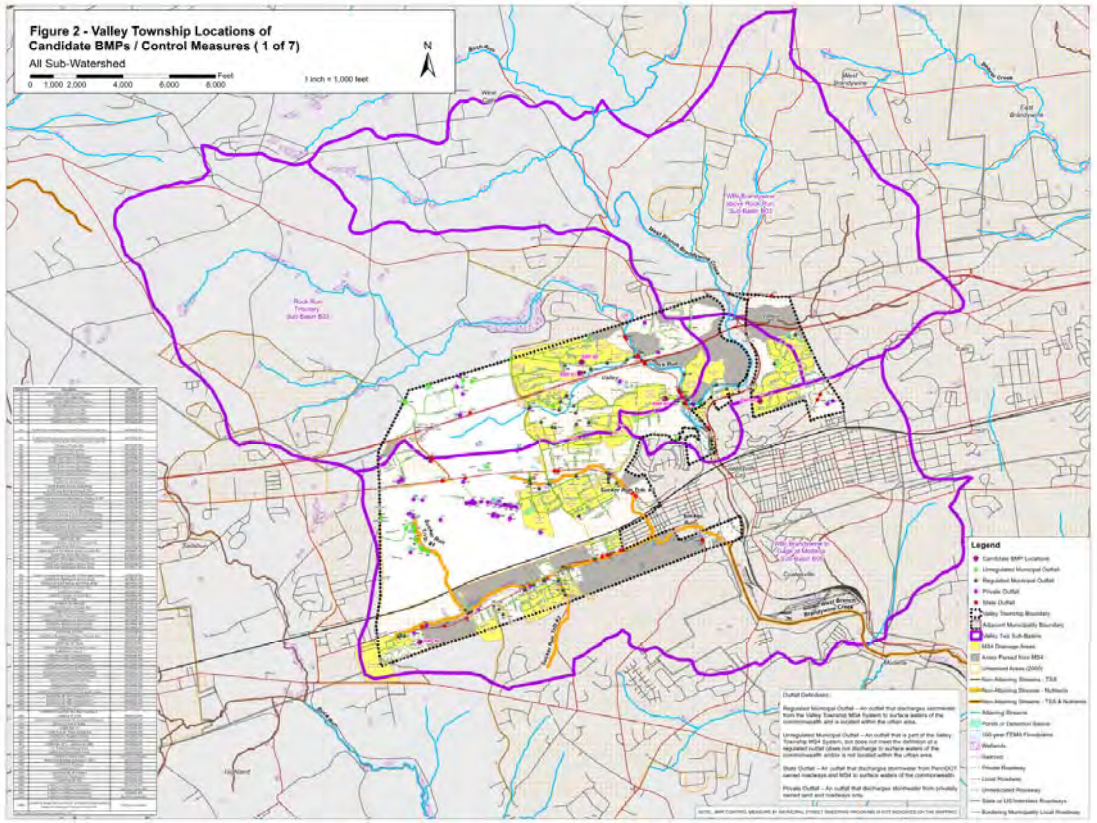
- Infrastructure Profile – Borough of Kennett Square

ID	Lattitude	Longitude	Elevation	Capturedat	Comment
7138	39.962161	-75.877025	149.591232	2011-03-24T19:21:04Z	OLET PIPE 16 WITH END WALL PP GOOD
7139	39.962778	-75.873795	155.695374	2011-03-25T15:15:44Z	OF PIPE 16 PP POOR DEBRIS & SED BUILDUP
7140	39.964346	-75.872949	135.496613	2011-03-25T18:53:28Z	OF PIPE 36 TO BASIN ON PP FAIR VEG
7141	39.964384	-75.872138	136.946320	2011-03-30T13:05:05Z	OF PIPE 36 TO BASIN ON PP POOR PIPE SILTED 50%
7142	39.966172	-75.872180	131.382187	2011-03-30T13:54:38Z	OF PIPE 36 TO SUCKER RUN FAIR SILTED
7143	39.966388	-75.871474	128.796616	2011-03-30T13:59:39Z	OF PIPE 16 SOURCE UNIDENTIFIED MAY BE ABANDONED OR BURRIED
7144	39.965475	-75.873405	130.428741	2011-03-30T14:28:23Z	OF PIPE 16 PP EX
7145	39.965166	-75.874877	132.771210	2011-03-30T14:48:22Z	OF PIPE 36 NO SAFETY GRATE PP GOOD
7146	39.965248	-75.875476	132.264618	2011-03-30T15:06:27Z	OF PIPE 36 FROM BASIN TO DRY WC
7147	39.965140	-75.875824	132.841797	2011-03-30T15:07:17Z	OF PIPE 24 FROM BASIN WITH FLOW
7148	39.964660	-75.876222	132.775177	2011-03-30T15:16:08Z	OF PIPE 24 TO BASIN PP FAIR MISSING RIP RAP AND DEBRIS BUILDUP ON SAFETY GRATE

MS4: IDDE

Component 1 - Auditing Existing Resources and Programs

- Infrastructure Profile – Valley Township



MS4: IDDE

Component 1 - Auditing Existing Resources and Programs

- Infrastructure Profile – Valley Township

Unregulated Municipal Outfall

Regulated Municipal Outfall

Private Outfall

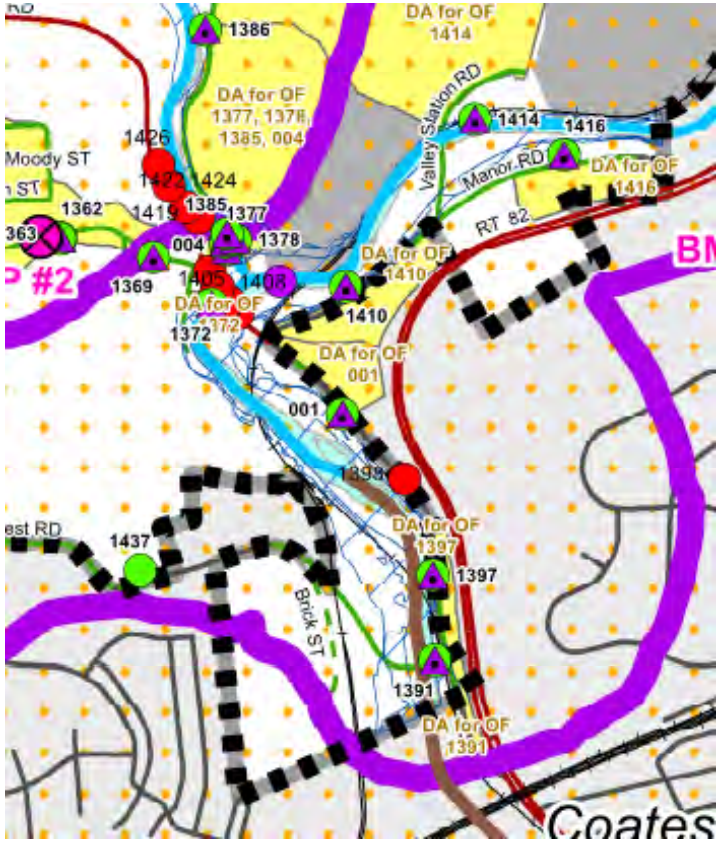
State Outfall

Valley Township Boundary

Adjacent Municipality Boundary

Valley Twp Sub-Basins

MS4 Drainage Areas

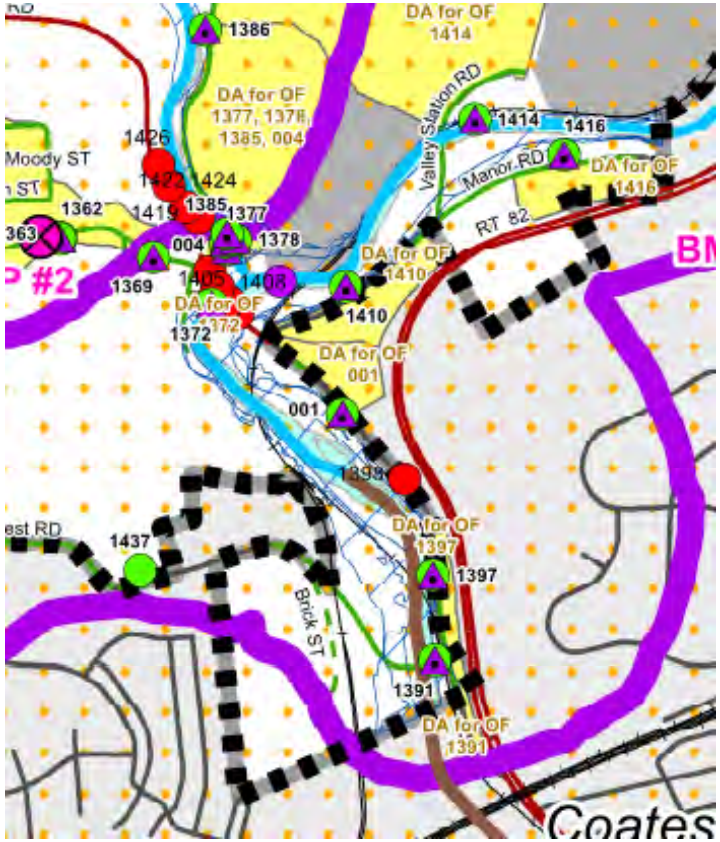


MS4: IDDE

Component 1 - Auditing Existing Resources and Programs

- Infrastructure Profile – Valley Township

Outfall ID	Description	Photo ID*
67	Outfall From SWM Pond to Tributary	DSC00084.JPG
73	Outfall From SWM Pond	DSC00090.JPG
74	Outfall From SWM Pond to Tributary	DSC00089.JPG
125	12" CMP Outfall Pipe to Sucker Run	DSC00146.JPG
126	Outfall to Culvert via Inlet	DSC00159.JPG
127	Outfall to Culvert via Inlet	DSC00160.JPG
128	Outfall to Culvert via Roadway	DSC00163.JPG
149	Outfall from Mt Carmel Road	DSC00183.JPG
152	Outfall from Roadway to Unnamed Tributary of Sucker Run	DSC00187.JPG
153	Outfall from Roadway to Unnamed Tributary of Sucker Run	DSC00190.JPG
154	Outfall from Roadway to Dry Water Course to Unnamed Tributary of Sucker Run	DSC00192.JPG
164	Outfall Hemlock Avenue	DSC00205.JPG
165	Outfall Hemlock Avenue	DSC00207.JPG



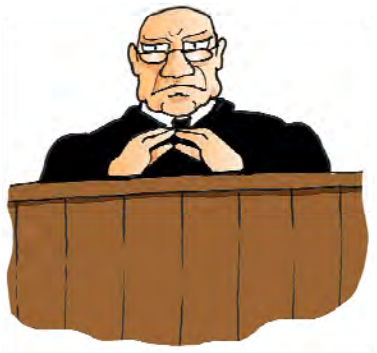
MS4: IDDE

Component 1 - Auditing Existing Resources and Programs

- Infrastructure Profile – Valley Township

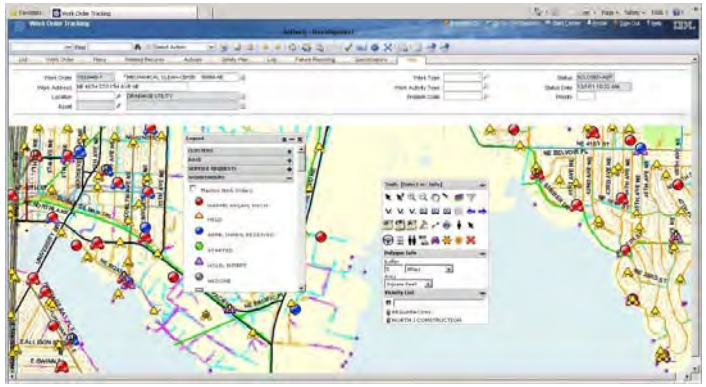
Component 1 - Auditing Existing Resources and Programs

- Establish Legal Authority
- Does your community have adequate legal authority to regulate illicit discharges through the following actions
  - Evaluate and modify plumbing codes
  - Prohibit illicit discharges
  - Investigate suspected illicit discharges
  - Require elimination of illicit discharges
  - Carry out enforcement actions

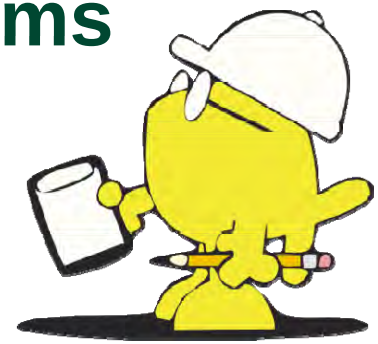


Component 1 - Auditing Existing Resources and Programs

- Review Available Mapping
  - Coverage and quality of mapping resources
  - Geographic Information System (GIS)
    - what digital mapping layers does it contain?



Component 1 - Auditing Existing Resources and Programs



- Availability of Field Staff
  - Field staff play a critical role
    - walk streams, assess outfalls, collect samples, respond to discharge complaints, and handle enforcement
  - Evaluate the availability of local staff to perform these functions, and their training needs
  - Develop initial estimate of the staff time needed for field crews

Component 1 - Auditing Existing Resources and Programs

- Access to Laboratory Analysis
  - Contract services from a private lab
  - Use existing lab facilities - drinking water or wastewater treatment plants
  - Partner with a local water and sewer district, university or community college
  - Develop your own “in-house” monitoring and lab capability

Component 1 - Auditing Existing Resources and Programs

- Education and Outreach
  - Look for other groups that are already involved in storm water or watershed education
    - parks, schools, watershed groups, utilities
  - Look for the current tools the public can use to report water quality problems
    - complaint hotlines, websites or community liaison offices
    - “piggy back” illicit discharge reporting at little additional cost

Component 1 - Auditing Existing Resources and Programs

- Discharge Removal Capability and Tracking
  - Evaluate local capacity to locate specific discharges, make needed corrections or repairs, and take any enforcement actions
  - Contract these services

Component 1 - Auditing Existing Resources and Programs

- Program Funding
  - Review the cost of IDDE program compliance for Phase I NPDES communities (CWP 2002 survey)
  - Construct unit cost budgets for each program component, based on an assumed level of effort
  - Use EPA estimated compliance costs for Phase II IDDE program of $1.30 per capita (with a large range $0.04 to $2.61/capita)

MS4: IDDE

Component 1 - Auditing Existing Resources and Programs

Questions

Component 2 - Establishing Responsibility and Legal Authority

- *Purpose*:
  - Establish legal and administrative authority to regulate, respond and enforce illicit discharges in the community
  - Review local plumbing codes to ensure that inappropriate connections are prohibited,
  - Develop a tracking system to locate illicit discharges and track management response
- *Method*:
  - Development of a new or amended illicit discharge control ordinance
  - Creation of a relational computer database for internal and external tracking of illicit discharges.

Component 2 - Establishing Responsibility and Legal Authority

- Who?
- What?
- How?

Component 2 - Establishing Responsibility and Legal Authority

- *Who* is responsible?

  - Department that oversees MS4
  - Coordination and communication with different departments is essential
  - Collaboration with adjacent or nearby permittees (regional approach – common watershed)

Component 2 - Establishing Responsibility and Legal Authority

- For *what* are they responsible?

  - Develop new or amended illicit discharge control ordinance

  - Key components

    - prohibit illicit discharges
    - investigate suspected illicit discharges
    - enforce elimination of illicit discharges

Component 2 - Establishing Responsibility and Legal Authority

- For *what* are they responsible?
  - Define illicit discharge
    - short, concise
    - list of specific substances or practices
  - Define illicit connection
  - Provisions for Access and Inspection

Component 2 - Establishing Responsibility and Legal Authority

Model Illicit Discharge and ConnectionStormwater Ordinance

ORDINANCE NO. _____

SECTION 1. PURPOSE/INTENT.

The purpose of this ordinance is to provide for the health, safety, and general welfare of the citizens of (_____) through the regulation of non-storm water discharges to the storm drainage system to the maximum extent practicable as required by federal and state law. This ordinance establishes methods for controlling the introduction of pollutants into the municipal separate storm sewer system (MS4) in order to comply with requirements of the National Pollutant Discharge Elimination System (NPDES) permit process. The objectives of this ordinance are:

(1) To regulate the contribution of pollutants to the municipal separate storm sewer system (MS4) by stormwater discharges by any user

(2) To prohibit Illicit Connections and Discharges to the municipal separate storm sewer system

(3) To establish legal authority to carry out all inspection, surveillance and monitoring procedures necessary to ensure compliance with this ordinance

SECTION 2. DEFINITIONS.

For the purposes of this ordinance, the following shall mean:

Authorized Enforcement Agency: employees or designees of the director of the municipal agency

Component 2 - Establishing Responsibility and Legal Authority

- *How* will they enforce the ordinance?
  - Enforcement Tools
    - escalating enforcement measures
    - voluntary compliance
    - aggressive enforcement

Component 2 - Establishing Responsibility and Legal Authority

- *How* will they enforce the ordinance?
  - Enforcement Tools
    - escalating enforcement measures
    - voluntary compliance
    - aggressive enforcement

- Written Warning with Voluntary Compliance
- Written Notice of Violation Ordering Compliance
- Administrative Penalties
- Civil Penalties
- Compensatory Action
- Criminal Prosecution
- Cost of Abatement of the Violation/Property Liens
- Emergency Cease and Desist Order
- Suspension of Water or Sewer Service
- Stop Work Order

Component 2 - Establishing Responsibility and Legal Authority

- *How* will they enforce the ordinance?
  - Enforcement Tools
    - escalating enforcement measures
    - voluntary compliance
    - aggressive enforcement
  - Establish a Tracking and Reporting System
    - important from legal perspective

Case Study – City of Raleigh, NC

- The City of Raleigh, **Water Quality Group (WQG)** within the Public Works Department oversees the City's IDDE Program.
- The WQG was created in the early 1990s to be responsible for surface water quality across the City and to ensure compliance with the City's NPDES permits.
- Raleigh's **Illicit Discharge Ordinance** - adopted in the second year of their original NPDES Phase I Permit.
  - defines and **prohibits illicit discharges and illicit connections**;
  - Requires **containment and clean-up of spills/discharges** (it is also standard operating procedure that the City fire chief be notified of any spills immediately);
  - allows for **guaranteed right of entry** for inspection of suspected discharges and connections;
  - outlines **escalating enforcement measures**, including civil and criminal penalties.
- Some functions are undertaken by the City's **Public Utilities Department** (dye testing, CCTV, sewer repairs
- Began with a **flat annual IDDE budget**
  - More recently, began receiving additional funds from the City's **storm water utility**
  - **Cleaning and correction costs** are funded through various budgets depending on the illicit discharge source

Component 2 - Establishing Responsibility and Legal Authority

Questions

MS4: IDDE

Component 3 - Desktop Assessment of Illicit Discharge Potential (IDP)

- *Purpose*:
  - to determine the potential severity of illicit discharges within a community, and
  - identifies which subwatersheds or generating land uses merit priority investigation
- *Method*:
  - Delineate subwatersheds
  - Compile available mapping and data (e.g., land use, age, outfalls, infrastructure history)
  - Derive subwatershed discharge screening factors using GIS analysis
  - Screen and rank illicit discharge potential at the subwatershed and community level
  - Generate maps to support field investigations

Component 3 - Desktop Assessment of Illicit Discharge Potential (IDP)

- Overview of Desktop Assessment of Illicit Discharge Potential
  - Initial Characterization
    - Existing background data and anecdotal information
  - Subwatershed Screening Ranking
    - *Low* – No known illicit discharge problems in the subwatershed
    - *Medium* – Problems are confined to a few stream reaches, outfalls or specific generating sites in the subwatershed
    - *High* – Problems are suspected to be severe throughout the subwatershed

Component 3 - Desktop Assessment of Illicit Discharge Potential (IDP)

- Overview of Desktop Assessment of Illicit Discharge Potential
  - Subwatershed Screening Tools
    - Step 1: Delineate subwatersheds
    - Step 2: Compile mapping layers and subwatershed data
    - Step 3: Compute discharge screening factors
    - Step 4: Screen for illicit discharge potential at the subwatershed and community level
    - Step 5: Generate maps to support field investigations

Component 3 - Desktop Assessment of Illicit Discharge Potential (IDP)

- Overview of Desktop Assessment of Illicit Discharge Potential
  - ➢ Subwatershed Screening Tools
    - ▪ Step 1: Delineate subwatersheds
      - ❖ smaller, more manageable units – easier to characterize and screen

Component 3 - Desktop Assessment of Illicit Discharge Potential (IDP)

- Overview of Desktop Assessment of Illicit Discharge Potential
  - Subwatershed Screening Tools
    - Step 2: Compile mapping layers and subwatershed data
      - GIS preferred
      - hydrologic, infrastructure and topographic map layers
      - extend beyond the political boundaries

Component 3 - Desktop Assessment of Illicit Discharge Potential (IDP)

- Map layers

Recommended	Optional
Aerial photos or orthophotos	Age of development
Subwatershed or catchment boundaries	As-builts or construction drawings
Hydrology including piped streams	Condition of infrastructure
Land use or zoning	Field inspection records
NPDES storm water permittees	Depth to water table and groundwater quality
Outfalls	Historical industrial uses or landfills
Sewer system, 1” = 200’ scale or better	Known locations of illicit discharges (current and past)
Standard Industrial Classification codes for all industries	Outfall and stream monitoring data
Storm drain system, 1” = 200’ scale or better	Pollution complaints
Street map or equivalent GIS layers	Sanitary sewer Infiltration and Inflow (I/I) surveys
Topography (5 foot contours or better)	Septic tank locations or area served by septic systems

Component 3 - Desktop Assessment of Illicit Discharge Potential (IDP)

- Overview of Desktop Assessment of Illicit Discharge Potential
  - Subwatershed Screening
    - Step 3: Compute Discharge Screening Factors

Component 3 - Desktop Assessment of Illicit Discharge Potential (IDP)

- Discharge Screening Factors

Discharge Screening Factors	
1. Past Discharge Complaints and Reports	6. Sewer Conversion
2. Poor Dry Weather Water Quality	7. Historic Combined Sewer Systems
3. Density of Generating Sites or Industrial NPDES Storm Water Permits	8. Presence of Older Industrial Operations
4. Storm Water Outfall Density	9. Aging or Failing Sewer Infrastructure
5. Age of Subwatershed Development	10. Density of Aging Septic Systems

Component 3 - Desktop Assessment of Illicit Discharge Potential (IDP)

- Overview of Desktop Assessment of Illicit Discharge Potential
  - ➢ Subwatershed Screening
    - ▪ Step 4: Screen for Illicit Discharge Potential (IDP) at the Subwatershed and Community Level

- Screen for Illicit Discharge Potential (IDP)

Prioritizing Subwatwersheds Using IDP Screening Factors

	Past Discharge Complaints/ Reports (total number logged)	Poor dry weather water quality (% of times bacteria standards are exceeded)	Density of storm water outfalls (# of outfalls per stream mile)	Average age of development (years)	Raw IDP score	Normalized IDP score**
Subwatershed A	8 (2)*	30% (2)*	14 (2)*	40 (2)	8*	2
Subwatershed B	3 (1)	15% (1)	10 (2)	10 (1)	5	1.25
Subwatershed C	13 (3)	60% (3)	75 (3)	75 (3)	11	2.75
Subwatershed D	1 (1)	25% (1)	15 (2)	15 (1)	5	1.25
Subwatershed E	5 (1)	15% (1)	29 (1)	20 (1)	6	1.5

* The number in parentheses is the IDP "score" (with 3 having a high IDP) earned for that subwatershed and screening factor.
Basis for assigning scores (based on benchmarks) to assess IDP is as follows:
Past discharge complaints/reports: <5 = 1; 5-10 = 2; >10 = 3
Dry weather water quality: <25% = 1; 25-50% = 2; >50% = 3
Storm water outfall density: <10 = 1; 10-20 = 2; >20 = 3
Average age of development: <25 = 1; 25- 50 = 2; >50 = 3

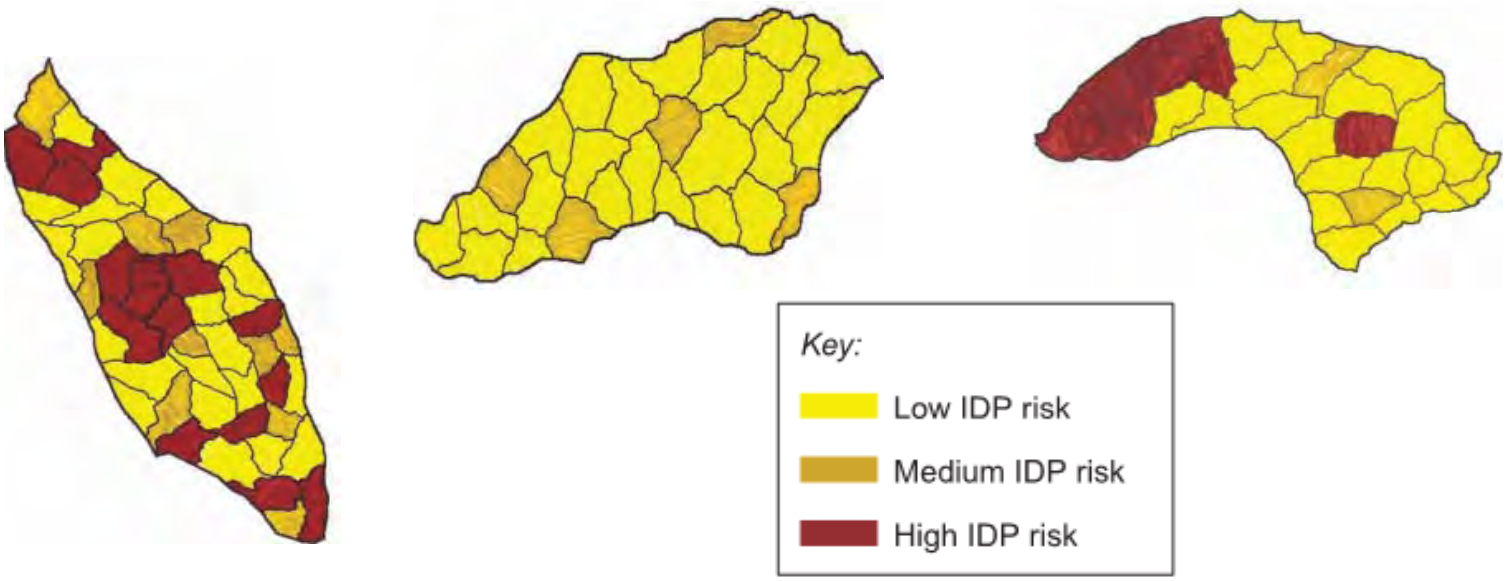
** Normalizing the raw IDP scores (by dividing the raw score by the number of screening factors assessed) will produce scores that fall into the standard scale of 1 to 3 for low to high IDP, respectively.

Component 3 - Desktop Assessment of Illicit Discharge Potential (IDP)

- Overview of Desktop Assessment of Illicit Discharge Potential
  - ➢ Subwatershed Screening
    - ▪ Step 5: Generate Maps to Support Field Investigations

Component 3 - Desktop Assessment of Illicit Discharge Potential (IDP)

- Maps to Support Field Investigations



Component 3 - Desktop Assessment of Illicit Discharge Potential (IDP)

Questions

Component 4 - Developing Program Goals and Implementation Strategies

- *Purpose*:
  - To define the goals and performance milestones to measure progress
  - To select the most appropriate and cost effective strategies to find, fix and prevent illicit discharges
- *Method*:
  - Analyze the results of the IDDE audit, desktop analysis and local water quality conditions
  - Develop realistic, achievable and measurable goals for the program
  - Goals and strategies should closely align with the type and severity of water quality problems and local watershed management priorities

Component 4 - Developing Program Goals and Implementation Strategies

- Develop Program Goals
  - Four broad types of goals
    - Overall program administration
    - Outfall assessment
    - Preventing illicit discharges
    - Finding and fixing illicit discharge

MS4: IDDE

Component 4 - Developing Program Goals and Implementation Strategies

GOALS RELATED TO OVERALL PROGRAM ADMINISTRATION		
EXAMPLE MEASURABLE GOALS	TIMEFRAME	PRIORITY
Audit existing capabilities and identify needs	Immediately	●
Designate one program head and identify key support staff		●
Develop a complete list of ongoing activities related to IDDE		○
Coordinate and communicate with other affected agencies	At program start up and continuously and regularly thereafter	●
Develop a projected 5-year budget		●
Secure funding to match 5-year goals		●
Draft and promulgate new or modified ordinance	Year 1	●
Establish a tracking and reporting system	Year 1	●

● - Essential ○ - Optional but recommended

MS4: IDDE

Component 4 - Developing Program Goals and Implementation Strategies

GOALS RELATED TO OUTFALL ASSESSMENT		
EXAMPLE MEASURABLE GOALS	TIMEFRAME	PRIORITY
Define and characterize drainage areas or sewer sheds	Year 1	●
Walk all stream miles	Begin in Year 1 Repeat once per permit cycle	●
Develop a digital (e.g., GIS) map of all outfalls, land use, and other relevant infrastructure	Year 1 and continuously and regularly thereafter	●
Secure analytical laboratory services either internally or by arrangement with a private laboratory	Initiate in conjunction with field screening	●
Sample and trace the source of a percentage of flowing outfalls each year of permit cycle	Initiate during first permit cycle and expand and enhance where problems are observed	●
Conduct regular in-stream assessments		○
Conduct investigations at a percentage of non-flowing outfalls with poor in-stream water quality		○
Integrate all collected stream data and citizen complaints into the GIS system	Initiate during first year and expand and enhance with time	○

● - Essential ○ - Optional but recommended

MS4: IDDE

Component 4 - Developing Program Goals and Implementation Strategies

GOALS RELATED TO PREVENTING ILLICIT DISCHARGES		
EXAMPLE MEASURABLE GOALS	TIMEFRAME	PRIORITY
Distribute educational materials to citizens and industries	Initiate during first year and expand and enhance with time	○
Conduct storm drain stenciling	Initiate during first permit cycle and expand and enhance where problems are observed	○
Hold hazardous waste collection days at least annually		○
Conduct upland subwatershed site reconnaissance surveys to better characterize generating site potential		○

● - Essential ○ - Optional but recommended

MS4: IDDE

Component 4 - Developing Program Goals and Implementation Strategies

GOALS RELATED TO FINDING AND FIXING ILLICIT DISCHARGES		
EXAMPLE MEASURABLE GOALS	TIMEFRAME	PRIORITY
Develop a spill response plan and coordinate emergency response with other agencies	Immediately	●
Remove all obvious illicit discharges	Ongoing with field screening and in response to hotline reports	●
Train staff on techniques to find the source of an illicit discharge	Initiate during first year and expand and enhance with time	●
Repair a fraction of the illicit discharges identified through field screening or citizen complaints	Initiate during first permit cycle and expand and enhance	●
Establish a hotline for public to call in and report incidents	Initiate during first year and expand and enhance with time	○
Inspect and dye-test all industrial facilities	Initiate during first permit cycle and expand and enhance	○
Develop a system to track results of on-site inspections	Initiate during first year and expand and enhance with time	○
Establish an Adopt-a-Stream program	Initiate during first permit cycle and expand and enhance	○

● - Essential ○ - Optional but recommended

MS4: IDDE

Component 4 - Developing Program Goals and Implementation Strategies

- Staff Training Video

Component 4 - Developing Program Goals and Implementation Strategies

- Crafting Implementation Strategies
  - most important implementation strategy is targeting
  - screening, education and enforcement efforts should always be focused on subwatersheds, catchments or generating sites with the greatest IDP

MS4: IDDE

Component 4 - Developing Program Goals and Implementation Strategies

Linking Implementation Strategies to Community–Wide IDP	
TYPE	IMPLEMENTATION STRATEGY
Low IDP	• Conduct field screening of outfalls in the context of broader watershed assessment and restoration initiatives or a comparable physical stream assessment approach that has broader focus and benefits. • Integrate IDDE program efforts into more comprehensive watershed assessment and restoration efforts where multiple objectives are being pursued (e.g., storm water education) • Target and coordinate with existing small watershed organizations to accomplish inventory and data collection efforts • Establish hotline to report suspicious discharges.

MS4: IDDE

Component 4 - Developing Program Goals and Implementation Strategies

Linking Implementation Strategies to Community–Wide IDP	
TYPE	IMPLEMENTATION STRATEGY
Medium IDP	• Conduct limited sampling in the suspect areas. The most cost-effective approach will likely involve using outside laboratory services or a municipal laboratory • Select a small set of indicator parameters using the nature of historic problems and land use as a guide • Target education program in problem areas • Look for partnerships with local watershed groups to regularly monitor problem areas • Establish a hotline to report suspicious discharges

Pennoni

MS4: IDDE

Component 4 - Developing Program Goals and Implementation Strategies

Linking Implementation Strategies to Community–Wide IDP	
TYPE	IMPLEMENTATION STRATEGY
High IDP	• Establish a hotline to report suspicious discharges. • Conduct and repeat screening in all subwatersheds • Plan for more rigorous sampling approach • Develop a community-specific chemical “fingerprint” of various flow sources to facilitate differentiation between likely flow sources • Develop community-wide educational messages aimed at increasing public awareness • Lead by example ▪ Emphasize cross-training of municipal employees ▪ Ensure municipal facilities are not contributing to illicit discharge problem

Pennoni

MS4: IDDE

Component 4 - Developing Program Goals and Implementation Strategies

Customize Strategies for Unique Subwatershed Screening Factors		
Initial Problem Assessment	Screening Factor *(from Table)*	Implementation Strategies
Aging Sewer Infrastructure	• Complaints of sewage discharges • Poor dry weather quality • Septic to sewer conversion • Historic combined system • Aging sewers	• Institute a point of sale inspection and verification process • Select a small set of indicator parameters that focuses on sewage connections • Develop cost share program to assist property owners with connection correction

Pennoni

MS4: IDDE

Component 4 - Developing Program Goals and Implementation Strategies

Customizing Strategies for Unique Subwatershed Screening Factors		
Initial Problem Assessment	Screening Factor *(from Table)*	Implementation Strategies
Aging Septic Infrastructure	• Aging septic systems	• Develop targeted education program for septic system maintenance • Institute a point of sale inspection and verification process. • Develop cost share capabilities to assist property owners with upgrade of system

Pennoni

Component 4 - Developing Program Goals and Implementation Strategies

Customizing Strategies for Unique Subwatershed Screening Factors		
Initial Problem Assessment	Screening Factor *(from Table)*	Implementation Strategies
Discharges from Generating Sites	• Density of generating sites • Older industry • Past complaints and reports	• Link IDDE program to existing industrial NPDES discharge permits • Inspect SWPPPs • Develop targeted training and technical assistance programs tailored to specific generating sites • Aggressively enforce fines and other measures on chronic violators

MS4: IDDE

Component 4 - Developing Program Goals and Implementation Strategies

Questions

Pennoni

Component 5 - Searching for Illicit Discharge Problems in the Field

- *Purpose*:
  - Detective work
  - Rapid field screening of outfalls in priority subwatersheds
  - Followed by indicator monitoring at suspect outfalls to characterize flow types
- *Method*:
  - Outfall Reconnaissance Inventory (ORI)
  - Used to find illicit discharge problems
  - Develop a systematic outfall inventory

Component 5 - Searching for Illicit Discharge Problems in the Field

- The Outfall Reconnaissance Inventory (ORI)
  - stream walk
  - to inventory and measure storm drain outfalls
  - find and correct “obvious” continuous and intermittent discharges without in-depth laboratory analysis
  - Initially completed for every stream mile

Component 5 - Searching for Illicit Discharge Problems in the Field

- The Outfall Reconnaissance Inventory (ORI)
  - Outcome/Product
    - An updated map of the locations of all outfalls within the MS4
    - Design and implementation of an indicator monitoring strategy to test suspect outfalls
    - Creation of a local chemical “fingerprint” library of pollutant concentrations for various discharge flow types

MS4: IDDE

Component 5 - Searching for Illicit Discharge Problems in the Field

Four Basic Steps to Conduct an ORI	
Step	Strategies
Step 1. Acquire necessary mapping, equipment and Staff	• Use maps from initial assessment • Minimal field equipment required • Two staff per crew with only basic field training required
Step 2. Determine when to conduct field screening	• During dry season and leaf off conditions • After a dry period of at least 48 hours • Low groundwater levels
Step 3. Identify where to conduct field screening (based on desktop assessment)	• Low IDP: integrate field screening with broader watershed or stream assessments • Medium IDP: screen drainage areas with higher ranking first for illicit discharge potential • High IDP: screen all outfalls systematically
Step 4. Conduct field screening	• Mark and photograph all outfalls • Record outfall characteristics • Simple monitoring at flowing outfalls • Take flow sample at outfalls with obvious or likely problems • Deal with major problems immediately

Pennoni

Component 5 - Searching for Illicit Discharge Problems in the Field

- The Outfall Reconnaissance Inventory (ORI)
  - Four Basic Steps to Interpret ORI Data
    - Step 1. Compile data from the ORI
    - Step 2. Develop ORI designation for outfalls
    - Step 3. Characterize the extent of illicit discharge problems
    - Step 4. Develop a monitoring strategy

Component 5 - Searching for Illicit Discharge Problems in the Field

- The Outfall Reconnaissance Inventory (ORI)
  - Four Basic Steps to Interpret ORI Data
    - Step 4. Develop a monitoring strategy
      - Use ORI data to prioritize problem outfalls or drainage areas
      - Select the type of indicators needed for your discharge problems
      - Decide whether to use in-house or contract lab analytical services
      - Consider the techniques to detect intermittent discharges
      - Develop a chemical library of concentrations for various flow types
      - Estimate staff time, and costs for equipment and disposable supplies

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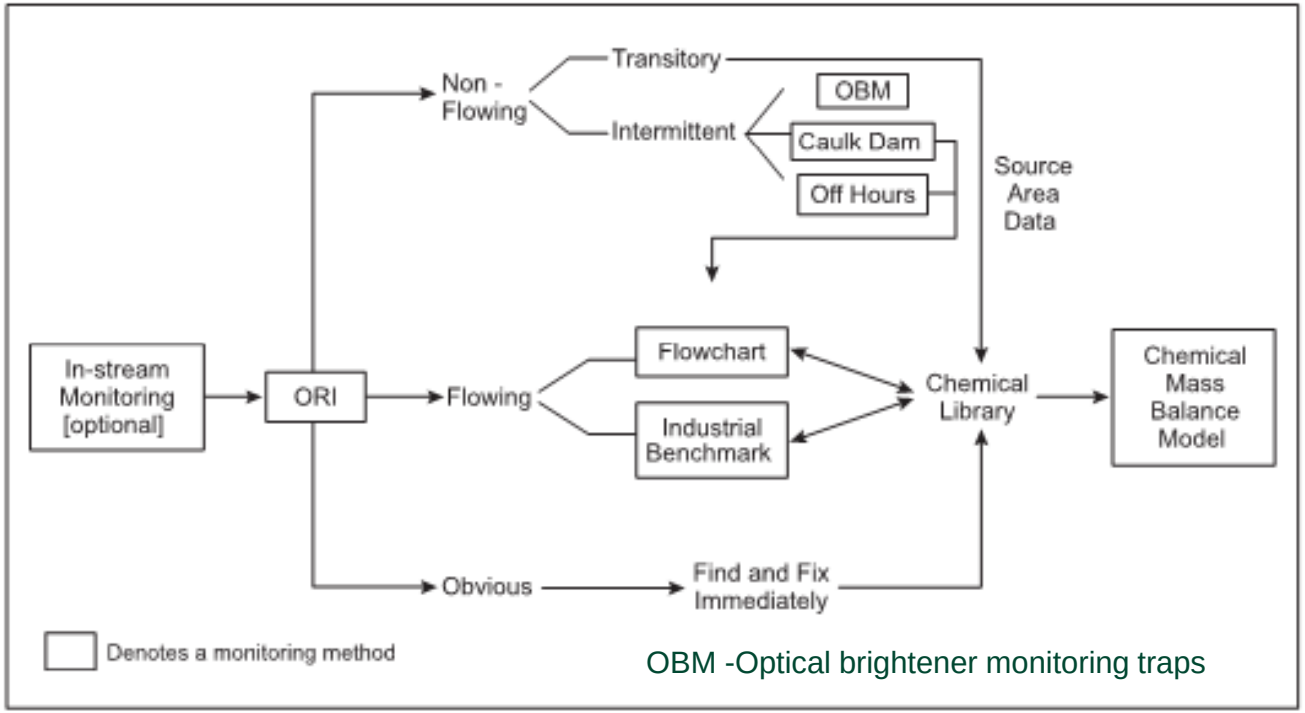
Component 5 - Searching for Illicit Discharge Problems in the Field

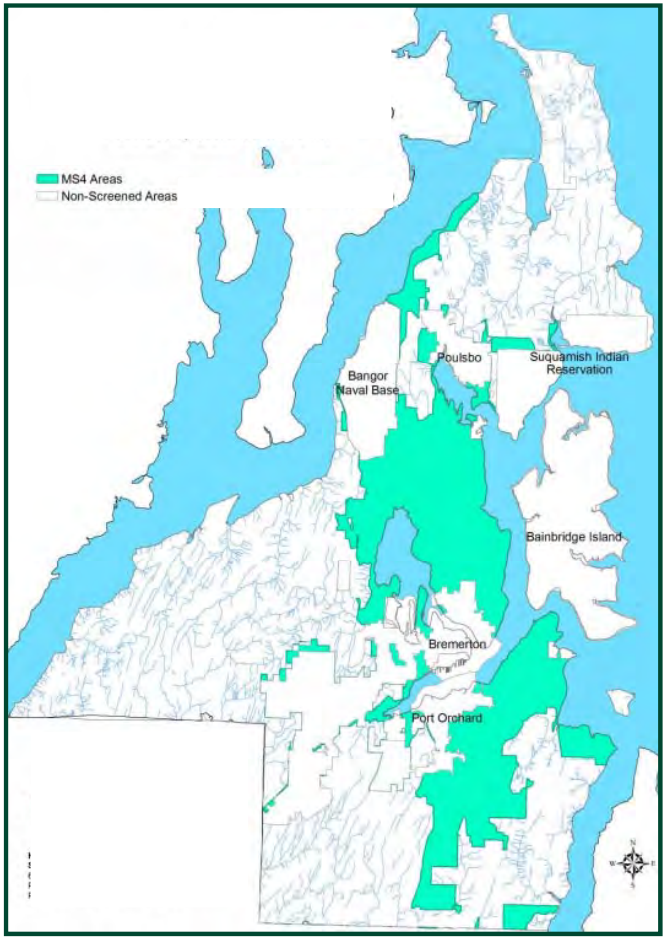
- The Outfall Reconnaissance Inventory (ORI)
  - Step 4. Develop a monitoring strategy



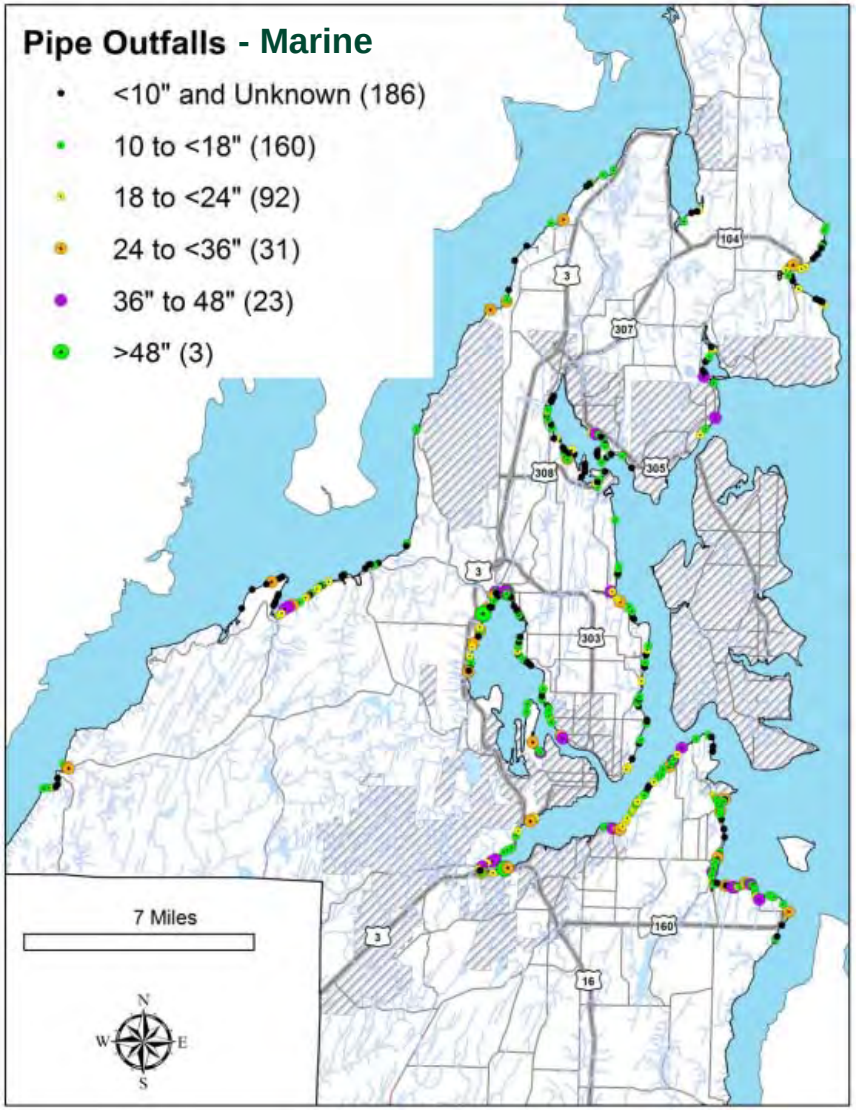
Component 5 - Searching for Illicit Discharge Problems in the Field

- ORI Case Study

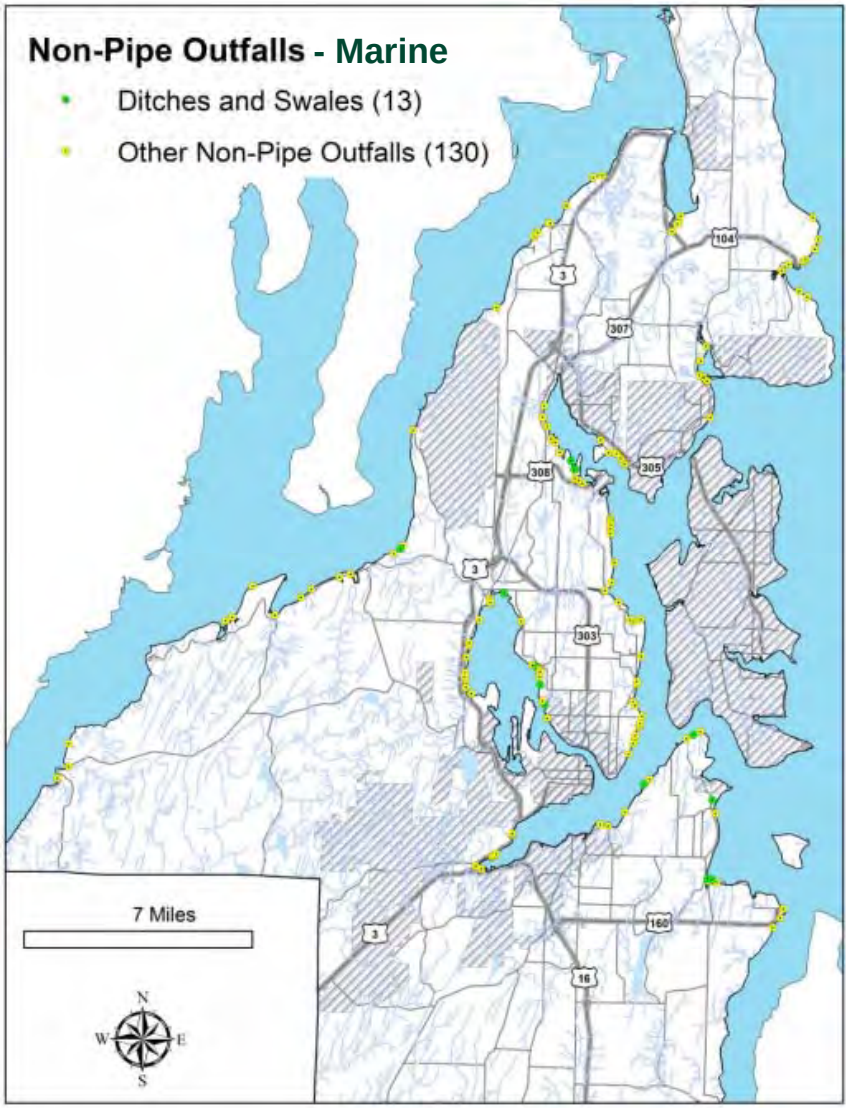
Outfalls to Marine Water		
Description	**Number**	**% of Total**
Total Outfalls	**638**	**100**
Total Piped Outfalls	**495**	**78**
County Piped Outfalls	*198*	*31*
Natural Outfalls	**143**	**22**
Streams, seeps, etc.	*130*	*20*
Ditches and Swales	*13*	*2*
Outfalls to Freshwater		
Description	**Number**	**% of Total**
Total Outfalls	**898**	**100**
Total Piped Outfalls	**425**	**47**
County Piped Outfalls	*355*	*40*
Natural Outfalls	**473**	**53**
Ditches	*446*	*50*
Swales and other	*27*	*3*



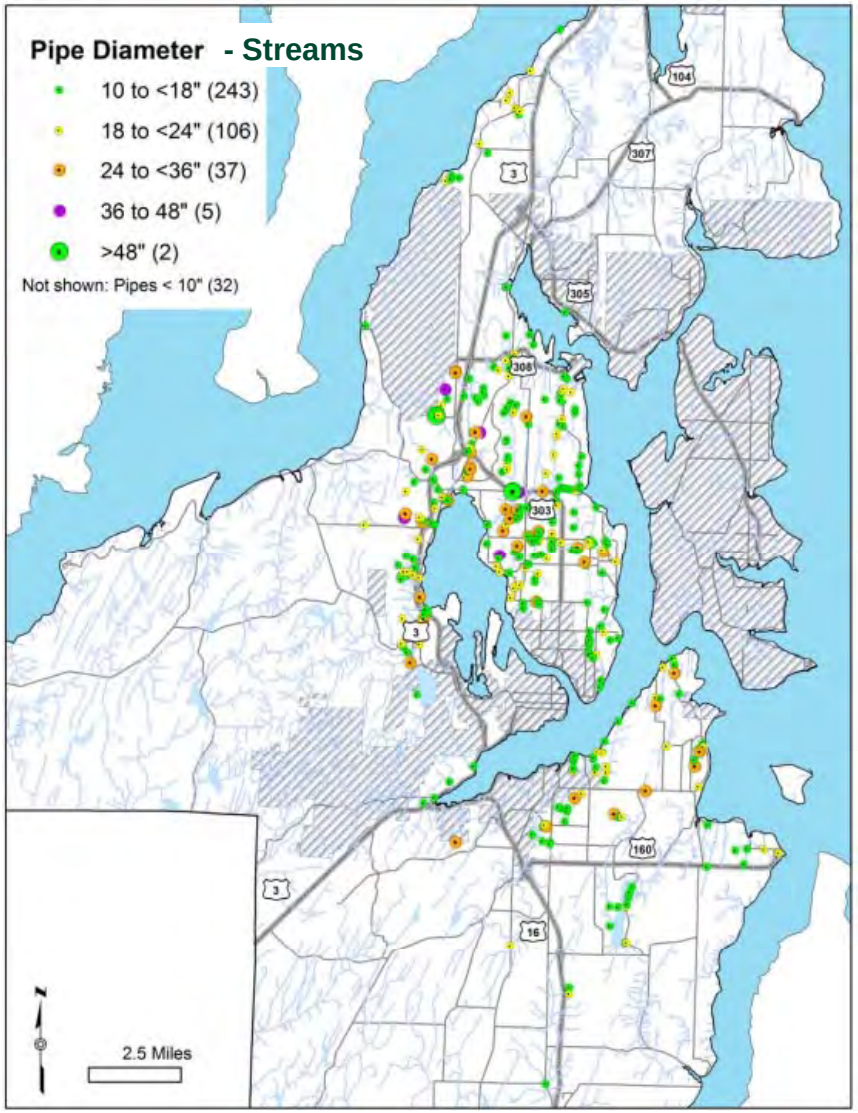
- ORI Case Study



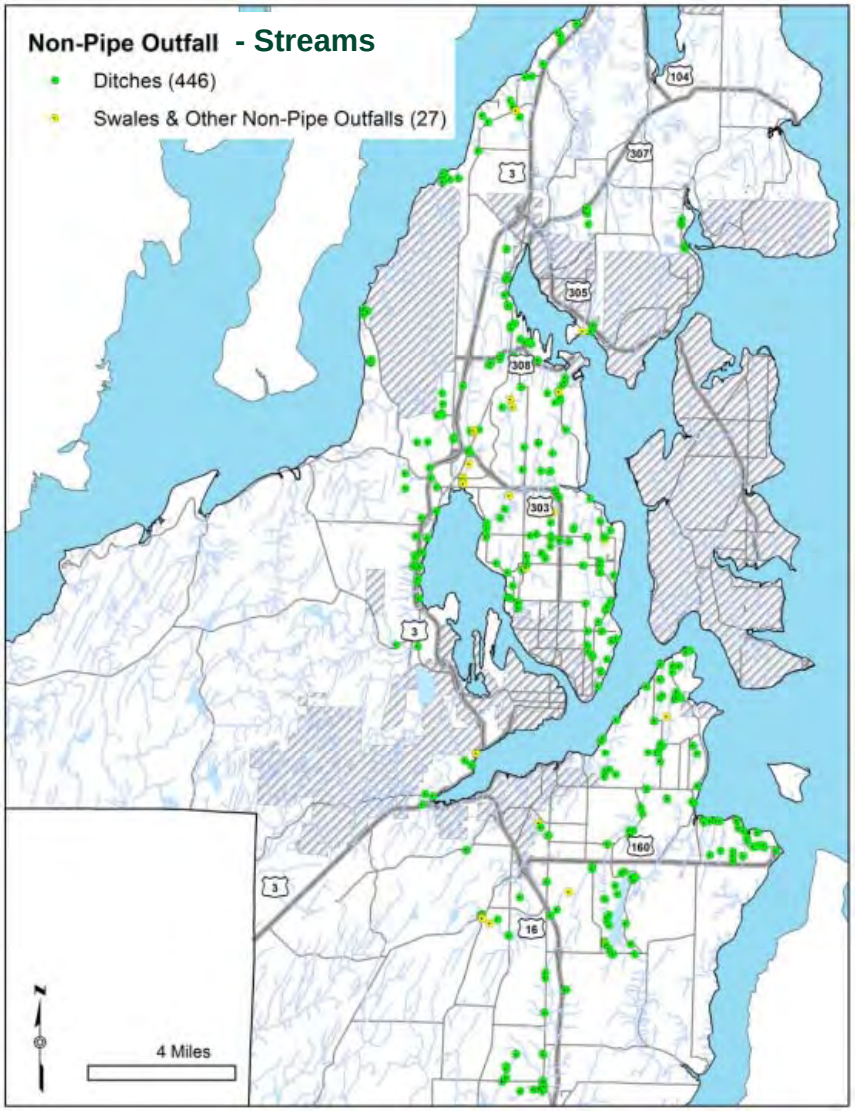
- ORI Case Study



- ORI Case Study



- ORI Case Study



Component 5 - Searching for Illicit Discharge Problems in the Field

- ORI Case Study
  - Visual Screening
    - A total of 36 (2%) outfall sites of the 1,536 observed has visual indication of an illicit discharge
  - Marine Outfall Water Quality
    - Of the 638 outfalls located, 263 (41%) were flowing and sampled
  - Stream Outfall Water Quality
    - Of the 898 outfalls located, 100 (11%) were flowing and sampled

MS4: IDDE

- ORI Case Study

Outfalls Discharging to Marine Water Sampling Results					
Illicit Discharge Potential	Number Of Outfalls	Unlikely %	Potential %	Suspect %	Obvious %
Fecal Coliform	263	79	10	8	3
Temperature	262	94	5	0	0
Conductivity	263	67	11	5	16
pH	263	96	4	0	0
Turbidity	262	97	2	2	0
Detergent	236	89	4	3	5
Glycol	245	91	1	3	5
Ammonia	245	76	13	8	4
Nitrate	210	70	26	3	0
Phosphate	253	85	11	4	0
Alkalinity	253	100	0	0	0
Hardness	249	88	2	1	9

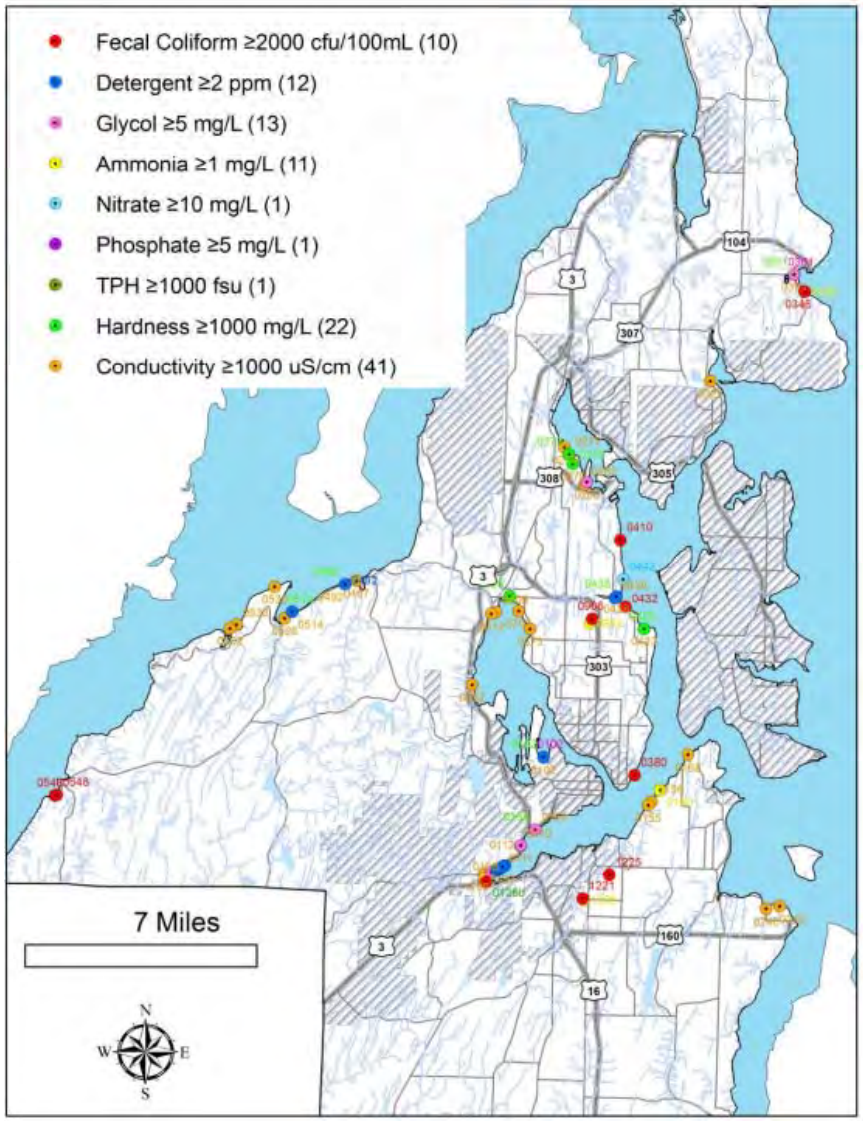
MS4: IDDE

- ORI Case Study

Outfalls Discharging to Fresh Water Sampling Results				
Illicit Discharge Potential	**Unlikely %**	**Potential %**	**Suspect %**	**Obvious %**
Fecal Coliform	87	O	1	4
Temperature	94	5	1	1
Conductivity	91	7	1	2
pH	100	0	0	0
Turbidity	95	1	4	4
Detergent	95	5	0	0
Glycol	97	3	0	0
Ammonia	61	17	2	22
Nitrate	58	34	0	8
Phosphate	97	1	0	2
Alkalinity	100	0	0	0
Hardness	99	0	0	1

- ORI Case Study

Location & Type Of Water Quality Contaminant



MS4: IDDE

Component 5 - Searching for Illicit Discharge Problems in the Field

Questions

Pennoni

Component 6 - Isolating and Fixing Individual Illicit Discharges

- *Purpose*:
  - to trace illicit discharge problems back up the pipe to isolate the specific source or improper connection that generates the discharge
- *Method*:
  - Five basic tools
    - Pollution reporting hotline
    - Drainage area investigations
    - Trunk investigations
    - On-site discharge investigations
    - Correction and enforcement

Component 6 - Isolating and Fixing Individual Illicit Discharges

- Pollution reporting hotline
- Storm drain network investigations
  - Work progressively up the trunk from the outfall and test manholes along the way
  - Split the trunk into equal segments and test manholes at strategic points of the storm drain system
  - Work progressively down the trunk (i.e., from the headwaters of the storm drain network and move downstream)

Component 6 - Isolating and Fixing Individual Illicit Discharges

- Drainage area investigations
  - Office – land use maps, SIC Code review, aerial photography
- On-site investigations
  - Field – dye testing facilities, septic tank and drain field inspection
- Septic system investigations
  - Community septic systems – breakout, straight pipe bypass discharges

Component 6 - Isolating and Fixing Individual Illicit Discharges

- Fixing Illicit Discharges

Methods to Fix Illicit Discharges		
Type of Discharge	Source	Removal Action(s)
Sewage	Break in right-of-way	Repair by municipality
	Commercial or industrial direct connection	Enforcement
	Residential direct connection	Enforcement; Incentive or aid
	Infrequent discharge (e.g., RV dumping)	Enforcement; Spill response
	Straight pipes/septic	Enforcement; Incentive or aid

Component 6 - Isolating and Fixing Individual Illicit Discharges

- Fixing Illicit Discharges

Methods to Fix Illicit Discharges		
Type of Discharge	Source	Removal Action(s)
Wash water	Commercial or industrial direct connection	Enforcement; Incentive or aid
	Residential direct connection	Enforcement; Incentive or aid
	Power wash/car wash (commercial)	Enforcement
	Commercial wash down	Enforcement
	Residential car wash or household maintenance related activities	Education

Component 6 - Isolating and Fixing Individual Illicit Discharges

- Fixing Illicit Discharges

Methods to Fix Illicit Discharges		
Type of Discharge	Source	Removal Action(s)
Liquid Waste	Professional oil change/car maintenance	Enforcement; Spill response
	Heating oil/solvent dumping	Enforcement; Spill response
	Homeowner oil change and other liquid waste disposal (e.g., paint)	Warning; Education; Fines
	Spill (trucking)	Spill response
	Other industrial wastes	Enforcement; Spill response

MS4: IDDE

Component 6 - Isolating and Fixing Individual Illicit Discharges

Questions

Component 7 - Preventing Illicit Discharges

- *Purpose*:
  - Identify key behaviors of neighborhoods, generating sites, and municipal operations that produce intermittent and transitory discharges
  - Target “discharge behaviors” improved pollution prevention practices
- *Method*:
  - Identifying major behaviors
    - The Unified Subwatershed and Site Reconnaissance (USSR; Wright et al., 2004)
    - Desktop analysis of potential generating sites
  - Source Control Plan
    - choose the appropriate combination of carrots and sticks to change behaviors

Component 7 - Preventing Illicit Discharges

- The Unified Subwatershed and Site Reconnaissance (USSR; Wright et al., 2004)
  - rapid field survey to evaluate potential pollution sources and restoration opportunities within urban subwatersheds
  - Checklists

Component 7 - Preventing Illicit Discharges

- *Preventing Illicit Discharges*
  - Public education and outreach
  - Public participation/involvement
  - Municipal pollution prevention/good housekeeping
  - Enforcement

Component 8 - IDDE Program Tracking and Evaluation

- *Purpose*:
  - address the ongoing management of the IDDE program
  - review progress made in meeting the measurable program goals established earlier in the permit cycle
  - Adaptive management is critical
- *Method*:
  - frequent maintenance and analysis of the IDDE tracking system

MS4: IDDE

IDDE Program Costs

Components of an Effective IDDE Program

Comparison of IDDE Program Components				
IDDE Program Component	Startup Costs	Annual Cost	Expertise Level	Type of Expertise
1. Audit	$	- 0 -	##	Planning/Permitting
2. Authority	$$	$	##	Legal
3. Desktop Analysis	$$	- 0 -	###	GIS
4. Goals/Strategies	$	- 0 -	##	Stakeholder Management
5. Field Search/Monitoring	$$	$$$$	###	Monitoring
6. Isolate and Fix	$	$$	###	Pipe and Site Investigations
7. Prevention	$$	$$$	##	Education
8. Evaluation/ Tracking	- 0 -	$	#	Data Analysis

Key: *$ = $10,000*
$$ =$10,00025,000
$$$ = $25,000 - 50,000
$$$$ = > $50,000

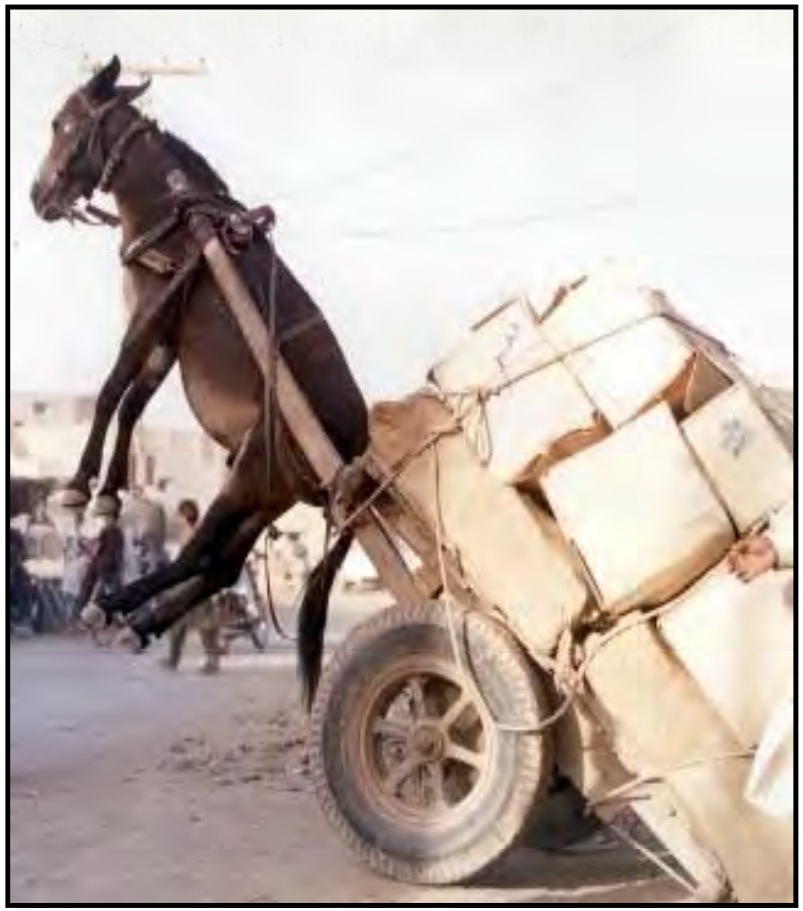
 # - Simple
- Moderately Difficult
– Complex

Questions

Well… that's it

Go out and conquer

Call if you feel overwhelmed !!



MS4: IDDE