ILLICIT DISCHARGE DETECTION AND ELIMINATION GUIDANCE MANUAL

A Guidance Manual
for Spokane County, Washington

Spokane County, Engineering & Roads
Stormwater Utility

March 2010
Updated February, 2019

ILLICIT DISCHARGE DETECTION AND ELIMINATION GUIDANCE MANUAL

A Guidance Manual for Spokane County, Washington

Prepared by

Spokane County Public Works
Stormwater Utility
1026 W. Broadway Avenue
Spokane, Washington 99260
509-477-3600
www.spokanecounty.org

Bill Galle, Stormwater Manager
bgalle@spokanecounty.org

Table of Contents

List of Tables

List of Figures

Introduction

This document is intended to serve as an illicit discharge detection and elimination (IDDE) guidance manual for Spokane County. The purpose of this manual is to assist Spokane County in developing programs and procedures required by the Eastern Washington Phase II Municipal Stormwater Permit (Permit). This manual details the IDDE minimum control measure, which is one of six components that operators of regulated small municipal separate storm sewer systems (MS4) are required to include within their stormwater management programs (SWMP).

Background of Phase II Permit

Although the quality of the nation's waters has improved greatly since the passage of the Clean Water Act in 1972, many water bodies are still impaired by pollution. According to the U.S. Environmental Protection Agency, the top causes of impairment include siltation, nutrients, bacteria, metals, and oxygen-depleting substances. Polluted stormwater runoff, including runoff from urban/suburban areas and construction sites are leading sources of impairment. To address this problem, EPA has put into place a program that regulates certain stormwater discharges.

In 1990, the EPA implemented Phase I of its stormwater program under the National Pollutant Discharge Elimination System (NPDES) permit provisions of the Clean Water Act. Phase I addressed stormwater runoff from "medium" and "large" municipal separate storm sewer systems (MS4s) generally serving populations of 100,000 or greater, construction activity that would disturb five or more acres of land, and 10 categories of industrial activity.

To further reduce the adverse effects of stormwater runoff, the EPA instituted its Stormwater Phase II Final Rule on December 8, 1999. The Phase II Stormwater program is also part of EPA's NPDES program driven by the Clean Water Act. The Washington State Department of Ecology is the regulating authority responsible for the Permit regulations within the State of Washington.

The Permit regulates discharges from small MS4s located in "urbanized areas" (as delineated by the Census Bureau in the most recent census) and urban growth areas.

The EPA's Stormwater Phase II Final Rule states that a stormwater management program must include the following six minimum control measures:

- Public Education and Outreach
- Public Involvement and Participation
- Illicit Discharge Detection and Elimination (IDDE)
- Construction Site Stormwater Runoff Control
- Post-construction Stormwater Management in New Development and Redevelopment
- Pollution Prevention and Good Housekeeping for Municipal Operations

Why Illicit Discharge Detection and Elimination Efforts are Necessary

Discharges from MS4s that include pollutants and wastewater from non-stormwater sources are illicit discharges (unless authorized by another NPDES or wastewater permit). These illicit discharges can enter the stormwater system through various means. The result is untreated stormwater that contribute to high levels of pollutants, including heavy metals, toxics, oil and grease, solvents, nutrients, viruses, and bacteria to receiving water bodies. Pollutant levels from these illicit discharges have been shown in EPA studies to be high enough to significantly degrade receiving water quality and threaten aquatic, wildlife, and human health. Now, more than ever, it is necessary to create an awareness of what illicit discharges are doing. This will allow operators and citizens to determine the types and sources of these discharges entering their water bodies. This manual can help establish the technical and educational means needed to prevent and eliminate these discharges.

What are the Guidelines for Developing and Implementing this Measure

The objective of the illicit discharge detection and elimination minimum control measure is to have regulated, small MS4 operators gain a thorough awareness of their systems and position themselves to take necessary action on eliminating illicit discharges. This awareness will allow operators to determine the types and sources of illicit discharges entering their system and procedures to eliminate these discharges.

Finding, Fixing, and Preventing Illicit Discharges

The purpose of an IDDE program is to find, fix, and prevent illicit discharges, as well as, develop a series of techniques to meet these objectives. This manual has been developed as a guidance document that provides the tools that will direct compliance with the relative IDDE parts of the Permit.

Chapter 1: Illicit Discharge Detection and Elimination

What is an Illicit Discharge?

Figure 1. Designated MS4 outfall location

An **illicit discharge** is defined by the Eastern Washington Phase II Permit (Permit) as "any discharge to an MS4 (Municipal Separate Storm Sewer System) that is not composed entirely of stormwater..." with some exceptions. These exceptions include discharges from NPDES-permitted industrial sources and discharges from emergency fire-fighting activities. Illicit discharges are considered "illicit" because MS4s are not designed to accept, process, or discharge such non-stormwater wastes.

At limited locations in Spokane County the MS4 is directly connected to a waterbody and does not receive any type of treatment prior to being discharged to receiving waters. Because of this non-treatment, it is vital that only stormwater be discharged from MS4s.

The Permit received by Spokane County requires the development of illicit discharge detection and elimination (IDDE) procedures. This Guidance Manual will assist Spokane County in meeting the requirements described within the Permit.

Types of Illicit Discharges

To promote a successful IDDE program, it is important to clearly understand the different types of illicit discharges so that proper identification can take place. This includes frequency of discharge and surrounding land use issues. Once the frequency of discharges and land use issues associated with these discharges are determined, it becomes possible to trace the illicit discharge back to its source and a solution can be pursued. Illicit discharges can be separated into three (3) categories based on frequency of discharge:

1. **Transitory Illicit Discharge:** These are typically a one-time event. They can result from spills, dumping, and line breaks. These types of discharges are often the most difficult to investigate and trace back to its source. Methods for reducing this type of discharge are to educate the public on stormwater and illicit discharges, establishment of a "hotline" telephone number for the public to call if any discharges are observed and investigate sources of illicit discharges.
2. **Intermittent Illicit Discharge:** These are typically discharges that occur occasionally. They can occur several hours per day, week or over the course of a year. They can happen as the result of line breaks or cross connections. Methods for reducing this type of discharge are education, stormwater "hotline" and investigation/enforcement.
3. **Continuous Illicit Discharge:** These direct connections into the MS4 can be from sanitary sewers, cross connections, infrastructure problems with a sanitary sewer system, or malfunctioning household septic systems. This type of discharge is the easiest to find, investigate, trace and eliminate from the MS4. These types of discharges also have the greatest impact because of the constant pollutant loading into a water body.

Table 1-1. LAND USES, LIKELY SOURCE LOCATIONS AND ACTIVITIES THAT CAN PRODUCE *TRANSITORY OR INTERMITTENT* ILLICIT DISCHARGES

Land Use	Likely Source Locations	Condition/Activity that Produces Discharge
Residential	· Multi-family · Duplex · Single Family	· Car Washing · Driveway Cleaning · Dumping/Spills · Equipment Wash-downs · Lawn/Landscape Watering · Septic System Maintenance · Swimming Pool Discharges · Laundry Wastewater · Improper Plumbing (garage floor drains)
Commercial	· Campgrounds/RV Parks · Car Dealers/Rental Car Co. · Car Washes · Commercial Laundry · Gas Stations/Auto Repair Shops · Marinas · Carpet Cleaners · Mobile Food Vendors · Nurseries and Garden Centers · Oil Change Shops	· 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 · Wash-down of Greasy Equipment & Grease Traps

	· Restaurants · Swimming Pools · Service Garages	
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	· All Commercial Activities · Industrial Process Water or Rinse Water · Loading and Un-loading Area Wash-downs · Outdoor Material Storage (fluids)
Municipal	· Airports · Landfills · Maintenance Depots · Municipal Fleet Storage Areas · Ports · Public Works Yards · Streets and Highways · Golf Courses · Other County Facilities	· Building Maintenance (power washing) · Dumping/Spills · Landscaping/Grounds Care (irrigation) · Outdoor Fluid Storage · Parking Lot Maintenance (power washing) · Road Maintenance · Emergency Response · Vehicle Fueling · Vehicle Maintenance/Repair · Vehicle Washing

SOURCE: ***Modified from Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments,*** **Center for Watershed Protection, 2004, p. 12, Table 2.**

Table 1-2. LAND USES, LIKELY SOURCE LOCATIONS AND ACTIVITIES THAT CAN PRODUCE *CONTINUOUS* ILLICIT DISCHARGES

Land Use	Condition or Activity that Produces Discharge
Residential	· Failed sanitary sewer infiltrating into storm drain · Sanitary sewer connection into storm drain · Failed septic systems discharging to storm drain system
Commercial/Industrial	· Failed sanitary sewer infiltrating into storm drain · Process water connections into storm drain · Sanitary sewer connection into storm drain
Municipal	· Failed sanitary sewer infiltrating into storm drain · Sanitary sewer connection into storm drain

Source: Table from ***Guidelines and Standard Operating Procedures for Stormwater Phase II Communities in Maine,*** **Casco Bay Estuary Partnership.**

The tables outlined above examine the likely source locations that contribute illicit discharges to an MS4. Land use can predict the potential for these discharges. By understanding the possible discharges emanating from land use activities, it allows for the IDDE program manager to thoroughly utilize this knowledge in identifying illicit discharges and their potential sources. Industrial facilities are regulated by additional permits through Ecology and/or the EPA. For industrial problems, please contact the local Ecology and/or EPA office.

Mode of Entry

Illicit discharges can also be classified based on how they enter the storm drain system. This entry can be direct or indirect. **Direct entry** means that the discharge is directly connected to the storm drain pipe system via a pipe. This type of entry will produce discharges that are either continuous or intermittent. Direct entry usually occurs when there are sewage cross-connections, or where there are industrial and commercial cross-connections. **Indirect entry** means that flows, which are generated outside the storm drain system, enter through storm drain inlets or by infiltrating through the joints of the pipe. Generally, indirect modes of entry produce intermittent or transitory discharges. This type of entry can include groundwater seepage into the storm drain pipe, spills, dumping, outdoor washing activities, and irrigation from landscaping or lawns that reaches the storm drain system.

What are the elements of an effective IDDE Program?

The Phase II Permit states that the following must be incorporated in an IDDE Program:

- Develop a storm sewer system map showing the location of all known and new connections to the MS4, all known outfalls, and the names and location of all waters of the state that receive discharges from those outfalls, and areas served by discharges to ground;
- To the extent allowable under law, effectively prohibit, through ordinance or other regulatory mechanism, non-stormwater discharges to the MS4 and implement appropriate enforcement procedures and actions;
- Develop and implement a plan to detect and address non-stormwater discharges, including illegal dumping, and a program for dry weather inspections;
- Inform public employees, businesses, and the general public of hazards associated with illegal discharges;
- Develop a list of occasional and incidental non-stormwater discharges that will not be addressed as an illicit discharge. This can include charity car washes if conducted in accordance with Spokane County's "Car Wash Program".

Does the IDDE Program address all Illicit Discharges?

The IDDE program is specifically directed towards addressing pollution within the MS4. Prior to the Permit, Spokane County Code prohibited, and continues to prohibit, several non-stormwater discharges that are not prohibited by the Permit, including:

- rising ground waters;
- uncontaminated pumped ground water;
- foundation drains;
- springs;
- water from crawl space pumps; and
- footing drains.

Spokane County Code and the Permit allow several non-stormwater discharges, including:

- diverted stream flows;
- uncontaminated ground water infiltration;
- air conditioning condensation;
- flows from riparian habitats and wetlands;
- non-stormwater discharges covered by a National Pollution Discharge Elimination System (NPDES) Permit and/or State Waste Discharge General Permit;
- discharges from emergency fire fighting activities;
- diverted stream flows not containing sediment;
- irrigation water from agricultural sources; and
- dust control materials that are applied in compliance with local and state policy and/or law.

Spokane County Code, as well as the Permit prohibits several non-stormwater discharges, unless special conditions are met, including:

- minimal discharges from lawn watering and other irrigation run-off are allowed;
- minimal discharges from street and sidewalk wash water, water used to control dust, and routine external building wash down that does not use detergents are allowed;
- discharges from potable water sources, including water line flushing, hyperchlorinated water line flushing, fire hydrant system flushing, and pipeline hydrostatic test water, as long as discharges are de-chlorinated to a concentration of 0.1 ppm or less, pH-adjusted if necessary, and volumetrically and velocity controlled to prevent re-suspension of sediments; and
- other non-stormwater discharges may be allowed when in compliance with the requirements of a stormwater pollution prevention plan approved by the county engineer or director of utilities.

Chapter 2: Mapping / Inventory

What is an MS4?

According to the Permit, the definition (see below) of a Small Municipal Separate Strom Sewer System (Small MS4) does not solely refer to municipally-owned storm sewer systems, but rather is a term with a much broader application. A Small MS4 also is not always just a system of underground pipes – it can include roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains.

> "Small Municipal Separate Storm Sewer System" or "Small MS4" is a conveyance or system of conveyances including roads with drainage systems, municipal street, catch basins, curbs, gutters, ditches, man-made channels, and/or storm drains which:
>
> a. Is owned or operated by a city; town; county; or district, association or other public body created pursuant to State law having jurisdiction over disposal of stormwater, sewage, industrial wastes, or other wastes, including special districts such as sewer districts; flood control districts or drainage districts, or similar entities;
> b. Is designed or used for collecting or conveying stormwater;
> c. Is not a combined sewer system;
> d. Is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2;
> e. Is not defined as a "large" or "medium" MS4 pursuant to 40 CFR 122.26(b)(4) & (7) or designated under 40 CFR 122.26 (a)(1)(v).
>
> Small MS4s include systems similar to separate storm sewer systems in municipalities such as: universities, prison complexes, and highways and other thoroughfares. Storm sewer systems in very discrete areas such as individual buildings do not require coverage under this permit. Small MS4s do not include storm drain systems operated by non-governmental entities such as: individuals, private schools, private colleges, private universities, and industrial and commercial entities."

Figure 2. Storm Sewer MS4 outfall

Figure 3. Ditch MS4 outfall

When the field crew is performing MS4 outfall inventories, a good understanding is needed of the community and the outfalls possibly located within or typically associated with a water body. Most people know that a storm sewer outfall is an MS4 outfall. However, it's important to remember that ditches and catch basins are considered part of the MS4s as well.

Mapping

The Permit (S5.B.3.a.) requirements for small MS4s state that one of the first mandatory elements of the IDDE program is to "develop a map of the MS4, showing the location of all known and new connections to the MS4 authorized or approved by the Permittee; all know outfalls; the names and locations of all waters of the state that receive discharges from those outfalls; and areas served by discharges to ground."

Figure 4. Map showing MS4 outfall locations.

Review Available Information

Many areas of Spokane County have developed detailed maps of their storm and sanitary sewer systems, while others have scattered information and still others have no information. In order to develop a map, inspectors need to collect any existing information on their storm sewer system.

The following is a list of possible resources that inspectors should collect and review when developing a comprehensive database for their storm sewer system. Identifying outfall locations may help prioritize areas that may have high priority outfalls.

- Review county records – county records can include a variety of maps as detailed below as well as information obtained regarding complaints filed with the community on possible illicit discharges emanating from a possible MS4 outfall.
- Zoning maps

- Drainage maps
- Subdivision maps
- Department of transportation maps
- Storm drain maps
- Stormwater Utility Atlas
- Age of infrastructure and development – this information is important when determining and prioritizing areas with possible illicit discharges. Older areas of infrastructure will have a higher priority.
- Identify water bodies and watersheds within the community – this information will provide the community a sense of where they exist within a larger watershed as well as the water bodies that they contain.
- Water quality information – this will assist the community in evaluating areas within their community that have impaired water bodies, as well as areas where past surface water pollution has been detected.

Once the inspector has compiled this information, it is necessary to perform field activities to locate the MS4 outfall locations as well as verify the information compiled in the review of any documents used.

Mapping the Storm Sewer System

Once the inspector has compiled the available information on their storm sewer systems, then it is necessary to perform field activities. The field survey will be necessary to create a map or to verify and update an existing map. These field activities will serve a number of purposes, including:

- Provide data as to the location of their MS4 outfall locations;
- Provide data on possible areas of illicit discharges;
- Provides data as to the condition of the water bodies within the community. This can include possible areas that can cause flooding problems (water bodies with excessive amounts of trees and debris obstructing the flow of water) during periods of high water flow;
- It allows for the prioritization of areas in regards to possible illicit discharges by the observance of pollution in a specific area;

The field survey will include a number of steps. These basic steps will be expanded upon in the next section and include:

- Contact regional partners to see if a numbering system already exists for the outfalls in your location. Include the Board of Health, Sewer District, County Engineer, Soil and Water Districts;
- Survey of all water bodies located within a community on foot or by boat to look for all outfalls in a waterbody;
- Note the locations of the outfalls on a map;
- Assign a number or code for each outfall that will be easy to understand and logical;
- Fill out a survey sheet for each outfall located.

It is vital that when performing the field inventory that the public is made aware and kept in formed of the process. This can be done in a variety of ways: letters/postcards to homeowners, newsletters, and community webpage.

Personnel safety is also extremely important during this process. Walking or boating water bodies can be potentially hazardous and safety precautions must be utilized during this phase of your IDDE program, such as, wearing safety vests, carrying a first aid kit, being careful while walking a water body due to algae growth (makes the rocks extremely slippery) and dark water (can contain unexpected deep holes and dangerous debris). Typical surveys should always be done with two field staff (whenever possible). All field staff should carry appropriate ID's.

Also, be aware of possible confined space locations when entering culvert pipes and follow confined space protocols. Remember, similar to the mapping component, during the field investigations, there will be remote areas that the field staff will be inspecting. If injury occurs, extra field staff is beneficial. Inform stormwater manager or appropriate personnel where field surveys will be conducted on any particular day.

In addition, specific locations may present employee safety concerns. Permission must always be granted before entering private property. Prior to entering or approaching an outfall, the field inspector shall conduct a visual inspection, as well as use their sense of smell to initially evaluate the presence of discharges that may be potential health hazards or dangerous substances. If any potentially hazardous or dangerous substance or material is suspected or observed, the field inspector shall exit the area and notify their supervisor immediately.

Field Survey

Figure 5. Field survey of outfall locations

The field survey includes a number of processes to accurately provide the desired information that the community needs in order to effectively develop an IDDE program. Attached to this

document in Appendix A and B are an "Inventory Form" and "Inspection Form" that can be used during field surveys. The field survey begins by compiling all of the obtained storm sewer systems information as well as MS4 outfall locations. This information can be in the form of a map or in written comment. Once this information is obtained, it is vital to bring the information along during the field survey for verification or to assist in finding outfall locations. Equipment for successful field surveys includes:

- GIS maps – for determining/documenting field locations and site notations;
- Field/survey sheets (located in Appendix A and B);
- Digital camera;
- GPS unit;
- Clipboards, pens, tape measure, waterproof flashlight;
- Waders (either chest or hip);
- First aid kit;
- Cell phone or handheld radio; and
- Cones/safety vests.

Field surveys are best conducted during low flows of the surface waterways to ensure that all MS4s are observable. During high water conditions, some MS4s may be covered and therefore missed during the inventory phase. During a field survey, the field crew must be aware of how to properly perform the field survey. The survey must be organized in a manner as to accurately obtain the information the community needs for their mapping component of their IDDE program. The first step is to utilize the field maps and plan a course of action to effectively walk or boat the waterbodies within the community. The field surveys of these waterbodies can be done in a variety of ways, including:

- Performing the survey in a section of the community (southeast, northeast, etc);
- Performing the surveys on one waterbody as it traverses through the community. This can include just walking the main branch first and then follow up with the tributaries at a later date, or to walk the main branch and walk the tributaries as you come upon them in the field; and
- Utilizing all of the above.

Figure 6 and 7. Field surveys of outfall locations.

When a methodology has been developed, make sure all staff are familiar with the process that will be used during the activity in the field. It is difficult to have one methodology for every situation. The methodology depends on the location and terrain, and how the water body traverses that particular area. In some circumstances, it is easier to walk the main branch of a stream and at a later date walk the tributaries. This is preferred if the main branch is a long stream that is difficult to reach. Likewise, if the main branch is somewhat shorter in length and is easy to access, it is much better to walk a stream's main branch, and then as a tributary is located, walk that tributary to its source or to the community boundary.

Once a selected methodology is decided upon, plans can change once the field survey is started. Methodologies created in the office are not always the same once field work is started. Everyone must be flexible enough to adapt once the field survey begins.

The field survey begins by deciding where a waterbody will be entered by the inspection crew and the utilization of the outfall site numbering system. Typically, this should be done by walking the waterbody upstream.

Downstream is defined as to where the stream is flowing. **Upstream** is defined as where the stream is flowing from. If at all possible, walking upstream allows for the accurate numbering of the outfalls while in the field.

The numbering of outfall locations is an important component of the overall IDDE program. Having a rationale in place in the numbering of your outfall locations will enable future follow ups and easy determination as to the location of the outfalls.

The first part of numbering any outfall relies on the waterbody itself. The first four digits of the outfall ID should be associated with the waterbody. For example:

- Abrams Creek Main Branch would be ACMB.
- Abrams Creek Tributary 1 would be ACT1.

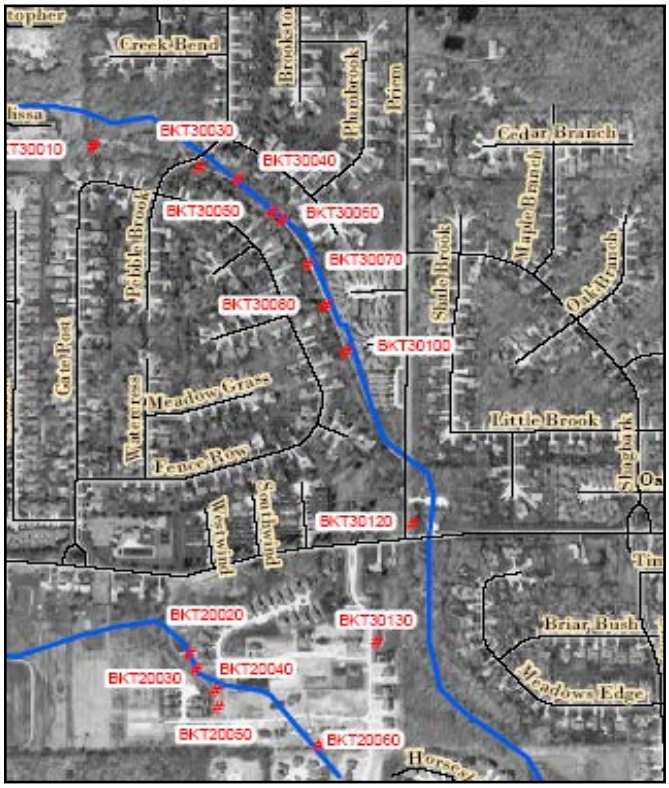

Figure 8. Outfall mapping

The next four digits of the outfall ID identify the number of that outfall.

Examples include:

❖ A stream traverses Community A. This stream is the main branch and flows throughout the community, border to border. In this situation, the survey should be conducted from the

downstream border of the stream and then walked upstream to the other border of the community.

- The stream where it leaves the community will be numbered as either a 0000, 1000, 2000, 3000 etc, depending on how many communities the stream passes through before it either enters another major river or lake. If it only travels through one more community, then it would start at 1000.
- Once the first outfall is located, either starting at 0000, 1000, 2000, etc, the next outfall number should go in sequences of 10's. This allows for the addition of future outfall locations between existing outfalls. This can occur with new construction or if one outfall was missed during the initial field survey.

Once in the waterbody, the inspection crew will walk or boat until they come upon a MS4 outfall location. When the outfall is located, perform the following for the outfall location:

- Take a photograph of the outfall and indicate the number of the photo on the survey form;
- Take GPS coordinates of the outfall – important in the mapping of the outfall locations; The GPS coordinates can be exported to different mapping systems that can plot these points on a map of the community;
- Fill out the necessary information on the field form (see Appendix A for example of field form), including:
    - Date
    - Observer
    - Community
    - Waterbody
    - Watershed / Subwatershed
    - Location (address if possible, street name, etc)
    - Latitude and Longitude
    - Elevation
    - Side of stream the outfall is located on (north, south, east or west when determining the side of the water body the outfall is on for consistency)
    - Shape of outfall
        - Circular
        - Elliptical
        - Egg
        - Rectangular
        - Other
    - Outfall Material
        - RCP (Reinforced Concrete Pipe)
        - CMP (Corrugated Metal Pipe)
        - VCP (Vitrified Clay Pipe)
        - PVC (Polyvinyl Chloride Pipe)

Figure 9. Measuring size of outfall

        - Other
    - Size of outfall
    - Condition of outfall
        - Good
        - Fair
        - Poor
        - N/A
    - Measurement of bottom of outfall to the top of the waterbody level, in feet
    - Type of outfall
        - MS4
        - Other
        - Unknown
        - Household septic discharge
        - Commercial septic discharge;
- Observe any noticeable pollution condition or other observances that may indicate possible illicit discharges that may be emanating from this outfall.

Note: It is always desirable to perform dry weather inspections and sampling at the same time as the field survey, when weather conditions allow. Once the outfalls have been identified and mapped, it is easier to perform wet weather inspections and sampling because the locations are now mapped and easier to locate.

Figure 10. Example of Outfall Materials

RCP (Reinforced Concrete Pipe)

CMP (Corrugated Metal Pipe)

VCP (Vitrified Clay Pipe)

PVC (Polyvinyl Chloride Pipe)

Chapter 3: Inspection and Developing Priority Areas

The Permit (S5.B.3) states, "Each Permittee shall develop, implement and enforce a program to detect and eliminate illicit discharges into the MS4". The program shall include the following components:

1. Locate priority areas within your community;
2. Field assessment of high priority water bodies;
3. Characterize the nature of the outfall and potential public or environmental threat;
4. Trace the source of an illicit discharge;
5. Remove the source of the illicit discharge;
6. Program evaluation and assessment; and
7. Training for municipal staff and other parties. (Not addressed within this Manual.)

Locating priority areas will be the focus of this chapter. The remaining components are addressed in the other chapters.

Identifying priority areas is vital to the development of an IDDE program. This process can be broken down into three fundamental steps:

1. Use all available information to identify the potential "hot spots" in the community;
2. Conduct dry weather field screenings to locate non-stormwater discharges;
3. Conduct water quality sampling and analysis to determine if non-stormwater discharges are present.

Hot Spots

Figure 11. MS4 outfall location with illicit discharge

The first step in locating priority areas is to identify possible "hot spots" within your community. These "hot spots" are areas where there is a potential for illicit discharges. These can be broken down into a list of commonly high probability locations where illicit discharges may be occurring.

1. Locations where there have been repeated problems in the past. This includes locations with known water quality data, as well as locations where numerous complaints have been received. These areas should be known by community officials as well as other agencies that

collaborate on specific problem areas. For example: Spokane County Utilities works on many sanitary sewer problems that can impact the MS4. Utilities would be a division within Spokane County that should be contacted for such information. Likewise, the local health department, Ecology, EPA office, county engineer, or a variety of other agencies/groups should be contacted when compiling this information.

2. Older areas of a community may indicate possible locations where there will be illicit discharges detected. These locations may have a higher percentage of illegal connections and/or have deteriorating sewer lines leading to infiltration problems from the older infrastructure found in that area.
3. The commercial and/or industrial areas of the community will tend to have a higher percentage of illicit discharges as well. Historically, these locations have significant numbers of illegal connections and have discharges with a high potential to affect water quality (Tuomari, 1999 and Pitt et al., 1993).

Detection / Inspections

Once the community has established their list of priority areas, then inspections must be conducted on all of the community's known MS4 outfall locations. Dry weather inspections are the required inspection protocol that must be performed on the MS4 outfall locations. Dry weather inspections are a visual inspection of the outfall location. Dry weather is defined as a minimum of 72 hours of no rainfall (0.1") within an area. During this type of visual inspection, there are a number of procedures required to perform an effective dry weather screening process.

Figure 12. Dry weather field inspection

- Always notify the public during any field component of your IDDE program. Examples include letters/postcards to residents, community webpage and community newsletters. As mentioned in the mapping chapter, it is important that the public is aware of what is occurring and keeping them informed will benefit the IDDE program. A better informed citizenry may assist in finding an illegal discharge or discharger, as well as helping with the educational component of the program.

- As mentioned in the previous chapter, safety in the field is vital. Typical surveys should always be done with two field staff (if available). Remember, like the mapping component, during the field investigations there will be remote areas that the field staff will be inspecting. If injury occurs, the extra field staff is beneficial. Also be aware of the

areas where field inspections will occur because certain locations may present special pollution sources that will provide cause for safety concerns.

- Utilize the information that you obtained from your mapping component. Print out completed inventory forms, inspection forms and a map indicating where the outfalls are and have them numbered on this map. This will allow for ease of locating known MS4 outfall locations. The field form will have the photo of the outfall, location of the outfall, side of stream, etc. This information is imperative when in the field. When the field staff finds the outfall, it is important to know which outfall is being inspected.

- During this visual inspection, fill out the field inspection form. The following is a list of observations needed for this component, and are listed on the field format:
    - Outfall number;
    - Date;
    - Time;
    - Crew staff;
    - Time of last rain;
    - Pipe flow (none, <1/4 pipe, <1/2/ pipe, etc); and
    - Comment section for: Odor, color, turbidity, floatable matter.

The above information is for dry weather visual inspections only. The field form also encompasses a sampling section for water quality sampling work that is conducted on an outfall.

Physical Indicators

As mentioned above, during dry weather visual inspections, it is important to indicate the conditions observed at an outfall location. This includes: flow, odor, color, turbidity and if floatables are present at the location. The information obtained from the physical characteristics observed is only an indicator and cannot be solely relied upon. Floatables are the best physical indicator. Floatables can consist of sewage, suds, and oil sheens. These are the most common. The observation of sewage at an outfall location indicates that there is a severe problem with that MS4 and should be looked at to determine where the source of the sewage. Suds can indicate a variety of things. Some suds are naturally formed by the movement of the water. If the suds are located at a water drop off and break up quickly, this may only be water turbulence related. If the suds have a fragrant odor, this can indicate the presence of laundry water or wash water in the waterbody. Oil sheens need to be looked at to try and determine the source of the oil sheen. Some oil sheens are common and occur naturally by in-stream processes (could also indicate the presence of a problem anaerobic condition that requires further analysis). This occurs when an iron bacteria forms a sheet-like film. This can be determined by looking at the sheen and seeing if it cracks when disturbed. Synthetic oil sheens, on the other hand, will swirl when disturbed. If this occurs, then the sheen is from an oil source.

Remember, when dry weather flows are observed at an outfall, the flow is considered non-stormwater related. This flow can be an illicit discharge, but it may also be a flow generated from another action that is not considered illicit (refer to chapter 1). Likewise, if no flow is observed at an outfall, it does not mean that there is no problem at that specific outfall. In

Chapter 1, different types of illicit discharges (continuous, intermittent and transitory) were discussed. The continuous flows are the easiest to locate. The other two are not. That is why it is important to observe the area at each outfall's location for any type of observable pollution problem that may be the result of a transitory or intermittent illicit discharge.

It is extremely important for IDDE program managers to recognize that during field inspections, the outfall is observed as a snapshot in time. An effective IDDE program utilizes long term dry weather inspections. This involves regular inspections of outfalls in a community. These inspections will be consistent with the established protocol. The inspections can be done once a year but on a continuous basis over time. This will ensure that each outfall is being monitored routinely and that if changes occur at that location, action can then be implemented.

Water Quality Sampling and Testing

An effective IDDE program will utilize water quality sampling and testing as a tool. When dry-weather flows are observed, it will be difficult to determine if there is a problem with that flow. Obvious problems, such as strong sewage odor, or the presence of raw sewage or toilet paper, will indicate that there is a bacterial problem at that location emanating from sanitary sewers, cross connections or septic systems. However, in most circumstances, water that is observed during dry weather conditions will not have those visual clues. That is why water quality testing and sampling is a vital component for an IDDE program.

Certain water quality parameters can serve as indicators of the likely presence or absence of a specific type of discharge. Some of these parameters can be measured in the field with specific instrumentation and field sample kits, while still others will need to be analyzed at a laboratory.

There are a large number of water quality parameters that can be measured in an IDDE program. The most commonly used and useful parameters are summarized in Table 3-1, which focuses on those parameters suggested in Pitt et al. (1993), the New England Interstate Water Pollution Control IDDE Manual and the EPA's Phase II regulations.

Figure 13. Taking a water sample at an MS4 outfall location during dry weather flow.

Table 3-1: Water Quality Test Parameters And Uses		
Water Quality Test	**Use of Water Quality Test**	**Comments (see: WAC 173-201A)**
Conductivity	Used as an indicator of dissolved solids	- Typically field measured with a probe
Bacteria (fecal coliform, *E. coli* and/or *enterococci*)	Used to indicate the presence of sanitary wastewater	- Potential health hazard
Ammonia (NH3-N)	High levels can be an indicator of the presence of sanitary wastewater	- Potential heath hazard - TMDL wasteload allocation
Surfactants	Indicate the presence of detergent (e.g., laundry, car washing)	- Pitt et al. 1993 suggested parameter; EPA Phase II regulations recommended parameter
pH	Extreme pH values (low or high) may indicate commercial or industrial flows; not useful in determining the presence of sanitary wastewater (which, like uncontaminated base flows, tends to have a neutral pH, i.e., close to 7)	- Typically measured in the field or lab with a probe
Temperature	Sanitary wastewater and industrial cooling water can substantially influence outfall discharge temperatures. This measurement is most useful during cold weather.	- Measured in the field with a thermometer or probe - TMDL wasteload allocation
Turbidity (or TSS)	Indicates the amount of solids suspended in water.	- Measured in the field with a turbidity meter
Total Chlorine	Used to indicate inflow from potable water sources; not a good indicator of sanitary wastewater because chlorine will not exist in a "free" state in water for long	- Pitt et al. 1993 suggested parameter
Potassium	High levels may indicate the presence of sanitary wastewater	- Pitt et al. 1993 suggested parameter
Optical Brighteners (Fluorescence)	Used to indicate presence of laundry detergents (can contain fabric whiteners, which cause substantial fluorescence)	-Pitt et al. 1993 suggested parameter
CBOD (Dissolved Oxygen)	Low DO can indicate high Phosphorus, or other potential problems	- TMDL wasteload allocation - Measured with probe
Copper, Total	May indicate urban runoff or industrial flows	-TMDL wasteload allocation
Zinc, Total	May indicate urban runoff or industrial flows	- TMDL wasteload allocation
TP (Total Phosphorus)	High phosphorus can indicate sewage and/or illegal gray water connections, fertilizer or other contamination	- TMDL wasteload allocation

Source: ***Table Modified from Illicit Discharge Detection and Elimination Manual: A Handbook for Municipalities*****, New England Interstate Water Pollution Control Commission**

The above table indicates that there are a number of water quality parameters that can be used to look for specific problems in communities. When deciding on what water quality parameters to use, the IDDE program manager must be aware of the community makeup and the possible sources of illicit discharges as well as how much money is available to complete water quality sampling. It is not necessary to do lab analysis on every sample. It is very possible to operate a successful IDDE program on a shoestring budget. That is why developing a priority list and hot spot locations are very important in determining the specific parameters to test for.

When developing the IDDE program protocol for sampling, it is important to have a monitoring plan in place. This can involve the utilization of Standard Methods reference documents as well as a Quality Assurance Project Plan (QAPP), or Quality Assurance Management Plan (QAMP). These plans will provide for proper quality assurance and quality control of proper sampling procedures. This will be important to validate your data. This will include proper calibration of field equipment and meters, how to properly take samples and keep them cold for the proper amount of time until delivered to the lab, and it will indicate how you will ensure the samples are valid (field blanks and replicate samples).

Also, it is important to take into account the resources that are available for the IDDE sampling portion of their program. During the sampling phase, utilizing a meter to obtain some of this information is a worthwhile endeavor. There are a series of meters that can be used for temperature, turbidity, pH, and conductivity. The lab analysis of samples is where there can be a high cost for communities. When determining what you want to sample for, look at the community as a whole and the potential problems within that community. In many circumstances, the problems may be with infrastructure. Where there are older sanitary and storm sewer lines, the problems may be with infiltration from the sanitary to the storm sewer. In most cases, the first sampling parameter should be for bacteria. Fecal coliform is an indicator organism found in the intestines of warm blooded mammals. When it is found in high quantities, this is an indicator of a bacterial problem.

The dry weather inspections and the water quality testing will provide valuable information for an effective IDDE program. By establishing a consistent protocol for these inspection strategies, IDDE managers will acquire quality data that will support the elimination of illicit discharges. Also, by performing long term dry weather inspections, a protocol will be set in place to view MS4 outfalls and ensure they are not discharging pollutants into the surface waters of the state.

By starting a sampling protocol and continuing this protocol on a yearly basis, an IDDE Program will develop baseline data relating to outfall discharges. This will allow staff to efficiently work on problem areas by directing their resources wisely by utilizing the sampling data. It will also allow staff to evaluate their MS4s over a long period of time and make decisions that will promote improvements in problem areas.

There is no single indicator parameter that is perfect. Table 3-2 summarizes the parameters that meet most of the indicator criteria, compares their ability to detect different flow types, and reviews some of the challenges that may be encountered when measuring them.

"The Data in Table 3-2 is based on research by the Center for Watershed Protection and Robert Pitt conducted outside of the northwestern United States. Therefore, the percentages shown to distinguish "hits" for specific flow types should be viewed as representative and may shift for Spokane County. Also, in some instances, indicator parameters were "downgraded" to account for regional variation or dilution effects. For example, both color and turbidity are excellent indicators of sewage based on discharge fingerprint data, but both can vary regionally depending on the composition of clean groundwater." (Center for Watershed Protection and Pitt, 2004)

Table 3-2. Indicator Parameters Used to Detect Illicit Discharges

	Discharge Types It Can Detect				
Parameter	Sewage	Wash water	Tap Water	Industrial or Commercial Liquid Wastes	Laboratory/Analytical Challenges
Ammonia	#	*	x	*	Can change into other nitrogen forms as the flow travels to the outfall
Boron	*	*	x	N/A	
Chlorine	x	x	x	*	High Chlorine demand in natural waters limits utility to flows with very high chlorine concentrations
Color	*	*	x	*	
Conductivity	*	*	x	*	Ineffective in saline waters
Detergents-Surfactants	#	#	x	*	Reagent is a hazardous waste
E. coli Enterococci Total Coliform	*	x	x	x	24-hour wait for results. Need to modify standard monitoring protocols to measure high bacteria concentrations
Copper or Zinc	x	x	#	*	Analytical Method: EPA 200.8
Hardness	*	*	*	*	
pH	x	*	x	*	Meter/Paper[3]
Potassium	*	x	x	#	May need to use two separate analytical techniques, depending on the concentration
Turbidity	*	*	x	*	Analytical Method: EPA 180.1 Meter

Can almost always (>80% of samples) distinguish this discharge from clean flow types (e.g., tap water or natural water). For tap water can distinguish from natural water.

***** Can sometime (>50% of samples) distinguish this discharge from clean flow types depending on regional characteristics, or can be helpful in combination with another parameter

x Poor indicator. Cannot reliably detect illicit discharges, or cannot detect tap water.

N/A Data are not available to assess the utility of this parameter for this purpose.

Data Source: Pitt (this study)

[3] Use either a calibrated pH meter or narrow-range pH indicator paper with a resolution not greater than ± 0.5 SU.

SOURCE: ***Table modified from Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments,*** **Center for Watershed Protection**

Quality Assurance Project Plans (QAPP)

Developing a Quality Assurance Project Plan (QAPP) is important to ensure that water samples are obtained using a consistent and approved protocol. This is to ensure that the data collected is accurate. The QAPP will dictate where to collect samples, when to collect, how to collect, calibration of equipment (meters), storage of samples, chain of custody, and transportation of samples to lab. It is important to have all field staff properly trained for sample collecting.

Equipment for Water Sampling

When performing water quality sampling, it is important to have adequate equipment. This includes, but not limited to:

- Cooler;
- Ice;
- Bottles: These will depend on the parameter being sampled for. The lab that you utilize for analysis may provide you the bottle that is required. Keep bottles in a safe environment to prevent cross contamination from occurring;
- Labels for bottles: In many circumstances, the lab will have the bottles pre-labeled. If not, get the labels that the lab recommends for labeling the bottles;
- Permanent marker for bottles;
- Field forms;
- Latex gloves;
- Meters: depends on what parameters and what type of meter purchased for use; and
- Test kits.

Whenever a water sample is taken at a MS4 outfall location, fill out the "Inspection Form" from Appendix B and make sure the time of sample is indicated. This is important when delivering samples to the lab. Use a lab that has a Quality Assurance/Quality Control policy in place and one that routinely performs this type of analysis for consistency purposes.

Special Monitoring

Some of the monitoring that will be required will involve different techniques. If an outfall location shows physical signs of a problem, but no flow is observed, then that illicit discharge is either an intermittent or transitory discharge. These do not flow continuously and may be difficult to observe.

Once an outfall is determined to have a possible illicit discharge associated with it and no flow is observed, then an alternate inspection and sampling program must be used. This can include the following:

> **Odd hours of monitoring:** Perform inspections either later in the evening or early morning hours or on the weekends. Since many types of intermittent discharges probably occur when residents are home, then the inspection needs to be performed during these

times as well. Make sure that if samples will be collected during odd times, the lab needs to be notified to ensure they can accept and analyze the sample since there are specific holding times for each type of parameter.

Sampling at the outfall plunge pool: A sample would be collected directly from the plunge pool below the outfall, if one is present. An upstream sample will also be taken to compare the results. This can be affected by dilution and time so it may not be completely accurate. The plunge pool test will however, determine if additional investigation is warranted.

Chapter 4: Illicit Discharge Source Tracing

Once an illicit discharge has been identified and detected, the next step is to locate the source of that discharge. The development of a plan to locate and address illicit discharges is required under the Permit (S5.B.3.c.iv.).

The information that is received from the mapping and the inspection protocols will be valuable in this component (see previous chapters)**.** During the inspection process, illicit discharges may be located and detected. Once these outfall locations are determined to have an illicit discharge, the next step is to start the tracing protocol to determine the source of the illicit discharge. Once located, the illicit discharge needs to be eliminated from the MS4.

Tracing Techniques

There are a number of different techniques that can be utilized to trace for an illicit discharge. Each technique listed must be fully understood and their limitations must be understood as well.

Visual Inspections/Manholes and Storm drain Network

Figure 14. Removing storm drain lid

Once a dry weather flow is observed and it has been determined to be an illicit discharge, a key tracing technique involves dry weather inspections along the specific MS4 conveyance system. Typically, if the conveyance system is an open ditch, this is an easier process then if it was within an enclosed storm drain network. The inspection process utilizing this method needs to start at the initial detection location (the MS4 outfall where the illicit discharge has been observed and noted). The next step is to work "upstream" from the detection location by moving up the storm drainage system to the first manhole. Check this manhole to see if there is evidence of flow. You may wish to sample each manhole, but look for flow in each up stream manhole first. Since the flow has already been determined to have an illicit discharge, it may be more cost effective and faster to initially pinpoint the source of the flow. Keep moving upstream until no flow or low flow is observed. Keep in mind that as you move upstream, there may be junction lines entering that main storm drainage system at other locations. Utilize the storm drainage maps for the community to determine if this is the case. Under this circumstance, you will need to check the additional manholes as well.

During this inspection process, key observations are necessary, including:

- Presence of flow;
- Odors;
- Colors/clarity;
- Stains or deposits on bottom of structure; and
- Oil sheen, scum or foam on any standing water.

At this stage, sampling can be utilized to assist in this tracing process. Once areas are determined to have possible illicit source flows, sampling these individual locations and manholes can assist in directing where the source of the illicit discharge is located. Specific parameters can be used when looking for the illicit discharge. Refer to Chapter 3, Table 3-1 for sample parameters that can be used for specific sources of illicit discharges. Typically, you will use the same parameter that was used when the initial sample was taken to determine if an illicit discharge was present at that flow.

Dye Testing

Figure 15. Dye at outfall location

When an area containing a potential illicit discharge source is located, the utilization of dye testing will assist in determining the exact location of the illicit discharge. Permission is required to access private property prior to starting a dye test procedure. Permission to access a building is also required. Once permission is granted, the dye testing will begin. Note: before any dye test is conducted, it is a good idea to notify the appropriate district office of the Department of Ecology that a dye test is being conducted as well as the local community fire department and other community personnel. The dye needs to be put into the suspect location. This is done by pouring the dye into sinks, toilets, etc. and then flushed through the drainage system. The storm drains and sanitary sewers need to be monitored to observe where the dye discharges to. This procedure is effective in determining direct connections of sanitary lines to storm lines.

Video Inspection

When an area has been determined to contain the illicit discharge, another method available to determine where a discharge source is located is to do a video inspection of the storm line. Video cameras can be used by either pushing or using a mobile video unit. Both cameras will provide detailed information as to where the infiltration or connection is located within the MS4 system.

Indicator Monitoring / Sampling

When dry weather flow is observed at an outfall location, and the sample reveals there is a problem with this flow, further monitoring can be done to assist in the location of the illicit discharge. As manholes are opened and dry weather flow is observed, samples can be taken and analyzed. During this process look for a pattern from the sample analysis that coincides with the parameter sampled for. This type of tracing allows the field crew to determine if the dry weather flow observed is the source of the flow at the outfall location. There can be circumstances where dry weather flow occurs and it is not “illicit” due to its source (drinking water line break, fire hydrant flushing, etc: refer to Chapter 1: Does this Measure Need to Address all Illicit Discharges). This flow can combine with an illicit source in the storm drainage system making it difficult to trace. By monitoring the water observed, it will assist in the tracing of the illicit source discharging into the storm drainage system.

"Automatic Samplers" can also be used during the investigation of intermittent flows. These type of samplers can be placed at specific locations within the storm drainage system and can be triggered by dry weather flows. This type of sampling and monitoring is not the best method for most communities due to the cost of the sampling equipment. However, this type of monitoring can be effective in areas with a large intermittent discharge problem and a very complex storm drainage system. The samplers will provide the date and time the sample was collected which will assist the community in locating the source of the discharge.

Smoke Testing

Smoke testing should be used during special circumstances when a good storm sewer map is not available for a location and there are known problems of connection issues. Smoke is introduced into the storm drainage system and will emerge at locations that are connected to that system. It is recommended that qualified personnel be used for this method to ensure accurate test results.

The public should be notified of the date and purpose of smoke testing before starting. The smoke used is non-toxic, but can cause respiratory irritation, which can be a problem for some residents. Residents should be notified one week prior to testing, and should be provided the following information” (Hurco Technologies, Inc., 2003):

- Date testing will occur and reason for smoke testing.
- Precautions they can take to prevent smoke from entering their homes or businesses.
- What they need to do if smoke enters their home or business, and any health concerns associated with the smoke.
- A number residents can call to relay any particular health concerns (e.g., chronic respiratory problems).

Optical Brightener Monitoring (OBM) Traps

Optical Brightener Monitoring (OBM) traps can be used to assist in tracing intermittent flows that result from wash water with detergent. Detergents contain optical brighteners that can be detected at high concentrations. However, this method usually only picks up highly concentrated

discharges. The OBM method may be used as a simple indicator for the presence or absence of intermittent flows or to detect the most concentrated flows.

These traps usually contain unbleached cotton pads or a fabric swatch placed inside of a wire mesh trap. These traps are anchored inside an outfall using wire that is secured to the pipe itself. Rocks can also be used to hold the trap in place.

These traps will be retrieved after 24-48 hours of dry weather. They need to be removed prior to having contact with stormwater. When placed under a fluorescent light, an OBM trap will indicate if it has been exposed to detergents. (Guidelines for SOP, 2-13).

Chapter 5: Elimination of an Illicit Discharge

Developing and implementing an effective IDDE program requires the successful removal of an illicit discharge after it is located. Spokane County has adopted an ordinance "that prohibits illicit discharges and authorizes enforcement actions, including on private property", as required within the Permit (S5.B.3.b.i.).

Once an illicit discharge has been identified, the next step is to determine who is responsible for the removal of the discharge. Ultimately, it is the property owner or the Jurisdiction. Examples include the following:

- Internal Plumbing Connection: Generally, it is the building owner;
- Service Lateral: This is also generally the building owner. However, in some circumstances, communities may fix the problem and share in the cost with the building owner depending on the policy and procedures communities have developed;
- Infrastructure Failure: This type of discharge is the community's responsibility if within the dedicated right of way;
- Transitory Discharge: Again, the building owner is responsible to correct; and
- Educating residents about illegal dumping, etc.

Typically, the timeframe established for the repair of these illicit discharges is established within a jurisdictions enforcement procedures. During the enforcement of illicit discharges, direction shall be provided to the responsible party about which actions are needed to correct the problem.

Once the removal of the illicit discharge has occurred, it must be confirmed to ensure the correction has been made. For example, this can be confirmed by dye testing internal plumbing fixtures if the source was from an internal or service lateral line source.

There are various methods that can be used to remove an illicit discharge and to fix the problem. Table 5-1 gives an overview of the technique, when to use and the description.

Table 5-1. Methods to Eliminate Discharges

Technique	Application	Description	Estimated Cost
Service Lateral Disconnection, Reconnection	Lateral is connected to the wrong line	Lateral is disconnected and reconnected to appropriate line	$2,500-$5,000
Cleaning	Line is blocked or capacity diminished	Flushing (sending a high pressure water jet through the line); pigging (dragging a large rubber plug through the lines); or rodding	$1/linear foot
Excavation and Replacement	Line is collapsed, severely blocked, significantly misaligned, or undersized	Existing pipe is removed, new pipe placed in same alignment; Existing pipe abandoned in place, replaced by new pipe in parallel alignment	For 12" line, $100-$150/linear foot

Manhole Repair	Decrease ponding; prevent flow of surface water into manhole; prevent groundwater infiltration	Raise frame and lid above grade; install lid inserts; grout, mortar or apply shortcrete inside the walls; install new precast manhole	Vary widely, from $250 to raise a frame and cover to ~ $4,000 to replace manhole
Corrosion Control Coating	Improve resistance to corrosion	Spray- or brush-on coating applied to interior of pipe.	< $10/linear foot
Grouting	Seal leaking joints and small cracks	Seals leaking joints and small cracks.	For a 12" line, ~ $36-$54/linear foot
Pipe Bursting	Line is collapsed, severely blocked, or undersized	Existing pipe used as guide for inserting expansion head; expansion head increases area available for new pipe by pushing existing pipe out radially until it cracks; bursting device pulls new pipeline behind it	For 8" pipe, $40-$80/linear foot
Slip Lining	Pipe has numerous cracks, leaking joints, but is continuous and not misaligned	Pulling of a new pipe through the old one.	For 12" pipe, $50-$75 /linear foot
Fold and Formed Pipe	Pipe has numerous cracks, leaking joints	Similar to slip lining but is easier to install, uses existing manholes for insertion; a folded thermoplastic pipe is pulled into place and rounded to conform to internal diameter of existing pipe	For 8-12" pipe, $60-$78/linear foot
Inversion Lining	Pipe has numerous cracks, leaking joints; can be used where there are misalignments	Similar to slip lining but is easier to install, uses existing manholes for insertion; a soft resin impregnated felt tube is inserted into the pipe, inverted by filling it with air or water at one end, and cured in place.	$75-$125/linear foot

SOURCE: Modified from *Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments,* Center for Watershed Protection, 2004

If the illicit discharge originates from outside of your jurisdiction, it is important to notify the community/jurisdiction where the discharge is originating. This should be done first with a phone call and followed up with a written communication (letter or email) so that documentation can be recorded and tracked. The written communication should include where the illicit discharge was detected and where it was traced to. Keep records of actions taken, and ask the neighboring community/jurisdiction to inform you when the correction has been made. Include all documentation within the Phase II Municipal Stormwater Permit Stormwater - Annual Report to Ecology.

Preventing Illegal Dumping

One source of illicit discharge to a MS4 system is illegal dumping. This is often difficult to identify and locate. Because of the potential problem that this type of discharge presents, it is important to consider illegal dumping as a potential illicit discharge source. Strategies for

preventing illegal dumping include:

- Site maintenance and controls: This includes cleaning areas where illegal dumping has occurred and to utilize specific controls to prevent further dumping. These controls can include signage or restricting access to the area;

- Targeted Enforcement: Utilization of an ordinance that prohibits illegal dumping; and

- Public Education and Outreach: Public Education and Outreach is vital to any successful IDDE program. This includes a variety of programs that can assist the community in meeting their requirements under this component of the Phase II Permit;

    - Educate general public, municipal employees and businesses about water quality issues and how illegal dumping has a direct impact on these water quality issues.

    - Educate the public about proper ways to dispose of waste.

    - Provide a way for citizens to get involved in reporting and preventing illegal dumping, such as storm drain marking that indicates:


No dumping – drains directly to river, creek, lake, wetland or other water body.

    - Develop materials/brochures for the public and businesses. This should include businesses that handle hazardous materials as well as restaurants, auto repair shops and others that may have an impact on possible sources of an illicit discharge.

    - Spokane County currently has a "stormwater hotline" that can be used by the public, businesses and municipal employees to report illicit discharges.

Chapter 6: IDDE Program Evaluation

The Permit (S5.B.3.e.) requires that permittees, "adopt and implement procedures for program evaluation and assessment, including tracking the number and type of spills or illicit discharges identified; inspections made and any feedback from public education efforts".

The IDDE program should be evaluated at the end of each year to assess if it has been effective and efficient.

Evaluating the IDDE Program

To effectively evaluate the IDDE Program, a number of questions need to be asked and analyzed.

1. Evaluate priority areas within your community
    a. Were these areas identified initially?
    b. Are these areas still appropriately considered a priority?
    c. Have illicit discharges been located in these areas?

    Once the questions have been answered, determine if the IDDE Program properly identifies and evaluates priority areas.

2. Detection Program
    a. Is the program effective? Reassess the program by determining what has been achieved. Look at the number of outfalls inventoried, the number visually inspected, the number that had dry weather flows and look at the overall percentages of these flows as part of the overall storm sewer system for your community.
    b. Cost effectiveness: What aspects of the program had the highest quality of effectiveness in relationship to cost?
    c. Number of illicit discharges detected utilizing each detection method (will assist to see what method is more effective).

    Once the questions have been answered and evaluated, determine the success of the Detection Program.

3. Tracing Program
    a. What techniques were used?
    b. Were these methods successful?
    c. Which techniques that were not used would be beneficial for next year?

    Once the questions have been answered, determine if the Tracing Program has been successful. If not, determine what revisions are necessary to improve the program.

4. Removing the Sources of Illicit Discharges
    a. What techniques were used?

b. Were these methods successful?
c. Which techniques not used would be beneficial for next year?
d. How many illicit sources were identified and eliminated?

5. Other
    a. If using water quality sampling, resample areas within community to determine effectiveness of the removal of illicit discharges.
    b. Determine how much time was spent by employees and expenses to determine overall cost for achieving given results.

Tracking and Reporting IDDE

Spills and illicit discharges will be identified and tracked using GIS. The individual inventory and inspection forms can be linked to individual outfalls within the GIS.

Reports will be generated using GIS data as well as inventory and inspection forms.

References

Eastern Washington Phase II Municipal Stormwater Permit, February 16, 2007

Spokane Regional Stormwater Manual, April 2008

Stormwater Management Manual for Eastern Washington

Spokane County Code

Spokane River and Lake Spokane Dissolved Oxygen - TMDL

State of Washington Department of Ecology, Industrial Stormwater General Permit

Hangman (Latah) Creek Watershed Fecal Coliform, Temperature, and Turbidity - TMDL

Chapter 173-201A WAC, Water Quality Standards for Surface Waters of the State of Washington

Chapter 90.48 RCW, Water Pollution Control Act

Center for Watershed Protection and Robert Pitt. 2004. Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments.

Guidance Manual for Municipalities in the State of Ohio, Cuyahoga County Board of Health, Harry Stark, Project Director

Casco Bay Estuary Partnership, Aquarion Engineering Services, and Edelstein Associates. Guidelines and Standard Operating Procedures for Stormwater Phase II Communities in Maine.

New England Interstate Water Pollution Control Commission, 2003. Illicit Discharge Detection and Elimination Manual: A Handbook for Municipalities.

Appendix A

Inventory Form

General Location Information	
Receiving Stream:	
Stream Segment:	
Watershed:	
Community:	
County:	
Parcel:	
State Plane N:	
State Plane E:	
CRGS N:	
CRGS E:	**Outfall Photograph**
Latitude:	
Longitude:	
Elevation (ft):	
Location Description:	
Storm Sewer Map Information	
Outfall on Map: ☐ Yes ☐ No	
Map ID/Number:	
Map Source:	
Outfall Located on (facing downstream)	
Pipe Characteristics	**Location Map**
Pipe Shape: ☐ Circular ☐ Elliptical ☐ Egg ☐ Rectangular ☐ Other, describe:	
Pipe Height (in):	
Pipe Width (in):	
Pipe Material: ☐ RCP ☐ PVC ☐ VCP ☐ Cast Iron ☐ CMP ☐ Other, describe:	
Pipe Condition: ☐ Good ☐ Poor ☐ Fair ☐ N/A	
Height from Invert to Stream Flow Level (ft):	**Additional Details**
Outfall Type/Ownership	**Comments**
Outfall Type:	
Owner:	
Authority:	
Other ID:	
NPDES Permit:	

Appendix B

Inspection Form

	Receiving Stream:	Location Description:
	Community:	

Inspection Information	
Project:	
Inspection Date: Time: Type:	
Agency:	
Department:	
Crew Leader:	
Crew Member:	
Crew Member:	
Time of Last Rain: ☐ < 24 Hrs. ☐ < 48 Hrs. ☐ < 72 Hrs. ☐ > 72 Hrs.	
Pipe Flow: ☐ None ☐ < 1/4 Pipe. ☐ < 1/2 Pipe ☐ < 3/4 Pipe ☐ Full ☐ Trickle	
Pipe Submergence: ☐ None ☐ < 1/4 Pipe. ☐ < 1/2 Pipe ☐ < 3/4 Pipe ☐ Full	**Inspection Image**
Comments:	

Sampling Information	Analytical Results	
Sample Collected: ☐ Yes ☐ No	Lab Analysis ID:	
Sample ID:	Analyzed By:	
Description:	Fecal Coliform:	(Colonies/100 ml)
Est. Flow (Gpm):	E. Coli:	(Colonies/100 ml)
Est. Method:	Ammonia (mg/l):	
Comments:	Temperature (C):	
	PH:	
Sampling Strategy:	Conductance (us):	
	Phosphorus (mg/l):	
	Dis. Oxygen (mg/l):	
	Other Parameters/Results	

Recommendations

Action Required: ☐ No ☐ Perform Problem Source Investigation

Comments:

Appendix C

Illicit Discharge Ordinance

Spokane County Code, Title 9, Chapter 9.14 - Roads, Approach and Drainage in New Construction

Revised Section 9.14.215 (see below)

9.14.215 Discharge of unauthorized waters and non-stormwater prohibited--Penalty.

(1) It shall be unlawful for any person to throw, drain, run or otherwise discharge or connect unauthorized water and/or non-stormwater discharges (illicit discharges) to the municipal separate storm sewer system (MS4), surface waters or ground waters of the state without written permission of the director of utilities, county engineer or authorized designee.

(A) For purposes of this chapter, unauthorized waters include, but are not limited to:

(a) Groundwater from springs or other natural or artificial sources, foundation drains, sump pumps, and other means of discharging groundwater to the surface;

(b) Stormwater runoff containing sediment;

(c) Discharges from swimming pools, hot tubs, detention or evaporation ponds;

(d) Other water and non-stormwater discharges (illicit discharges) posing a public health or safety hazard or that could reduce the effectiveness of stormwater control and treatment facilities, or negatively impact the MS4, surface or ground water. Illicit discharges include but are not limited to the following:

(i) Trash and debris;

(ii) Construction Materials;

(iii) Petroleum products including but not limited to oil, gasoline, grease, fuel oil and heating oil;

(iv) Antifreeze and other automotive products;

(v) Metals, in either particulate or dissolved form;

(vi) Flammable or explosive materials;

(vii) Radioactive materials;

(viii) Batteries;

(ix) Acids, alkalis or bases;

(x) Paints, stains, resins, lacquers or varnishes;

(xi) Degreasers and/or solvents;

(xii) Drain cleaners;

(xiii) Pesticides, herbicides or fertilizers;

(xiv) Steam cleaning wastes;

(xv) Soaps, detergents or ammonia;

(xvi) Swimming pool or spa filter backwash;

(xvii) Chlorine, bromine or other disinfectants;

(xviii) Heated water;

(xix) Domestic animal waste;

(xx) Sewage;
(xxi) Recreational vehicle waste;
(xxii) Animal carcasses;
(xxiii) Food wastes;
(xxiv) Bark and other fibrous materials;
(xxv) Lawn clippings, leaves or branches;
(xxvi) Silt sediment, concrete or gravel;
(xxvii) Dyes;
(xxviii) Chemicals not normally found in uncontaminated water;
(xxix) Any other associated process discharges, except as allowed by permit or law;
(xxx) Any hazardous material or waste not listed above;
(xxxi) Water discharged from the cleaning of containers or equipment used in laying, cutting, or processing concrete and mortar and the water used in such processes; and
(xxxii) Water discharged from the cleaning of equipment or containers holding paint solvents or similar contaminants;

(2) Discharges -- Conditionally Allowed.

The following types of discharges shall not be considered to be illegal discharges if the stated condition(s) is met:

(A) Minimal discharges from lawn watering and other irrigation run-off are allowed;

(B) Minimal discharges from street and sidewalk wash water, water used to control dust, and routine external building wash down that does not use detergents are allowed;

(C) Discharges from potable water sources, including water line flushing, hyperchlorinated water line flushing, fire hydrant system flushing, and pipeline hydrostatic test water, as long as discharges are de-chlorinated to a concentration of 0.1 ppm or less, pH-adjusted if necessary, and volumetrically and velocity controlled to prevent re-suspension of sediments; and

(D) Other non-stormwater discharges may be allowed when in compliance with the requirements of a stormwater pollution prevention plan approved by the county engineer or director of utilities.

(3) Discharges -- exemption.

The following discharges are exempt from the provisions of 9.14.215:

(A) Non-stormwater discharges covered by a National Pollution Discharge Elimination System (NPDES) Permit and/or State Waste Discharge General Permit;

(B) Discharges from emergency fire fighting activities;

(C) Diverted stream flows not containing sediment;

(D) Uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(20));

(E) Air conditioning condensation;

(F) Flows from riparian habitats and wetlands; and

(G) Irrigation water from agricultural sources.

(H) Dust control materials that are applied in compliance with local and state policy and/or law.

(4) Definitions.

"*CWA*" means the Federal Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Pub. L. 92-500, as amended in Pub. L. 95-217, Pub. L. 95-576, Pub. L. 96-483, and Pub. L. 97-117, 33 U.S.C. 1251 *et. seq*;

"*Ground water*" means water in a saturated zone or stratum beneath the surface of the land or below a surface water body;

"*Hazardous materials*" means any material, including any substance, waste or combination thereof, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause or contribute to a substantial present or potential hazard to human health, safety and property or the environment when improperly treated, transported, or disposed of, or otherwise managed; and

"*Hyperchlorinated*" means water that contains more than 10mg/liter chlorine;

"*Minimal Discharges*" means minor infrequent discharges that occur during the normal course of lawn watering, street or sidewalk washing, exterior building washing, dust control, or irrigating that do not cause structural damage, negatively impede the function of the MS4 and are not defined as an illicit discharge. Discharges from publicly conducted or contracted street cleaning, dust control and maintenance activities that require water are classified as minimal discharges;

"*Municipal Separate Storm Sewer System or MS4*" means a conveyance, or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains): (i) owned or operated by a state, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State Law) having jurisdiction over disposal of wastes, stormwater, or other wastes, including special districts under State Law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to water of the United States; (ii) designed or used for collecting or conveying stormwater; (iii) which is not a combined sewer; and (iv) which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFT 122.2.

"*National Pollutant Discharge Elimination System (NPDES)*" means the national program for issuing, modifying, revoking, and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 402, 318 and 405 of the Federal Clean Water Act, for the discharge of pollutants to surface waters of the state from point sources. These permits are referred to as NPDES permits and, in Washington State, are administered by the Washington State Department of Ecology;

"*Non-stormwater Connection or Illicit Connection*" means any man-made conveyance that is connected to a municipal separate storm sewer system without a permit, excluding roof drains and other similar type connections. Examples of illicit connections include, but are not limited to; sanitary sewer line connections, floor drains, channels, pipelines, conduits, inlets, or outlets that are connected directly to the municipal separate storm sewer system;

"*Non-stormwater Discharge or Illicit Discharge*" means any discharge to a municipal separate storm sewer system that is not composed entirely of stormwater except discharges pursuant to a NPDES permit (other than the NPDES permit for discharges from the municipal separate storm sewer) and discharges resulting from emergency fire fighting activities;

"Waters of the State" includes those waters as defined as "waters of the United States" in 40 CFR 122.2 within the geographic boundaries of Washington State and ""waters of the state" as defined in Chapter 90.48 RCW which includes: lakes, rivers, ponds, streams, inland waters, underground waters, salt waters and all other surface waters and water courses within the jurisdiction of the State of Washington.

(5) Authority to Inspect.

(A) The county engineer and/or director of utilities, or authorized designee(s) shall have the authority to inspect county property and/or the municipal separate storm sewer system, surface water or ground water to discover and locate illegal discharges.

(6) Authority to Investigate.

(A) The county engineer and/or director of utilities, or authorized designee(s) shall have the authority to investigate public or private property to determine the source of illegal discharges to public property, the municipal separate storm sewer system, surface water or ground water.

(7) Enforcement.

(A) The county engineer and/or director of utilities, or authorized designee(s), may give oral or written notice to any property owner or person who is discharging unauthorized waters or non-stormwater to county property, municipal separate storm sewer system or public rights-of-way;

(B) The county engineer and/or director of utilities or authorized designee(s), may give oral or written notice to any property owner or person who has connected or is illegally connecting a pipe, culvert, ditch, swale, stormwater pond, detention or retention facility, or other unauthorized connection to county property, municipal separate storm sewer system, public rights-of-way, surface water or ground water for the purpose of discharging unauthorized waters or non-stormwater;

(a) The illegal discharge or connection must cease and desist as soon as notice is given to the person. If oral notice is given, the county within twenty-four hours will send written notice to the person.

(i) If the violation does not cease and desist immediately upon oral and/or written notice, the county engineer or director of utilities or authorized designee, may authorize the immediate removal of the illegal discharge and/or connection;

(8) Penalty.

(A) If the illegal discharge or connection does not cease and desist immediately upon notice, the person shall be guilty of a misdemeanor, and shall be subject to a fine not to exceed two hundred fifty dollars or imprisonment in the county jail not exceeding ninety days or both. Each day that a violation exists shall constitute a separate offense;

(B) The county may seek legal remedy and/or financial reimbursement for enforcement and, when applicable, soil and/or water contamination clean-up expenses resulting from illegal discharges and connections from the responsible party, as per the provisions of local, state and federal law.
(Res. 01-1093, Exhibit A (part), 2001) (Res.09-0672, Exhibit A (part), 2009)

Appendix D

IDDE Outfall Maps

Overview

The outfall GIS maps were originally developed for internal use by Spokane County - Engineering and Roads, Stormwater Utility.

For More Information regarding the Outfall Database - Contact:

Bill Galle
Stormwater Utility Manager
1026 W. Broadway Avenue
Spokane, WA 99260

(509) 477-7261
bgalle@spokanecounty.org