ILLICIT DISCHARGE DETECTION AND ELIMINATION PROCEDURES

YAKIMA COUNTY AND THE CITIES OF YAKIMA, UNION GAP, AND SUNNYSIDE

IN COMPLIANCE WITH THE EASTERN WASHINGTON PHASE II MUNICIPAL STORMWATER PERMIT

WAR04-6009, CITY OF SUNNYSIDE

WAR04-6010, CITY OF UNION GAP

WAR04-6013, CITY OF YAKIMA

WAR04-6014, YAKIMA COUNTY

Regional Stormwater Management Program

April 10, 2009

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Acknowledgements

This Illicit Discharge and Detection and Elimination Procedures guide was funded by the Yakima County Regional Stormwater Management Program including Yakima County and the Cities of Yakima, Sunnyside, and Union Gap. A portion of this funding originated from Washington Department of Ecology grants. The following individuals provided review and input to the primary author.

Name:	Municipality and Division:
Primary Author	
Matt Durkee	Yakima County Surface Water Management
Reviewers	
Brian Cochrane	Yakima County Surface Water Management
Terry Keenhan	Yakima County Surface Water Management
Shelley Willson	City of Yakima Wastewater Collections
Randy Meloy	City of Yakima Engineering
Shane Fisher	City of Sunnyside Public Works
Matt Cobb	City of Union Gap Public Works

Much of the material included in this guide was adapted from the Center for Watershed Protection's "Illicit Discharge Detection and Elimination - A Guidance Manual for Program Development and Technical Assessments."

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Figures and Tables

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Abbreviations and Acronyms

AKART – All Known, Available, and Reasonable methods of control and Treatment

BMP – Best Management Practice

Co-Permittees – Yakima County, City of Yakima, City of Union Gap, City of Sunnyside

DEM – Digital Elevation Model

DID – Drainage Improvement Districts

Ecology – Washington State Department of Ecology

GIS – Geographical Information Systems

HHW – Household Hazardous Waste

IDDE – Illicit Discharge Detection and Elimination

IDP – Illicit Discharge Potential

ILA – Interlocal Agreement or Intergovernmental Local Agreement

MS4 – Municipal Separate Storm Sewer System

NPDES – National Pollutant Discharge Elimination System

NOV – Notice of Violation

O&M – Operation and Maintenance

POTW – Publicly Owned Treatment Works

RCW – Revised Code of Washington State

RSL – Regional Stormwater Lead

RSPG – Regional Stormwater Policy Group

RSWG – Regional Stormwater Working Group

RSWMP – Regional Stormwater Management Program

SOP – Standard Operating Procedure

SWPPP – Stormwater Pollution Prevention Plan

TMDL – Total Maximum Daily Load

UA – Urbanized Area

UGA – Urban Growth Area

UIC – Underground Injection Control

USEPA – United States Environmental Protection Agency

WAC – Washington Adminstrative Code

YCHD – Yakima County Health District

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1. Introduction

The following procedures provide guidance for implementing the Illicit Discharge Detection and Elimination (IDDE) program to the Regional Stormwater Management Program (RSWMP) members. These procedures may be tailored by each member to suit their individual needs.

Urban storm drain systems may convey flows other than stormwater. These non-stormwater discharges enter the storm drain system from a variety of sources, such as landscape irrigation, car washing, and illicit discharges.

Non-stormwater contributions and illicit discharges are potential sources of pollutants discharged to surface water from the Municipal Separate Storm Sewer System (MS4) that may adversely impact receiving water quality and threaten aquatic life, wildlife, and human health (Table 1).

The development and implementation of illicit discharge detection and elimination (IDDE) program and procedures are required by the Eastern Washington Phase II National Pollutant Discharge Elimination System (NPDES) Stormwater Permit. Yakima County, City of Yakima, City of Union Gap, and City of Sunnyside (Figure 1) obtained regional NPDESII co-permittee coverage from the Washington Department of Ecology (Ecology). The interlocal governmental agreement (ILA) signed by the partners on July 5, 2007 describes specific permit compliance activities that the regional partners will implement, including the IDDE program.

Required IDDE Program Components
Included in this Document

- Illicit Discharge Reporting and Tracking
    - Non-Threatening Discharges
    - Threatening Discharges
- Recurring Assessment
    - Identify Priority Receiving Waters/ Other Areas for Assessment (5 Step Process)
    - Initially Complete Assessment of Three Water Bodies or Other High Priority Areas and One Annually Thereafter
- Investigating Suspected Illicit Discharges
    - Characterize Discharges Found
    - Trace Illicit Discharges
- Remove Illicit Discharges or Connections
- Public Outreach and Employee Training
    - Overlaps with both Pollution Prevention/ Good Housekeeping for Municipal Operations and General Stormwater Public Education/Outreach NPDES permit requirements.
- Program Evaluation

Table 1. Common Stormwater Pollutants, Sources, and Impacts (adapted from Rabasca and Rinehart, 2006).

Common Stormwater Pollutants, Sources, and Impacts		
Pollutant	**Sources**	**Impacts**
Sediment	Construction sites Eroding stream banks & lakeshores Winter sand & salt application Vehicle & boat washing Agricultural sites	Plant & fish habitat damage; Transport attached oils, nutrients, and other pollutants; Increased maintenance costs, flooding
Nutrients	Fertilizers Malfunctioning septic systems Livestock, bird/pet waste Vehicle & boat washing Grey Water Decaying grass & leaves Sewer overflows Leaking trash containers Leaking sewer lines	Nuisance/ toxic algal blooms; Low levels of dissolved oxygen (can kill aquatic organisms)
Hydrocarbons (petroleum compounds)	Vehicle & equipment leaks Vehicle & equipment emissions Pesticides Fuel Spills Equipment cleaning Improper fuel storage & disposal	Toxic to humans & aquatic life at low levels
Heavy Metals	Vehicle brake & tire wear Vehicle/equipment exhaust Batteries Galvanized metal Paint & wood preservatives Fuels Pesticides Cleaners	Toxic at low levels Drinking water contamination
Pathogens (Bacteria)	Livestock, bird, and pet wastes Malfunctioning septic systems Sewer overflows Damaged sanitary sewer lines	Risk to human health leading to closure of shellfish and swimming areas; Drinking water contamination

1.1 Non-Stormwater Discharges Explained

Non-stormwater discharges are broken into three groups (Ecology 2007):

- Illicit Discharges
- Conditional Non-Stormwater Discharges
- Allowable Non-Stormwater Discharges

Each is explained in the following three sections with appropriate examples listed (adapted from Ecology 2008 and RSWMP MODEL IDDE Ordinance 2009).

1.1.1 Illicit Discharges and Connections

Illicit discharges are the ***introduction of non-stormwater runoff, sewage, or hazardous materials*** into the public storm drain system through illicit connections and illegal dumping.

Illicit connections are ***physical connections to the storm drain system that have not been approved for storm water drainage by the facility owner and/or functions to convey a prohibited pollutant***. Examples include an internal plumbing connection (e.g., washing machine or garage floor drain) or a service lateral cross-connection.

Illegal dumping is the ***intentional or inadvertent dumping of prohibited materials*** into the conveyance system, streets, inlets or basins, and the improper disposal of material on land that is then discharged to the Municipal Separate Storm Sewer System (MS4) when it rains.

Examples:

- Sanitary wastewater from improper sewage connections, exfiltration, or leakage
- Effluent from improperly operating/ or designed septic tank systems
- Fruit packing wash water
- Surface flow and irrigation drainage from feed lots and hobby farms
- Commercial car wash wastewaters
- Radiator flushing wastewaters
- Engine degreasing wastes
- Improper oil disposal
- Leaky underground storage tanks
- Excess fertilizer or pesticides
- Laundry wastes
- Spills from roadway or other accidents
- Dewatering of construction sites
- Improper disposal of household toxic wastes
- Chemical, hazardous materials, and garbage
- Swimming pool cleaning wastewater and filter backwash

1.1.2 Conditional Non-Stormwater Discharges

Conditional non-stormwater discharges are ***allowable, given that certain conditions are met***.

Examples:

- Potable water from:
  - Water line flushing
  - Hyperchlorinated water line flushing
  - Fire hydrant system flushing
  - Pipeline hydrostatic test water.

  Planned discharges shall be de-chlorinated to a concentration of 0.1 ppm or less, pH-adjusted, if necessary and in volumes and velocities controlled to prevent re-suspension of sediments in the stormwater system.

- De-chlorinated swimming pool discharges. If de-chlorinated to a concentration of 0.1 ppm or less, pH-adjusted, if necessary and in volumes and velocities controlled to prevent re-suspension of sediments in the stormwater system.

- Street and sidewalk wash water, water used to control dust, and routine external building wash down may be discharged provided sweeping is performed prior to washing and no detergents are used. At active construction sites, street sweeping shall be performed prior to washing the street.

- Non-stormwater discharges covered by another NPDES permit, provided, that the discharger is in full compliance with all requirements of the permit, waiver, or order and other applicable laws and regulations; and provided, that written approval has been granted by the owner for any discharge to the storm drain system.

- Other non-stormwater discharges. The discharges shall be in compliance with the requirements of a stormwater pollution prevention plan (SWPPP) reviewed and approved by the [city/county], which addresses control of such discharges by applying all known, available, and reasonable methods of control and treatment (AKART) to prevent contaminants from entering surface or ground water.

- Dye testing is allowable after verbal notification to the municipality prior to the time of the test.

1.1.3 Acceptable Non-Stormwater Discharges

Acceptable non-stormwater discharges are ***those not likely to cause pollution of surface water or groundwater***.

Examples:

- Discharges resulting from emergency fire fighting activities
- Diverted stream flows
- Rising ground waters
- Uncontaminated ground water infiltration
- Foundation drains
- Uncontaminated pumped groundwater
- Air conditioning drains
- Irrigation water from agricultural sources that is commingled with urban stormwater
- Springs
- Water from crawl space pumps
- Footing drains
- Flow from riparian habitats and wetlands
- Discharges from lawn watering and other irrigation runoff

These discharges may be considered illicit if any of the following conditions exist:

- Whether singly or in combination with others, may cause or contribute to a violation of the NPDES stormwater permit issued to the municipality.
- May cause the municipality to violate Ecology's UIC rules
- Causing or contributing to a water quality or flooding problem.

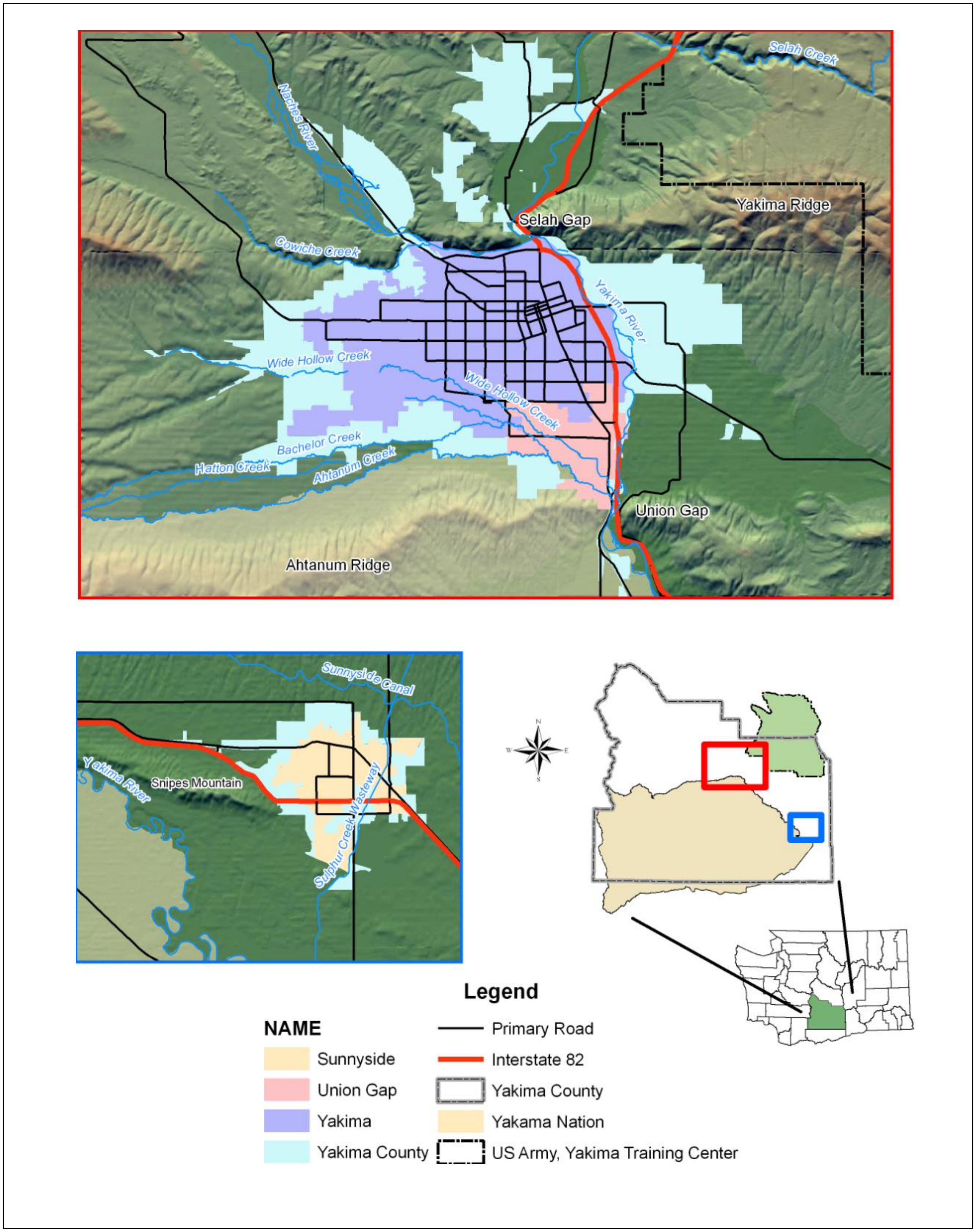

Figure 1. Yakima Regional Stormwater Management Program (RSWMP) Area.

2. Illicit Discharge Reporting and Tracking

Reporting Hotline:
Reporting of illicit discharges by the general public and government employees is critical to the success of any IDDE program. The illicit discharge hotline phone number (**509) 574-2300** and e-mail (PublicServicesIllicitDischarge@co.yakima.wa.us) are maintained by the Regional Stormwater Lead (RSL) and listed on the RSWMP website.

After hours and weekend reporting of threatening discharges (see 2.2 Threatening Discharges) can be made directly to **911** or the Washington State Department of Ecology Central Regional Office (**509) 575-2490**. Emergency responders or Ecology would contact the local municipality. See Table 2 for additional contact information.

Reporting Hotline Log Database:
A call log database (Figure 3) documenting illicit discharge reports and follow-up actions is maintained by the RSL for the purpose of providing information to investigate reports, plan future monitoring, define specific areas for public outreach, and NPDES permit reporting.

Co-permittees forward calls to the hotline when appropriate, or notify the RSL after illicit discharge calls are received by their jurisdictions. Figure 2 outlines reporting and response when the hotline is used.

2.1 Non-Threatening Discharges

Stormwater program staff from the appropriate jurisdiction will initiate an investigation of a reported illicit discharge, spill, or illegal dumping within **7 days** (on average) if it is described as non-threatening (Ecology 2007). Staff will follow procedures to characterize, trace, and remove any illicit discharge found (see 4. Investigating Illicit Discharges).

2.2 Threatening Discharges

Suspected discharges or spills determined by the co-permittees staff or other qualified personnel to be an **emergency or threat to health, welfare, or the environment should be investigated immediately** and referred to the Department of Ecology regional office once verified (no later than 24 hours)**.**

Local emergency response agencies within Yakima County are supplemented by both a Tri-County Hazardous Materials Response Team and Ecology Regional Spill Response Team. Illegal dumping of hazardous materials is regulated by State Dangerous Waste requirements (WAC 173-303-145) and the Uniform Fire Code.

2.2.1 Spill Response

While the spiller is always responsible for reporting a spill and immediate efforts to mitigate damages from the spill, city and county staff may also be directly involved in the response.

Upon responding, do not allow the responsible party to leave the scene.

Specific instructions for staff responding to an emergency include the following:

1. Stay upwind and uphill from the material.
2. Isolate the area and keep people out.
3. Call 911 or appropriate number for a Hazardous Materials / Fire / EMS response and inform dispatch of what is seen including any of the following:
   - Injuries or exposures
   - Size and type of vehicle or containers
   - Placards, labels, MSDS sheets
   - Size of spill and color of material
   - If smoke or vapors are coming from the material
   - If there is a threat from the material to people or the environment
4. Remain in a safe area and await emergency response.
5. Do not allow responsible party to leave scene.

Illicit Discharge Reporting and Response

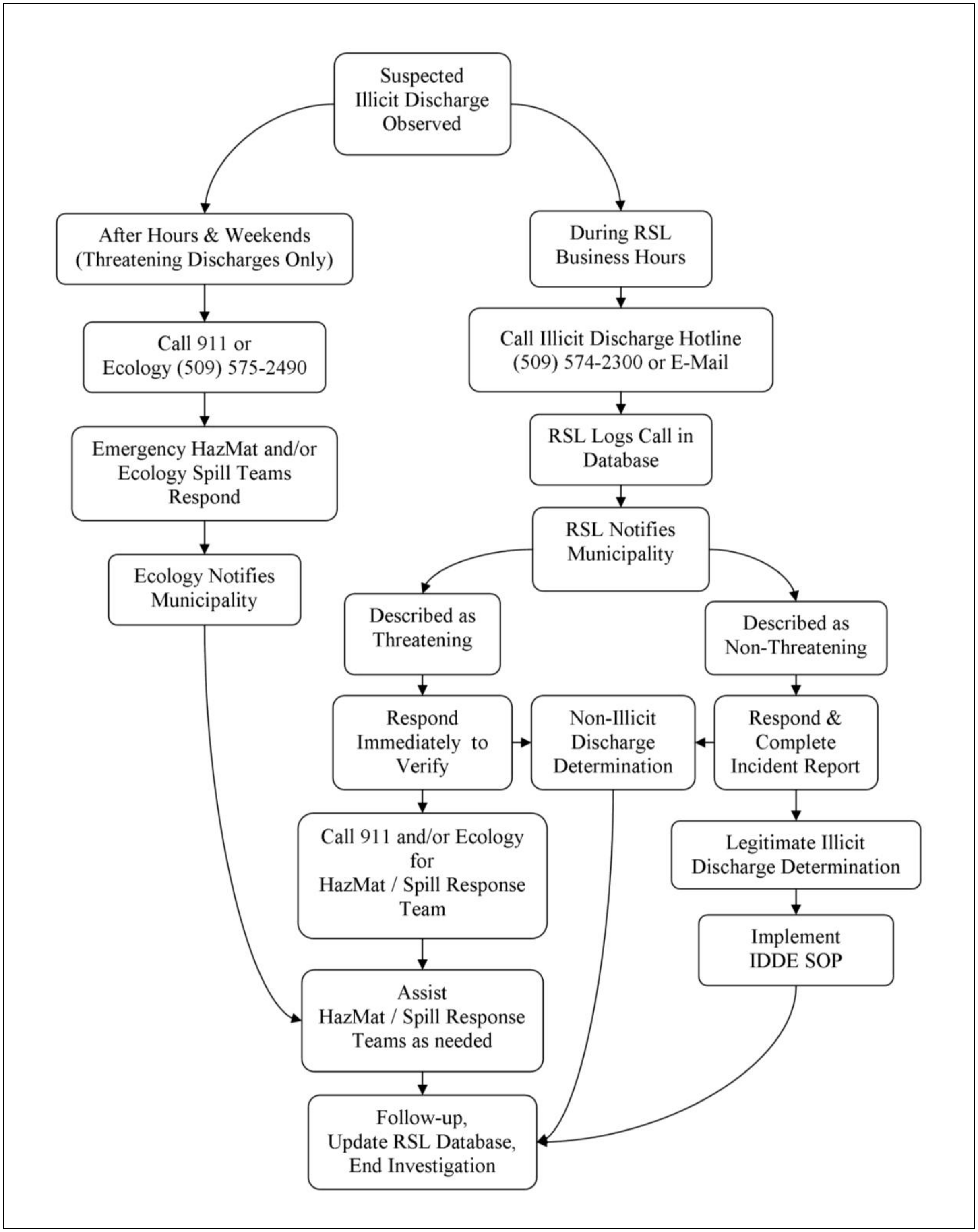

Figure 2. Illicit discharge reporting and response flowchart.

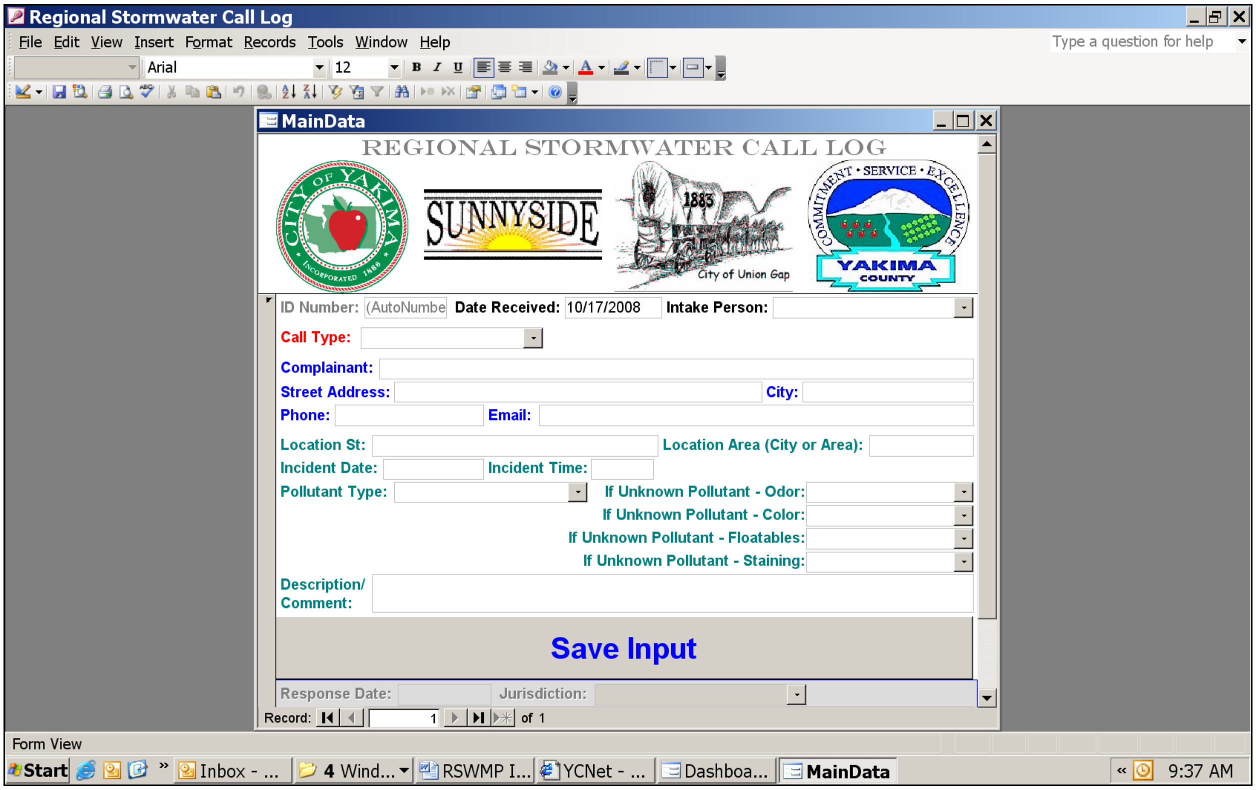

Figure 3. Screenshot of Regional Stormwater Call Log Access Database input form.

Table 2. Contact list including RSWMP members and emergency spill response.

Contact	Phone Number
Yakima County Public Services	(509) 574-2300
City of Yakima Engineering	(509) 575-6111
City of Union Gap Public Works	(509) 225-3524
City of Sunnyside Public Works	(509) 837-5206
Emergency Response	911
Washington Department of Ecology Central Regional Office (24 hour & weekends)	(509) 575-2490
Washington Emergency Management Division	1-800-258-5990
National Spill Response Center	1-800-424-8802

3. Recurring Assessments

In addition to illicit discharge reporting and tracking, ongoing monitoring of the MS4 provides a systematic approach for identifying illicit discharges.

The following NPDES permit requirements outline the type and occurrence of MS4 illicit discharge monitoring.

- Prioritize receiving waters for visual inspection to identify unknown outfalls and detect illicit discharges (Ecology 2007).
    - Once prioritized, at least **three high priority water bodies or other high priority areas** should be assessed to verify outfall locations and detect illicit discharges. Appendix A contains an Outfall Inventory form (Center for Watershed Protection 2004).
    - At least **one high priority water body or other high priority area** shall be assessed each year thereafter. All assessments should occur during dry weather and avoid any high use periods (Ecology 2007).

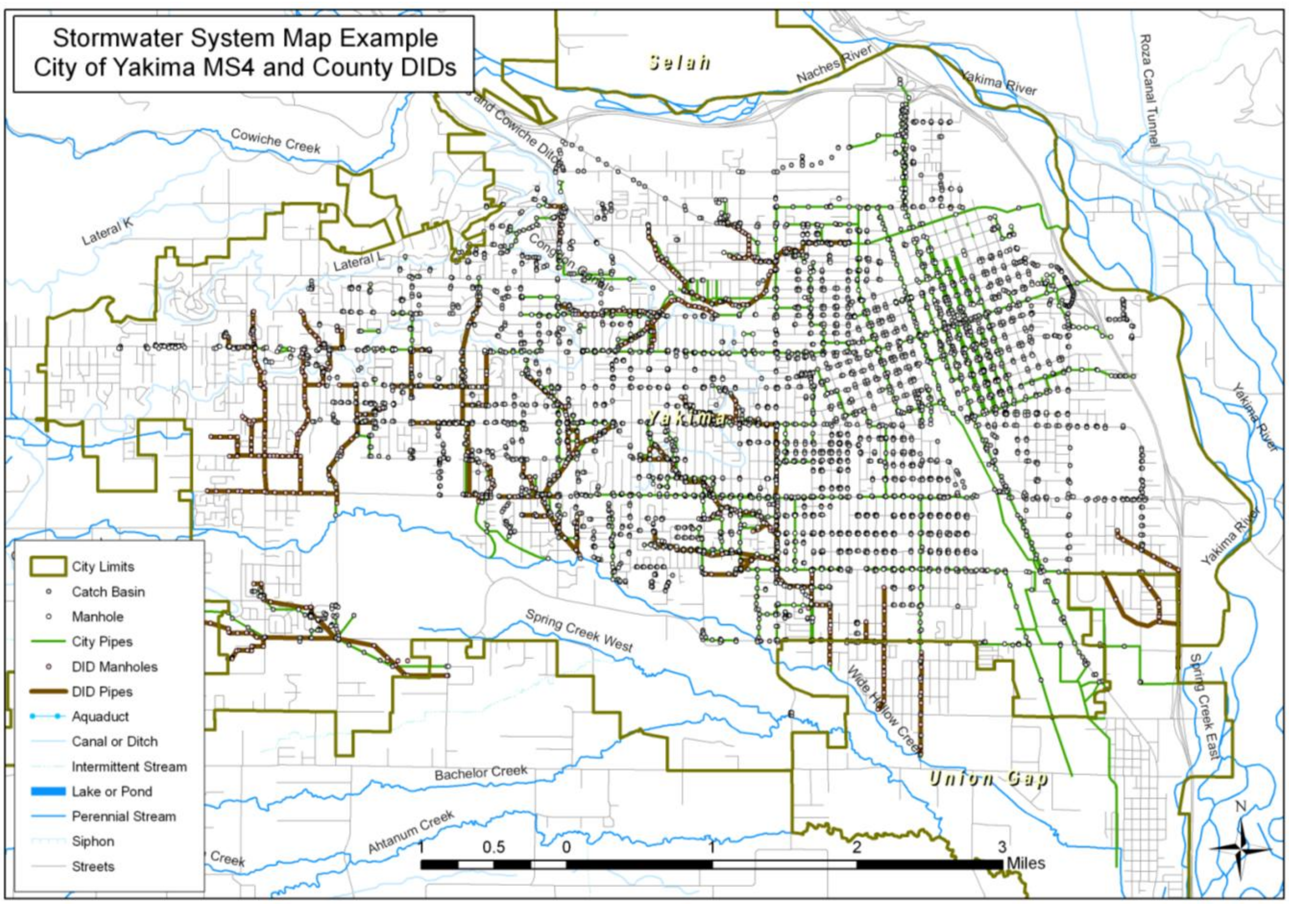

Figure 4. MS4 Example Map.

3.1 Prioritizing Receiving Waters and Other Areas for Assessment

Illicit discharges are not usually distributed uniformly across a community, but tend to be clustered within certain watersheds, subwatersheds, sewersheds, land use, and sewage infrastructure type/age areas. To identify priority areas for assessment, GIS mapping and other available data are used to estimate the potential severity of illicit discharges for a given drainage basin. This is referred as Illicit Discharge Potential (IDP).

Examples of High Priority Areas:

- Outfalls, other Flow Control Facilities (BMPs), and UICs
- Areas with past reports of illicit discharges
- Industrial and business areas with:
  - Significant hazardous materials
  - Large quantities of materials, especially near receiving waters
- Aging or Failing Sewer Infrastructure/ Septic Systems

Once mapping of the MS4 and receiving waters (Figure 4) is completed, including any outfalls, the five step process shown below (in this case at the subwatershed level) and summarized throughout this section could be applied at the watershed, subwatershed, and/or sewershed level to prioritize for monitoring based on IDP.

The scale at which the analysis should occur depends on the goal.

- **Prioritizing Receiving Water Bodies:**
  - Analyze entire watershed/subwatershed that drains into the receiving water body (river, creek, stream, or lake)

- **Prioritizing Other High Priority Areas,**
  Analysis during an Illicit Discharge Investigation,
  Delineating/ Prioritizing UIC Sewersheds:
  - Analyze at sewershed level
    (basin draining to a flow control facility – outfalls, BMPs, UICs)

Municipalities in Yakima County have a relatively few number of receiving bodies, but many have a high number of UICs (Underground Injection Controls), so analyses at the sewershed level may be more useful in many instances.

Desktop Assessment Steps to Prioritize Receiving Water Bodies and Other Areas:

1. Delineate Watersheds/Subwatersheds/Sewersheds which drain to a receiving water body or other area.
2. Compile Available Mapping and Descriptive Data for each
3. Derive Discharge Screening Factors Using GIS Analysis
4. Screen and Rank Illicit Discharge Potential
5. Generate Maps to Support Field Investigations

3.1.1 Delineate Drainage Basins

Dividing the MS4 into smaller, more manageable geographic areas may allow for a more effective assessment to pinpoint probably sources of illicit discharges. If watersheds, subwatersheds, and sewersheds have not already been defined, hydrologic, infrastructure, topographic map layers, and digital elevation models (DEMs) could be used to delineate them.

Some subwatersheds or even sewersheds may extend into other jurisdictions. If investigations are conducted in these basins, it is recommended that the entire drainage basin be delineated and assessed which may require coordination with neighboring jurisdictions.

3.1.2 Compile Mapping and Descriptive Data

The extent and quality of available data may directly influence future analyses and field investigations. Figure 4 contains a list of spatial layers and data sets that could be useful while completing a desktop assessment of IDP.

Base Data:

- Parcel Boundaries
- City Boundaries
- Land Use and Zoning
- NPDES Permittees
- Watersheds, Subwatersheds, & Sewersheds
- Topography
- Receiving Waters & other Hydrology
- Depth to Groundwater
- Depth to Confining Layer
- Aerial Orthophotographs
- Municipal Streets

Historical Data:

- Previous Illicit Discharge Sites
- Historical Land Uses
- Historic Hydrology
  Previous Water Quality Monitoring Data
- Annexation History
- Building Age

Facility Data:

- Stormwater System
  - Catch Basins
  - Pipes
  - Manholes
  - UICs
  - Runoff Treatment BMPs
  - Flow Control BMPs
  - Outfalls
  - Non-Outfall Outlets (to canals, etc.)
  - Culverts (Stormwater conveying)
  - Curb and Gutters
  - Roadside Ditches
  - Manmade Channels
  - Illicit Connections
- Sanitary Sewer System
- Septic System served areas
- Irrigation Canals/Systems
- Urban Drainage Improvement Districts (DIDs)
  - Pipes
  - Manholes
  - Outfalls

Figure 5. Recommended spatial layers and data sets to development or acquire for the IDP desktop assessment.

3.1.3 Develop Discharge Screening Factors

Define the discharge factors used to prioritize areas for monitoring based upon their illicit discharge potential (IDP) (Adapted from Center for Watershed Protection 2004 and Cañon City 2007).

<u>Potential</u> screening factors for a given area could include:

1. Past Discharge Complaints -
   -History of discharge complaints may equal High IDP.

2. Poor Water Quality During Dry Weather -
   -If historic water quality data exists and standards have been exceeded on multiple occasions, may have High IDP.

3. Density of Potential Generating Sites and Industrial NPDES Stormwater Sites -
   -Density of more than 10 potential generating sites or 5 industrial NPDES stormwater sites per square mile is considered a High IDP.

   -Examples of generating sites include auto repair shops, car dealers, gasoline stations, food processing facilities, restaurants, and petroleum storage facilities. Appendix A of the Center for Watershed Protection IDDE Manual includes a complete list.

4. Stormwater Outlet Density (Outfalls, Non-Outfall Outlets, UICs) -
   -A density of 20+ outfalls per linear mile of receiving water can indicate a High IDP.
   -A high density of UICs could also lead to a High IDP.

5. Age of Development -
   -Average age of the majority of development in a subwatershed.
   -Developments of older than 50 years may indicate a High IDP.

6. Sewer Conversion -
   -Septic systems switched to sanitary sewer connections in the last 30 years creates High IDP (Yakima County Health District records)

7. Historic Combined Sewer System -
   -Combined sewer systems which were subsequently separated create High IDP.

8. Older Industrial Operations -
   -Subwatersheds containing more than 5% older industrial sites (40+ years old) are considered to have High IDP.

9. Aging or Failing Sewer Infrastructure -

-When the sewer age exceeds the design life of construction materials (~50 years) or when clusters of pipe breaks or spills are reported High IDP may exist.

10. Density of Aging Septic Systems -

-Subwatersheds with a density of more than 100 older (30+ yrs) drain fields per square mile are considered to have High IDP (Yakima County Health District records).

***Annexation history could be used as a proxy for many of these screening factors.**

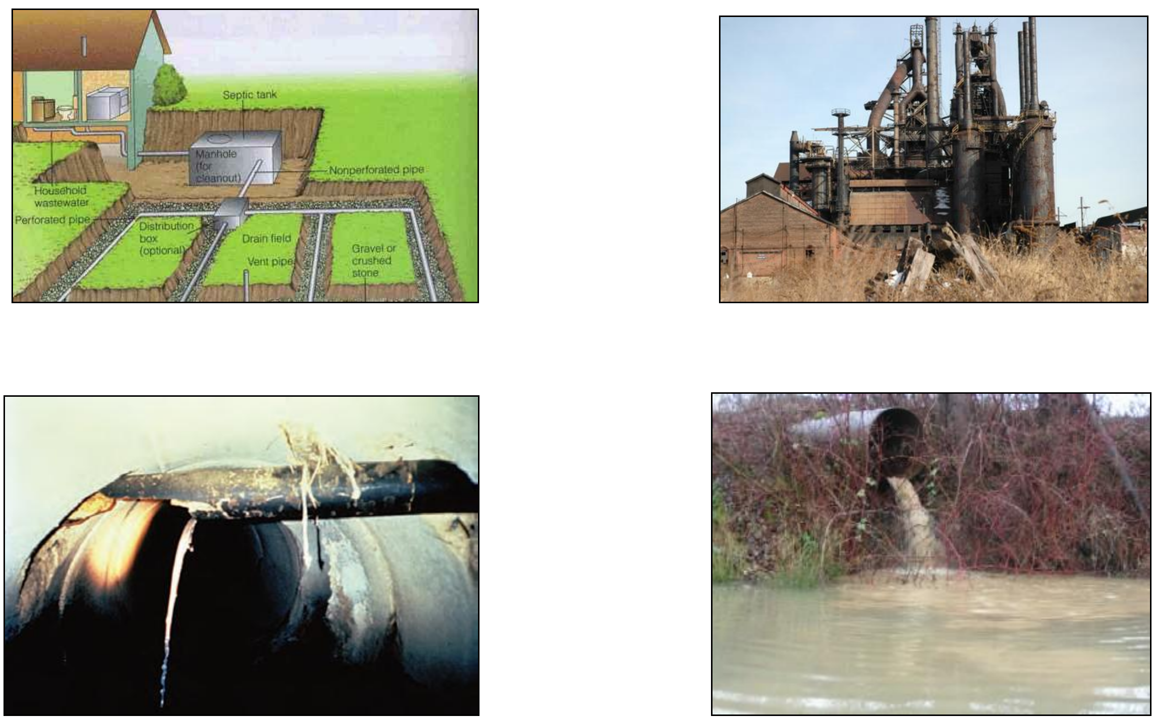

Figure 6. Examples of screening factors.

3.1.4 Screen and Rank Illicit Discharge Potential

A variety of methods could be applied to screen and rank IDP depending on the goal of the analysis and what data is available. GIS layers for various screening factors could be combined to provide an estimate of IDP for a given area or drainage basin.

Land use is the only GIS layer currently available for all municipalities. A land use layer was developed by Yakima County based on the Yakima County Assessor's Land Use Codes for each parcel. The land use codes were broken down based on classification's used for Yakima County's Stormwater Utility.

Industrial =	**High IDP**
Commercial =	**Moderate IDP**
Residential and Agricultural =	**Low IDP**
Undeveloped/Park =	**No/Insignificant IDP**

Annexation data available for the City of Yakima could be used as a proxy for development and infrastructure age.

Sanitary sewer data is available for the cities of Yakima and Union Gap and was included in analyses presented in Appendix B. Stormwater sewer data for the City of Yakima was also incorporated into the example analyses included in Appendix B. Buffers were created for areas near sanitary sewer pipes where the chance of an accidental connection to the stormwater sewer pipe is the greatest.

If drainage basins (watersheds, subwatersheds, sewersheds) are delineated, various screening factors could be evaluated using GIS for each basin.

Available data sets mentioned above were used to create these IDP maps for the municipalities. Figure 7 presents simple analyses for the City of Yakima by combining land use and annexation history to create an IDP map. Figure 8 combines the subwatersheds (surrounding each receiving water) and the IDP map from Figure 7.

Analyzing the percent of high, moderate, and low IDP per each watershed/subwatershed could be used to rank receiving waters for monitoring. An example for the City of Yakima is presented after Figure 8.

Example of a Simple Illicit Discharge Potential (IDP) Analysis
City of Yakima

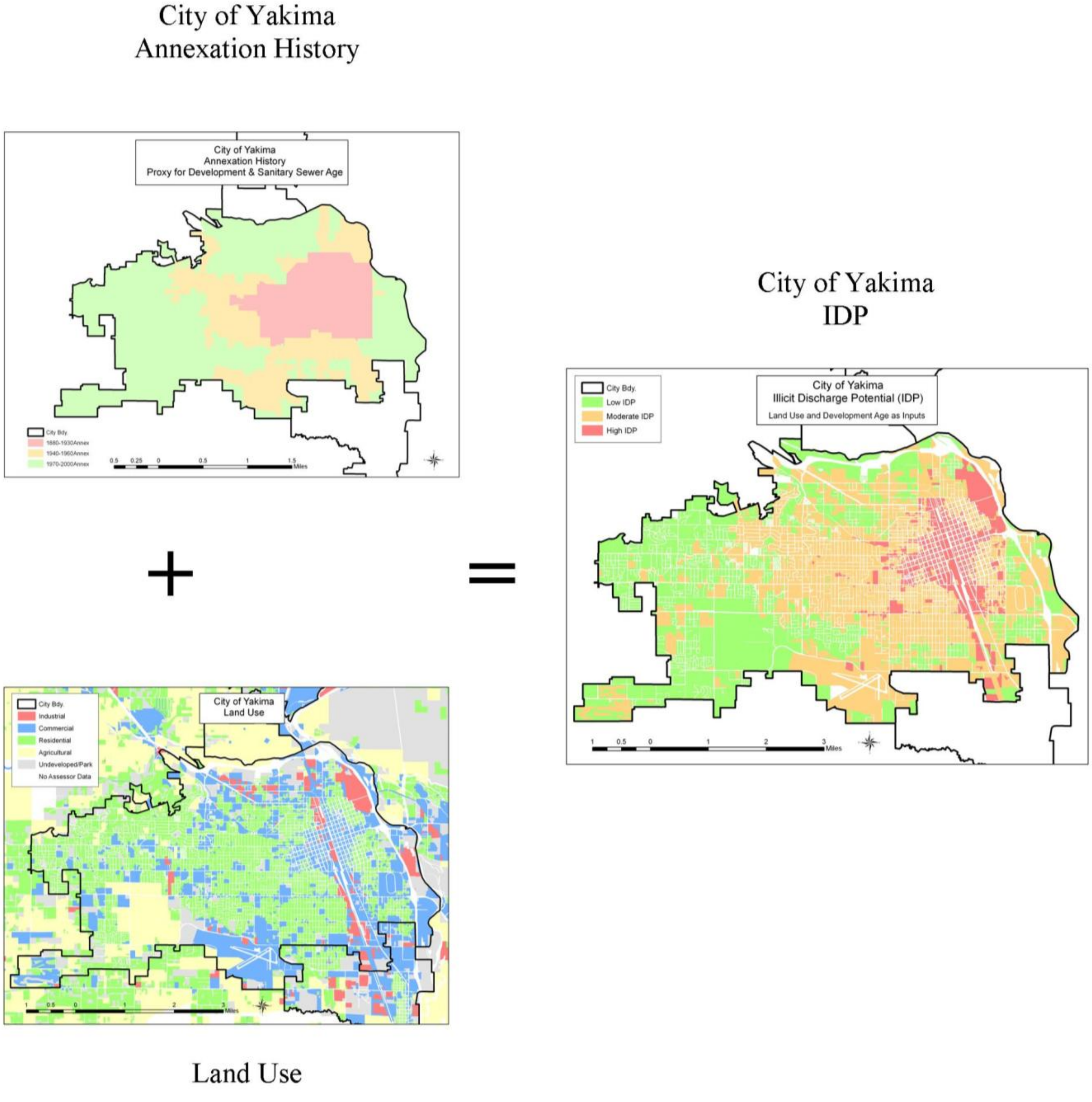

Figure 7. Simple identification of Illicit Discharge Potential with GIS.

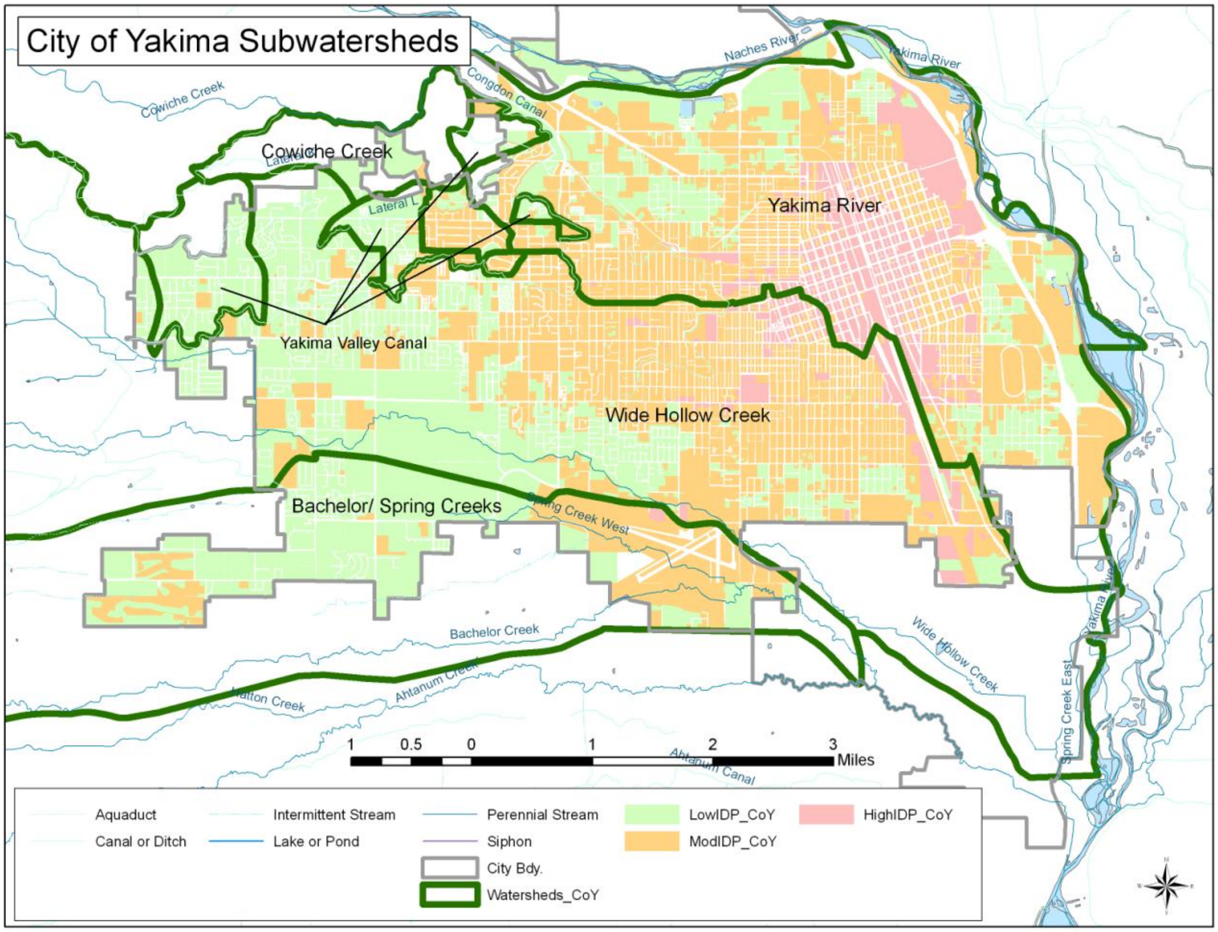

Figure 8. City of Yakima Subwatersheds and IDP (from Figure 7).

The percent of high, moderate, and low IDP per watershed/subwatershed could be determined based on Figure 8. Based on a quick visual analysis of this for Figure 8, the following is an example of how the receiving waters could be prioritized for monitoring based on IDP.

1. Yakima River
2. Wide Hollow Creek
3. Bachelor/ Spring Creeks
4. Yakima Valley Canal
5. Cowiche Creek

This analysis is only as good as the data and methods used. Better delineation of the receiving water drainage basins is recommended. The watershed data used originated from the City of Yakima 1993 stormwater system analysis. The Naches River is not included because no data was available for the associated watershed boundary. This should be included as the Naches River is a receiving water of the City of Yakima. The drainage basins would also need to be clipped to the city boundaries to allow for calculations of percentages of low, moderate, and high IDP per drainage basin. The only data sets used to determine IDP were land use and annexation history. This may need to be expanded to provide a more detailed analysis.

If data is available, a more quantitative scoring system could be used to prioritize receiving waters or other areas for illicit discharge monitoring.

Table 3 shows possible criteria for scoring of screening factors. Again, annexation history could be used a proxy for many of these screening factors.

Table 4 shows an example of scoring and ranking subwatersheds based on the results of an analysis of selected screening factors (adapted from Center for Watershed Protection 2004 and Cañon City 2007). Those subwatersheds scoring the highest would be recommended as a priority for assessment/monitoring.

Screening factors and the associated scoring thresholds used in both Table 3 and Table 4 may need to be customized for each municipality based on available data sets.

Table 3. Potential benchmarks used to assign a score for each screening factors.

Screening Factor	Unit	Score 1	Score 2	Score 3
Past Discharge Complaints	Total Logged Reports	<5	5-10	>10
Poor Water Quality During Dry Weather	% Events Exceeding Water Quality Standards	<25%	25-50%	>50%
Density of Potential Generating Sites and Industrial NPDES Stormwater Sites	# Sites per Square Mile	1-2	3-10	>10
Stormwater Outfall	# Outfalls per Stream Mile	<10	10-20	>20
UIC Density	# UICs per Road Mile	<10	10-20	>20
Age of Development	Years	1970-Present	1940-1960	1880-1930
Sewer Conversion	% Area	<25%	25-50%	>50%
Historic Combined Sewer System	% Area	<25%	25-50%	>50%
Older Industrial Operations (40+ years old)	% Area	<3%	3-5%	>5%
Aging or Failing Sewer Infrastructure (~50 years old)	% Area	<25%	25-50%	>50%
Density of Aging Septic Systems (30+ years old)	# Systems per Square Mile	<25%	25-50%	>50%

Table 4. Example of prioritizing subwatersheds using selected IDP screening factors. Uses scoring system of 1-3 (Low to High)

Example of Prioritizing Subwatersheds Using IDP Screening Factors										
Subwatershed	**Past Discharge Complaints** (Number logged)		**Poor Water Quality** (% exceed stand.)		**Outfall Density** (per linear mile)		**Avg. Age Development** (years)		**Total IDP**	**Avg. IDP**
	#	Score	#	Score	#	Score	#	Score	Score	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	16	2	75	3	11	2.75
Subwatershed D	1	1	25%	1	9	1	15	2	5	1.25

3.1.5 Generate Area Specific Maps to Support IDDE Field Investigations

After priority receiving waters and/or other areas are prioritized for monitoring through this screening process, simple maps should be created to assist staff in the field. These maps could include the subwatersheds (with corresponding flow control facilities), MS4, land use, and areas with the highest IDP.

4. Investigating Suspected Illicit Discharges

Once a suspected illicit discharge has been reported or located during monitoring, steps must be taken to characterize the discharge and determine if it is illicit.

As mentioned in 2. Illicit Discharge Reporting and Tracking, Stormwater program staff from the appropriate jurisdiction will initiate an investigation of a reported illicit discharge, spill, or illegal dumping within **7 days** (on average) if it is described as non-threatening and **immediately** if described a threat to human health, welfare, or the environment (Ecology 2007).

If it is determined to be illicit, the discharge should be traced to the source and removed. An Illicit Discharge Field Investigation Report form (Los Angeles County 2002) is included in Appendix B.

4.1 Characterizing Discharges Found

If a discharge is found, determine if it is illicit or an acceptable non-stormwater discharge (See 1.1 and 1.2) (Center for Watershed Protection 2004).

Methods to determine if the discharge is illicit by characterizing pollutants (Ecology 2003):

- **Visual Test.** Evaluate the following (Appendix C has example photographs):
  - Odor
    - *Sewage*: Smell associated with stale sanitary wastewater, especially in pools near outfall.
    - *Sulfur*: Industries that discharge sulfide compounds or organics (meat packers, canneries, dairies, etc.).
    - *Rancid-sour*: Food preparation facilities (restaurants, hotels, etc.).
    - *Oil and gas*: Petroleum refineries, vehicle maintenance facilities, petroleum storage facilities.
  - Color
    - *Yellow*: Chemical plants, textile, and tanning plants
    - *Brown*: Meat packers, printing plants, metal works, stone and concrete, fertilizers, and petroleum refining facilities.
    - *Green*: Chemical plants, and textile facilities
    - *Red*: Meat packers
    - *Gray*: Dairies
  - Turbidity
    - *Cloudy*: Sanitary wastewater, concrete or stone operations, fertilizer facilities, automotive dealers.
    - *Opaque*: Food processors, lumber mills, metal operations, and pigment plants.

- **Visual Test (continued).** Evaluate the following (Appendix C has example photographs):

  - Floatable matter
    - *Oil sheen*: Petroleum refineries or storage facilities, and vehicle service facilities.
    - *Sewage*: Sanitary wastewater
    - *Suds*: Sanitary wastewater

  - Vegetation
    - *Excessive growth*: Food product facilities
    - *Inhibited growth*: High stormwater flows, beverage facilities, printing plants, metal product facilities, drug manufacturing, petroleum facilities, vehicle service facilities and automobile dealers

  - Deposits or Stains
    - *Sediment*: Construction site erosion
    - *Oils*: Petroleum refineries or storage facilities and vehicle service facilities
    - *Bacteria*: Sanitary wastewater and food processors

  - Outfall Damage
    - *Spalling, Cracking, Chipping, or Corrosion*: Industrial flows

  - Winter Conditions
    - *Exaggerated melting at frozen or flowing outfall*:

      Sewage or industrial flows

      "Rim ice" (ice formation): Sewage or relatively hot discharge that causes steam to form which freezes as "rim ice".

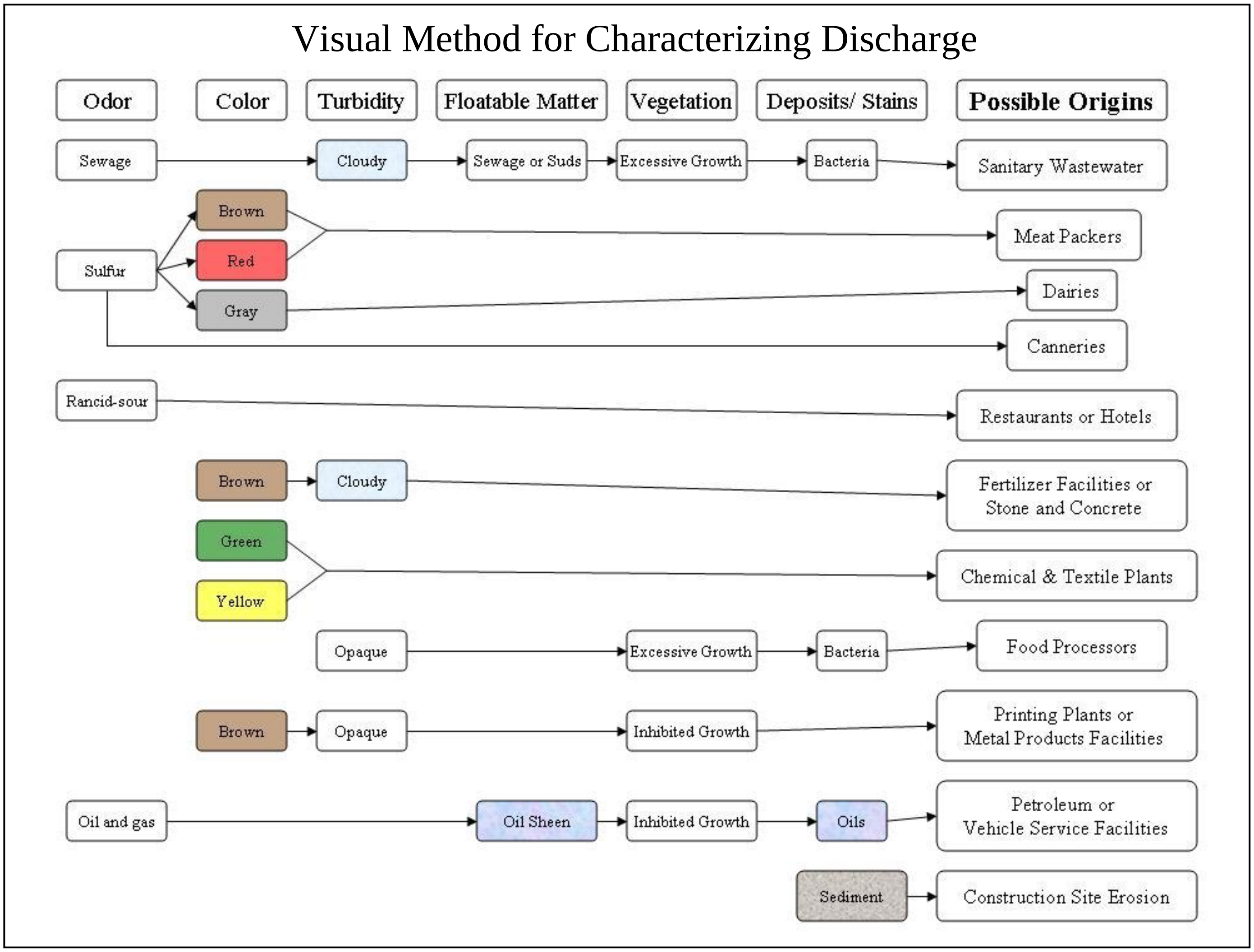

Figure 9. Flowchart of visual methods for discharge characterization with sources.

- **Simple Field Measurements.** Measure water quality parameter on-site including:
  - Temperature
  - Dissolved Oxygen
  - pH
  - Conductivity
  - Turbidity
  - Chlorine

  Table 5 contains RSWMP member's equipment inventory. Table 5 and Appendix C contain information regarding possible discharge sources based on these water quality parameters.

- **Grab Sampling and Laboratory Analysis.** May be necessary to determine the pollutant types and concentrations contained in the discharge. Table 6 and Appendix D contain information regarding possible discharge sources based on pollutant types and water quality parameters. Appendix D contains estimated expenses associated with water sample analysis. Sample collection procedures are listed in Appendix E.

Table 5. RSWMP member's available equipment inventory.

INDICATOR PARAMETERS USED TO DETECT ILLICIT DISCHARGES

Parameter	Discharge Types it can Detect				Laboratory/Analytical Challenges
	Sewage	Washwater	Tap Water	Industrial or Commercial Liquid Wastes	
Ammonia	●	◙	○	◙	Can change into other nitrogen forms as the flow travels to the outfall.
Boron	◙	◙	○	*	
Chlorine	○	○	○	◙	High chlorine demand in natural waters limits utility to flow with very high chlorine concentrations.
Color	◙	◙	○	◙	
Conductivity	◙	◙	○	◙	Ineffective in saline waters, generally highly variable.
Detergents - Surfactants	●	●	○	◙	Reagent is a hazardous waste.
E. coli Enterococci Total Coliform	◙	○	○	○	24-hour wait for results. Need to modify standard monitoring protocols to measure high bacteria concentrations.
Fluoride**	○	○	●	◙	Reagent is a hazardous waste. Exception for communities that do not fluoridate their tap water.
Hardness	◙	◙	◙	◙	
pH	○	◙	○	◙	
Potassium	◙	○	○	●	May need to use two separate analytical techniques, depending on the concentration.
Turbidity	◙	◙	○	◙	

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

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

* Data are not available to assess the utility as a single parameter, but when combined with additional parameters (such as detergents, ammonia and potassium), it can almost always distinguish between sewage and washwater.

** Fluoride is a poor indicator when used alone, but can distinguish between washwater and sewage when combined with analysis for detergents, ammonia and potassium.

Table 6. Indicator Parameters used to determine the source of illicit discharges (Rabasca and Rinehart 2006).

RSWMP Member's Water Quality Monitoring and Storm System Investigation Equipment	
Equipment by Jurisdiction	**Water Quality/Flow Parameter or Use**
Yakima County	
Thermo Orion Portable Meter Model 290Aplus	Temperature, pH, Dissolved Oxygen, Nitrates
Thermo Orion Turbidimeter Model AQ4500	Turbidity
JBS AquaCalc Pro (In-stream Discharge Computer)	Tag line distance, Stream Depth, Individual 0.2, 0.6, and 0.8 observation locations, Meter Revolutions, Time, and Velocity.
USGS Top Set Wading Rod	For use with Type AA and pygmy current meters
AA and Pygmy Meters	Large Streams and Shallow Streams

4.2. Tracing Illicit Discharges

The following methods could be applied to identify the source of an illicit discharge. These are listed in order of progression to be used until source is identified (also see Figure 14):

- **Drainage Surface Area Investigation.** Make a visual inspection of the surrounding land area and storm drain system to identify any obvious potential contributing sources. Analysis of GIS data regarding land use could be helpful to identify what operation or business is responsible for the discharge.

- **Storm Drain System Investigation.** Storm drain system or "trunk" investigations narrow the source of the discharge to a specific segment of the system. Depending on the situation, one of these three options could be utilized to trace the illicit discharge:

  - **Work Up Trunk**
    -Best for small drainage networks with small diameter outfalls (<36").
    -Requires less preparation, only a map of the system is needed.

  - **Split Trunk into Segments**
    -Best for larger drainage networks with larger diameter outfalls (>36").
    -Requires the system to be examined and identification of strategic manholes to be sampled.

  - **Work Down Trunk**
    -Best for very large drainage networks (>1 sq. mile)
    -Useful if multiple pollutants from many sources present.
    -Requires a good understanding for the most upstream segments of the storm drain system

  All three options include opening manholes to determine if the illicit discharge is flowing through them. Methods from 4.1 Characterizing Discharges Found could be applied at each manhole. **Safety precautions regarding traffic control may need to be taken.**

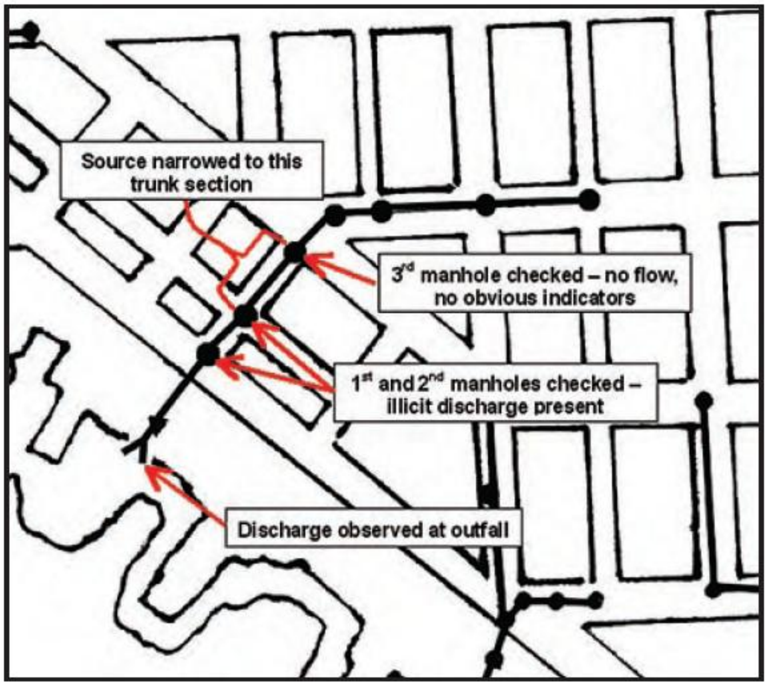

Figure 10. Schematic of investigation that works up the storm system trunk.

- **Detailed Inspection Methods.** If the source cannot be identified through either inspection of the drainage area or the storm drain system, then more detailed inspection procedures may be necessary. Approximate expenses associated with each method are listed in Appendix F.

  The following methods could be utilized if available
  (See Center for Watershed Assessment 2004 for more information):

  - **Water Sample Analysis**
    - Follow methods discussed in 4.1 Characterizing Discharges while conducting one of the three trunk investigations (also see Appendix D).

  - **Video Testing**
    - Good for continuous discharges limited to a single pipe.
    - Equipment is relatively expensive and cannot be used if too much flow exists.

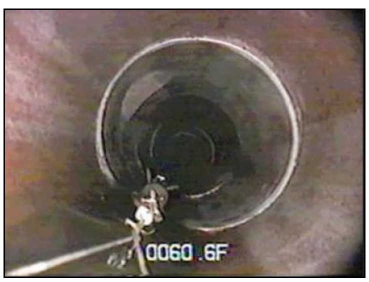

Figure 11. Camera Being Towed (left); Remote Controlled Camera (right).

- **Dye Testing**
  - Best for discharges limited to a small drainage area
  - May be difficult to gain access to some properties.


Figure 12. Dye placed into upstream manhole (left); Dye observed at downstream manhole (right).

- **Smoke Testing**
  - Best for identifying cross-connection with sanitary sewer or other drains.
  - Public notification needed and may miss some discharge sources.

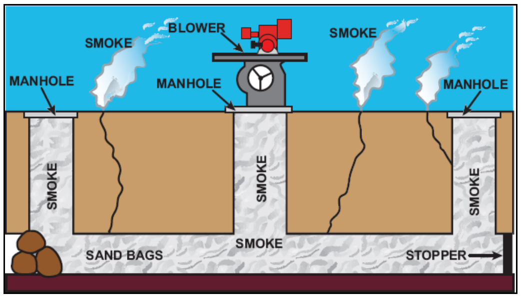

Figure 13. Smoke Testing and Smoke Blower.

- **Sandbagging or Damming**
  - Best for capturing intermittent flows.
  - Only use during dry weather and requires multiple trips to manholes.

- **Septic System Investigations**

  - Homeowner survey could include questions regarding the following:
    - Septic tank capacity
    - Last inspection/maintenance
    - Septic system problems
    - Known connection to stream, roadside ditches, storm sewer, or a farm drain tile.

  - Surface condition analysis is a rapid site assessment where field crews looks for the following conditions:
    - Foul odors in yard
    - Wet, spongy ground; lush plant growth
    - Algal blooms or excessive growth in nearby ditches
    - Heavy vehicles or objects over drain field
    - Visible liquid from drain field
    - Straight pipe discharges

  - Detailed System Inspection conducted by a certified professional.

  - Infrared Imagery
    - Infrared thermography uses the temperature difference of sewage as an identifying marker.
    - Color Infrared Aerial Photography looks for changes in plant growth, differences in soil moisture content, and the presence of standing water on the ground to identify failing septic systems.

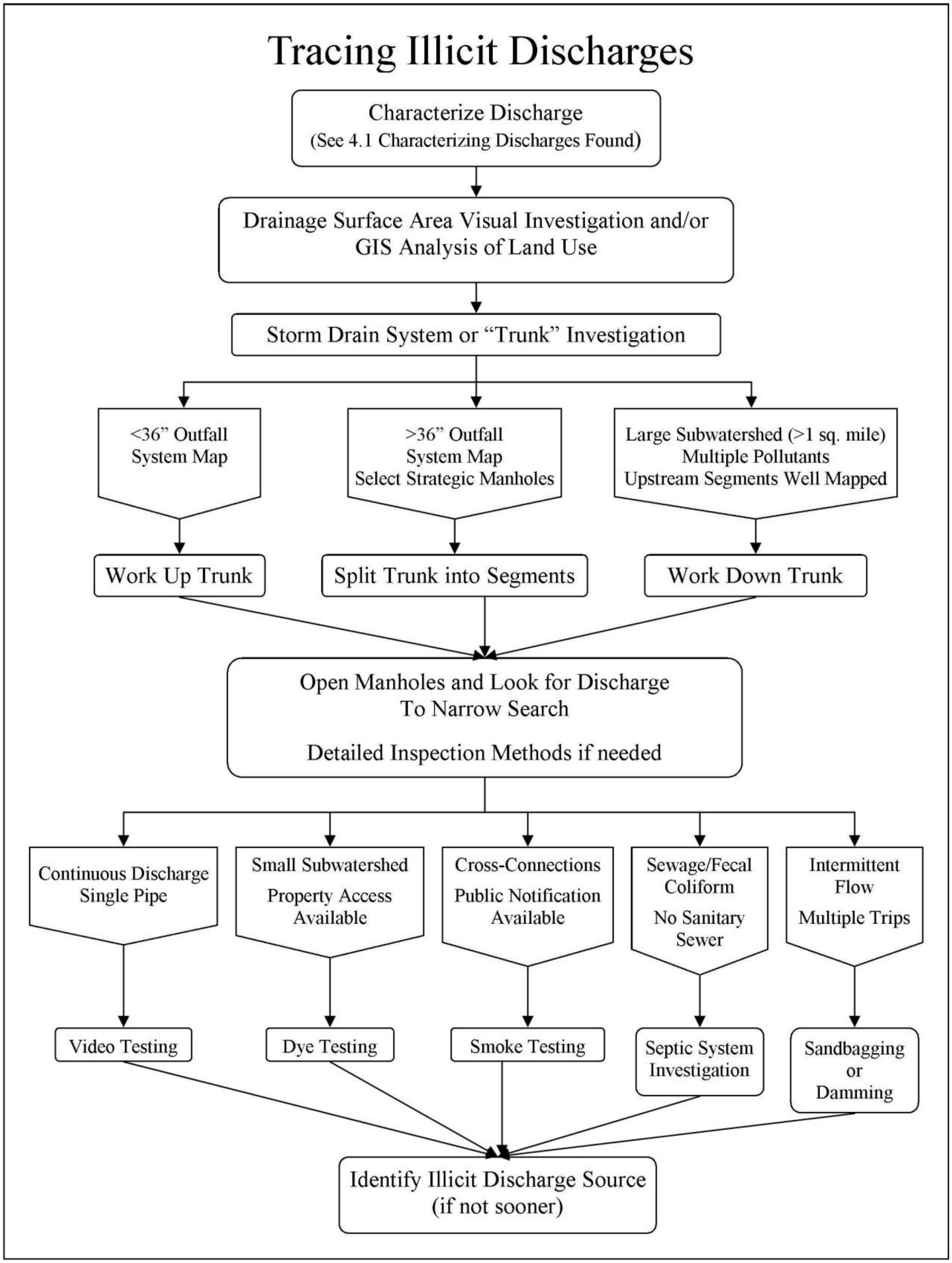

Figure 14. Progression of possible methods to trace an illicit discharge.

5. Removing Illicit Discharges and Connections

Once the source of an illicit discharge has been identified, the NPDES permit requires steps that need to be taken to fix or eliminate the discharge or connection. Procedures will vary depending on the severity and nature of the event.

Once the discharge is characterized and the source confirmed, procedures for ending the discharge should be initiated within **21 days** of the initial report or discovery.

All illicit connections must be terminated within **180 days**, using enforcement provisions if necessary (Ecology 2007).

Important considerations that need to be taken into account before removing an illicit discharge include the following:

- Who is responsible?
- Who owns the connection if one exists?
- What methods will be used to fix it?
- How long will it take?
- How will removal be confirmed?

Removing the source of the illicit discharge is the responsibility of the discharger and/or property owner. The municipality/ utility may be responsible if there is a failure of publicly owned infrastructure.

- **Internal Plumbing Connections and Service Laterals**
  Responsibility of the property/building owner to disconnect and reconnect to appropriate line (sanitary sewer in many cases).

- **Transitory Discharge (Dumping or Spill)**
  Repair or removal of transitory discharge sources will be the responsibility of the property owner. Spill response, enforcement and/or education should be applied depending on the type of discharge.

- **Infrastructure failure within Sanitary Sewer or MS4**
  Municipality/Utility responsible for repairs. Common repairs include cleaning (flushing, pigging (dragging a large rubber plug through the lines), or rodding), excavation and replacement, grouting, and sliplining.

Discharger/owner response to discharges or minor spills could include the following:

- Stop the source of the spill.
- Contain any liquids (deploy containment booms if spill could reach storm system inlet or water body).
- Cover the spill with available absorbent material such as absorbent pads, kitty litter, or sawdust. Do not use straw. Dispose of used absorbent material properly.
- Apply enforcement and/or education when appropriate.

Municipal response to provide the above actions due to failure of property owner or discharger will result in reimbursement.

5.1 Notification

Notification of Appropriate Authorities:

- Threatening Discharge/Spill. If the discharge or spill is determined to be a threat to human health, welfare, or the environment, follow the procedures listed in 2.2 Threatening Discharges.

Notification of Property Owner:

- May contact first in person or telephone, and follow up in writing with Notice of Violation.

  Include the following:
  - Name and address of the owner or responsible person.
  - Address or other description of the site upon which the violation is occurring.
  - Statement specifying the nature of violation.
  - Corrective actions necessary (could include copy of IDDE ordinance)
    - Appropriate timeframe for eliminating the discharge or connection.
  - Statement of the penalty or penalties that may be assessed.

  A sample letter is provided in Appendix G. (Adapted from Aquarion Engineering Services 2005)

- Following the initial notification provide technical assistance as requested/needed.

Follow-Up Inspection:

- Complete a follow-up inspection to ensure property owner took appropriate action.
  - Methods could include visual inspection, dye testing, video testing, and sandbagging.

5.2 Escalating Enforcement

Escalating enforcement including a Notice of Infraction if discharge is not eliminated:

- **Penalty**: A financial penalty assessed against the owner. Also, this could include the recovery of cleanup and abatement costs. See IDDE Ordinance for more information.

- **Legal Action**: Any action that brings the owner into the court system, including a formal citation or civil/ criminal actions. See IDDE Ordinance for more information.

6. Public Outreach and Education

One of the most important and effective components of the IDDE program is public education and outreach. An effective illicit discharge prevention message which targets neighborhoods, generating sites, and municipal operations should significantly reduce the number of discharges. IDDE awareness will be integrated with other stormwater education programs required by the NPDES permit.

Based on experience elsewhere, the following areas to concentrate public outreach/education efforts could include:

Neighborhoods:

- Storm Drain Stenciling
  - Messages should inform the public to keep pollutants out of the storm system. An example could include “Dump No Waste” and “Drains to Stream”.
  - An alternative to stenciling that requires less maintenance would be to purchase grates that have the selected message molded into the metal (see City of Selah for examples).

- Septic System Maintenance
  (see http://www.yakimacounty.us/health/eh/wwprojects.htm)
  - Media and brochures to increase awareness of septic system maintenance related to water quality.
  - Discount coupons for maintenance
  - Low interest loans for repairs
  - Mandatory inspections including performance certification as property transfer

- Vehicle Fluid Changing
  - Outreach materials distributed at auto parts stores and service stations
  - Oil collection stations
    (see
  http://www.yakimacounty.us/publicservices/solidwaste/hazardous_waste.asp#oil)

- Car Washing
  - Media campaigns, brochures, and bill inserts promoting environmentally safe car washing products and techniques
  - Storm drain plug and wet vac provisions for charity car washes
  - Discounted tickets for commercial car washes

- Household Hazardous Waste (HHW) Storage and Disposal (see http://www.yakimacounty.us/publicservices/solidwaste/hazardous_waste.asp)

- Swimming Pool Draining
  - Conventional outreach techniques on proper discharge (bill inserts, at pool supply retail outlets, etc.)

Businesses:

- Concentrate on businesses that are likely to generate illicit discharges such as vehicle operations, turf and landscaping, restaurants, outdoor materials, building repair/maintenance, and waste management.

- Provide outreach materials and technical assistance to businesses for pollution prevention
  - Could include employee training materials or assistance with spill prevention and response planning

- If possible, provide voluntary site inspections of any non-regulated sites that discharge to the storm drain system. This could be a good method to educate and provide materials to the owner/operator.

7. Employee Education and Training

IDDE employee training will be provided to those employees who are directly involved in the program or who are likely to encounter illicit discharges. IDDE concepts are being incorporated into satisfying Pollution Prevention and Good Housekeeping training requirements of the NPDES permit.

The RSL and/or permittee will provide IDDE training to the following three groups of employees:

- Receives calls about illicit discharges
- May encounter illicit discharges in the course of their work
- Will investigate illicit discharges

Training will be tailored to each group of employees by developing three presentations, one for each group above.

Permittees will identify appropriate personnel and provide opportunities for staff to be trained. The RSL and/or permittees will train employees annually in each jurisdiction.

Most employee groups already conduct some form of regular training on procedures, safety, or trade specific practices. Illicit discharge training will be coordinated with any other applicable NPDES and existing training to minimize interruption of staff duties.

The RSL and/or permittees will document training events, including the number of employees, class rosters, and locations.

8. Program Evaluation

Periodic evaluation of the IDDE program is important to maintain flexibility to respond to changing discharge problems, program obstacles, and emerging technologies. Evaluation will also help maintain the illicit discharge reporting and tracking system.

- **Annual Reporting**
  Data derived from the illicit discharge reporting and tracking database could be used for both annual NPDES reporting and program evaluation.

  Data sets to summarize could include the following:
  - Stream reach/ drainage basin survey results
  - Rerouting/removal of outfalls discharging to sensitive water bodies
  - Number of Illicit connection removals
  - Hotline usage
  - Number of incidents investigated, and average time to investigate
  - Number of confirmed and corrected illicit discharges
  - Status of any enforcement actions
  - Average time to remedy identified illicit problem
  - Feedback from public education efforts

- **Program Adjustments**
  All staff involved with various components of the program should meet annually to discuss he program’s effectiveness and propose possible amendments based upon program valuation, annual report data, and any problems faced while implementing the program.

Glossary

Discharge – Any spilling, leaking, pumping, pouring, emptying, dumping, disposing, or other addition of pollutants to UIC wells, waters of the State, or the MS4.

Hazardous Materials - Those wastes designated by 40 CFR Part 261, and regulated by the EPA.

Illegal Dumping - The intentional or inadvertent spilling, leaking, pumping, pouring, emptying, disposing, or other addition of prohibited materials into the conveyance system, streets, inlets or basins, and the improper disposal of material on land that is then discharged to the Municipal Separate Storm Sewer System (MS4) when it rains.

Illicit Connection - A connection defined as either of the following:

Any drain or conveyance, whether on the surface or subsurface, which allows an illicit discharge to enter the MS4 including but not limited to any conveyances which allow any non-storm water discharge including sewage, process wastewater, and wash water to enter the MS4 and any connections to the MS4 from indoor drains and sinks, regardless of whether said drain or connection had been previously allowed, permitted, or approved by the jurisdiction.

OR

Any drain or conveyance connected from a commercial or industrial land use to the MS4 which has not been documented in plans, maps, or equivalent records and approved by the jurisdiction.

Illicit Discharge - Any discharge to a municipal separate storm sewer that is not composed entirely of storm water 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.

Industrial Activity - Manufacturing, processing or raw materials storage areas at an industrial plant. These activities are required to NPDES permit coverage in accordance with 40 CFR 122.26.

Municipal Separate Storm Sewer System (MS4) - 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 waters 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 CFR 122.2.

National Pollutant Discharge Elimination System (NPDES) - 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-Storm Water Discharge - Means any discharge to the MS4 that is not composed entirely of storm water.

Outfall - Means point source as defined by 40 CFR 122.2 at the point where a municipal separate storm sewer discharges to waters of the State and does not include open conveyances connecting two municipal separate storm sewers, or pipes, tunnels, or other conveyances which connect segments of the same stream or other waters of the State and are used to convey waters of the State.

Point Source - Any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural runoff.

Pollutant - Means dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, domestic sewage sludge (biosolids), munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal, and agricultural waste. This term does not include sewage from vessels within the meaning of section 312 of the CWA, nor does it include dredged or fill material discharged in accordance with a permit issued under section 404 of the CWA.

Pollution - Means contamination or other alteration of the physical, chemical, or biological properties of waters of the state; including change in temperature, taste, color, turbidity, or odor of the waters; or such discharge of any liquid, gaseous, solid, radioactive or other substance into any waters of the state as will or is likely to create a nuisance or render such waters harmful, detrimental or injurious to the public health, safety or welfare; or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses; or to livestock, wild animals, birds, fish or other aquatic life.

Process Wastewater - Means any water which, during manufacturing or processing, comes into direct contact or results from the production or use of any raw material, intermediate product, finished product, byproduct, or waste product.

Receiving Water Body – See Waters of the State

Runoff - Water that travels across the land surface, or laterally through the ground near the land surface, and discharges to water bodies either directly or through a collection and conveyance system. Runoff includes stormwater and water from other sources (e.g. snowmelt) that travels across the land surface.

Stormwater - Runoff during and following precipitation and snowmelt events, including surface runoff, drainage and interflow.

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.

Watershed - A region or area bounded peripherally by a divide and draining ultimately to a particular watercourse or body of water. A watershed could be divided into smaller units including subwatersheds and sewersheds.

Underground Injection Control (UIC) - A manmade subsurface structure fluid distribution system designed to discharge fluids into the ground and consists of an assemblage of perforated pipes, drain tiles, or other similar mechanisms, or a dug hole that is deeper than the largest surface dimension (WAC 173-218-030).

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Photo Acknowledgements

Figure **Source**

Cover…………………………..Yakima County - G:\Projects\3053 Stormwater\Photos
Figure 6…………………..........http://www.ontario-home-builder.com/Septic_Tank_System.html
http://www.dpcprints.com/print.php?IMAGE_ID=151242.
Center for Watershed Protection 2004
http://www.lclark.edu/org/nedc/slough.html
Figure 10…………………….Center for Watershed Protection 2004
Figure 11…………………….Center for Watershed Protection 2004
Figure 12…………………….Center for Watershed Protection 2004
Figure 13…………………….Center for Watershed Protection 2004

Appendix A. Outfall Inventory/ Sample Collection Form

OUTFALL RECONNAISSANCE INVENTORY/ SAMPLE COLLECTION FIELD SHEET

Section 1: Background Data

Subwatershed:	Outfall ID:
Today's date:	Time (Military):
Investigators:	Form completed by:
Temperature (°F):	Rainfall (in.): Last 24 hours: Last 48 hours:
Latitude: Longitude:	GPS Unit: GPS LMK #:
Camera:	Photo #s:
Land Use in Drainage Area (Check all that apply):	
☐ Industrial	☐ Open Space
☐ Ultra-Urban Residential	☐ Institutional
☐ Suburban Residential	Other: ____________
☐ Commercial	Known Industries: ____________
Notes (e.g., origin of outfall, if known):	

Section 2: Outfall Description

LOCATION	MATERIAL	SHAPE		DIMENSIONS (IN.)	SUBMERGED
☐ **Closed Pipe**	☐ RCP ☐ CMP ☐ PVC ☐ HDPE ☐ Steel ☐ Other: ________	☐ Circular ☐ Eliptical ☐ Box ☐ Other: _____	☐ Single ☐ Double ☐ Triple ☐ Other: _____	Diameter/Dimensions: ____________	In Water: ☐ No ☐ Partially ☐ Fully With Sediment: ☐ No ☐ Partially ☐ Fully
☐ **Open drainage**	☐ Concrete ☐ Earthen ☐ rip-rap ☐ Other: _____	☐ Trapezoid ☐ Parabolic ☐ Other: _____		Depth: _____ Top Width: _____ Bottom Width: _____	
☐ **In-Stream**	**(applicable when collecting samples)**				
Flow Present?	☐ Yes ☐ No ***If No, Skip to Section 5***				
Flow Description (If present)	☐ Trickle ☐ Moderate ☐ Substantial				

Section 3: Quantitative Characterization

FIELD DATA FOR FLOWING OUTFALLS				
PARAMETER		RESULT	UNIT	EQUIPMENT
☐Flow #1	Volume		Liter	Bottle
	Time to fill		Sec	
☐Flow #2	Flow depth		In	Tape measure
	Flow width	____' ____"	Ft, In	Tape measure
	Measured length	____' ____"	Ft, In	Tape measure
	Time of travel		S	Stop watch
Temperature			°F	Thermometer
pH			pH Units	Test strip/Probe
Ammonia			mg/L	Test strip

Outfall Reconnaissance Inventory Field Sheet

Section 4: Physical Indicators for Flowing Outfalls Only

Are Any Physical Indicators Present in the flow? ☐ Yes ☐ No *(If No, Skip to Section 5)*

INDICATOR	CHECK if Present	DESCRIPTION	RELATIVE SEVERITY INDEX (1-3)		
Odor	☐	☐ Sewage ☐ Rancid/sour ☐ Petroleum/gas ☐ Sulfide ☐ Other:	☐ 1 – Faint	☐ 2 – Easily detected	☐ 3 – Noticeable from a distance
Color	☐	☐ Clear ☐ Brown ☐ Gray ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:	☐ 1 – Faint colors in sample bottle	☐ 2 – Clearly visible in sample bottle	☐ 3 – Clearly visible in outfall flow
Turbidity	☐	See severity	☐ 1 – Slight cloudiness	☐ 2 – Cloudy	☐ 3 – Opaque
Floatables -Does Not Include Trash!!	☐	☐ Sewage (Toilet Paper, etc.) ☐ Suds ☐ Petroleum (oil sheen) ☐ Other:	☐ 1 – Few/slight; origin not obvious	☐ 2 – Some; indications of origin (e.g., possible suds or oil sheen)	☐ 3 - Some; origin clear (e.g., obvious oil sheen, suds, or floating sanitary materials)

Section 5: Physical Indicators for Both Flowing and Non-Flowing Outfalls

Are physical indicators that are not related to flow present? ☐ Yes ☐ No *(If No, Skip to Section 6)*

INDICATOR	CHECK if Present	DESCRIPTION	COMMENTS
Outfall Damage	☐	☐ Spalling, Cracking or Chipping ☐ Peeling Paint ☐ Corrosion	
Deposits/Stains	☐	☐ Oily ☐ Flow Line ☐ Paint ☐ Other:	
Abnormal Vegetation	☐	☐ Excessive ☐ Inhibited	
Poor pool quality	☐	☐ Odors ☐ Colors ☐ Floatables ☐ Oil Sheen ☐ Suds ☐ Excessive Algae ☐ Other:	
Pipe benthic growth	☐	☐ Brown ☐ Orange ☐ Green ☐ Other:	

Section 6: Overall Outfall Characterization

☐ Unlikely ☐ Potential (presence of two or more indicators) ☐ Suspect (one or more indicators with a severity of 3) ☐ Obvious

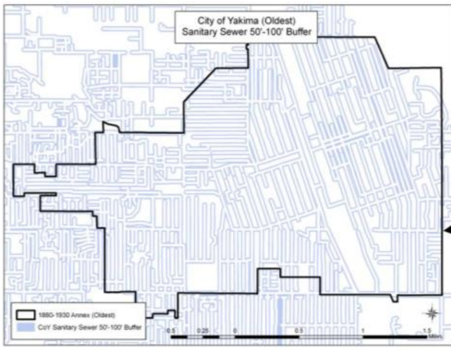
Section 7: Data Collection

1. Sample for the lab?	☐ Yes	☐ No		
2. If yes, collected from:	☐ Flow	☐ Pool		
3. Intermittent flow trap set?	☐ Yes	☐ No	If Yes, type: ☐ OBM	☐ Caulk dam

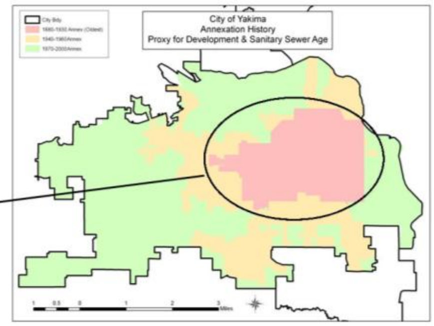
Section 8: Any Non-Illicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?

Appendix B. Illicit Discharge Potential (IDP) Example Maps

Example of a more Detailed Illicit Discharge Potential Analysis
City of Yakima (Oldest Portion)



Sanitary Sewer
50'-100' Buffer

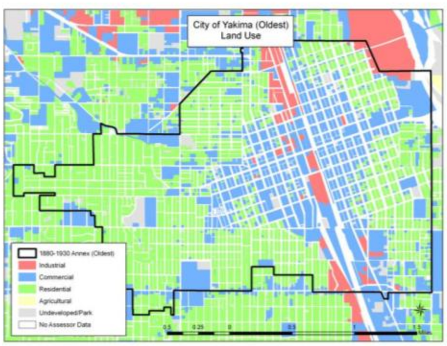


City of Yakima
Annexation History

1880-1930 Circled
Higher IDP

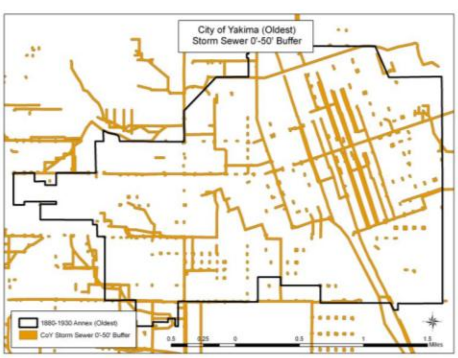
Annexation used as a proxy to determine Development and Sanitary Sewer Age

+



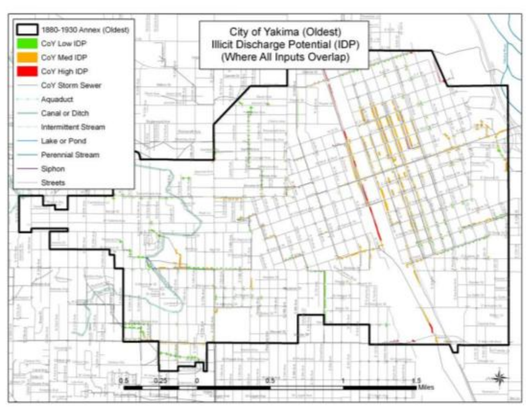
Land Use

+

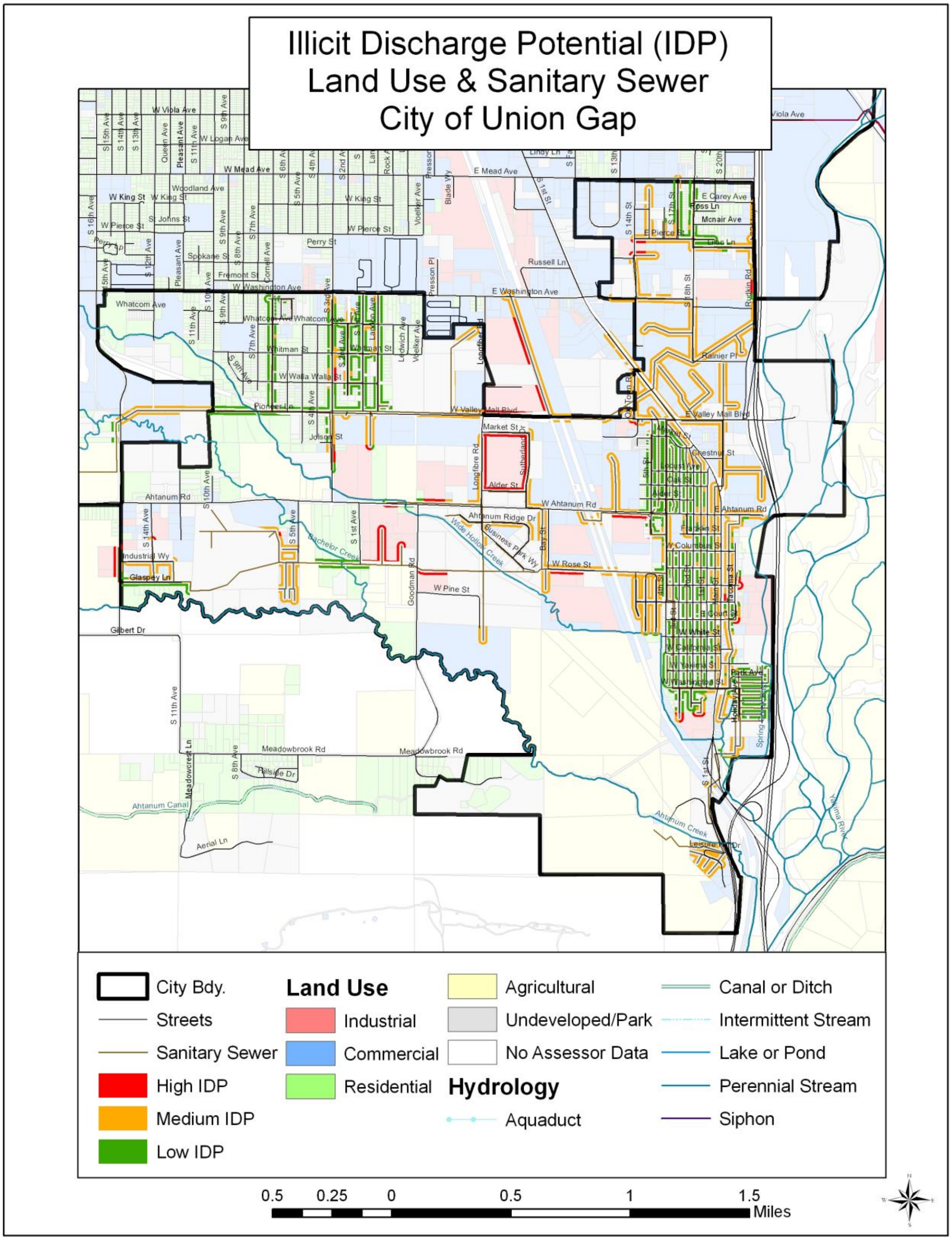


Storm Sewer
0'-50' Buffer

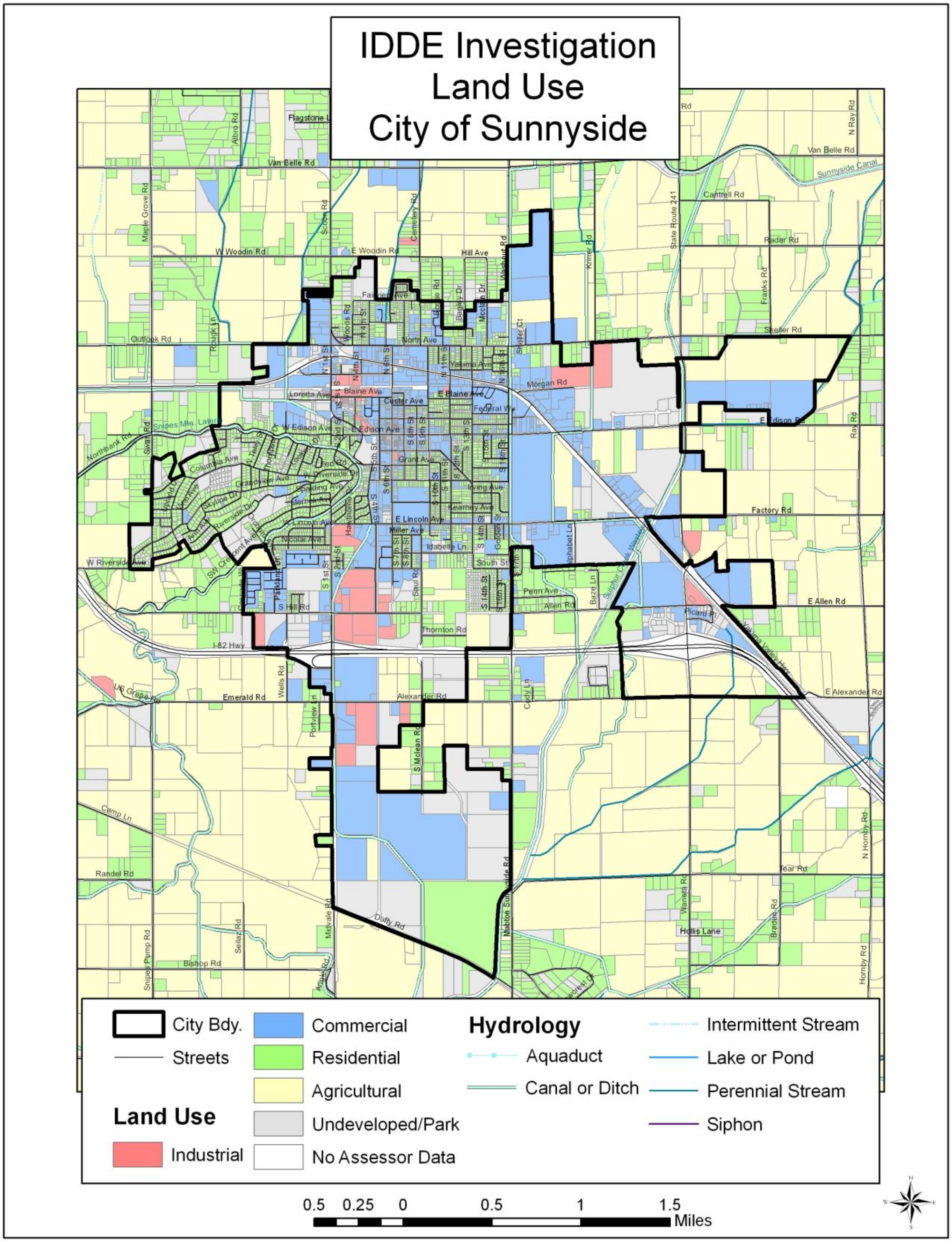
=



City of Union Gap IDP
Based on Land Use and Proximity to Sanitary Sewer Lines.



Land Use as an Indicator for IDP within the City of Sunnyside.



Appendix C. Illicit Discharge Field Investigation Report Form

ILLICIT DISCHARGE/CONNECTION FIELD INVESTIGATION CHECKLIST

Field Site Description

Location:

Dominant Watershed Land Uses:

Industrial | Commercial | Residential | Public | Unknown

Illicit Connections

Connection found?	Station:	Type:
	Size:	Bank:

Discharge Observations

Surface I.D.	Channel I.D.
Flow (Yes/No)	(If yes, how much flow)

If "yes" check:

Odor:	None	Musty	Sewage	Rotten Eggs	Sour Milk	Oily	Other ________
Color:	Clear	Red	Yellow	Brown	Green	Grey	Other ________
Turbidity:	Clear	Cloudy	Opaque	Suspended Solids	Other ________		

If "yes" or "no" check:

Deposits/Stains:	None	Sediments	Oily	Garbage	Other ________
Structural Condition:	Normal	Concrete Cracking	Metal	Corrosion	Other ________
Vegetation Conditions	None	Mosquito Larvae	Algae	Other ________	
Picture Taken:	Yes/No	Roll No. ________		Photo No. ________	

Field Analysis (Parameters Optional)

Water Temperature:	(C)	Chlorine (total):	(mg/L)
Dissolved Oxygen:	(mg/L)	Copper (total):	(mg/L)
Phenol (total):	(mg/L)	Detergents (surf):	(mg/L)

PH:

Comments:

Source Investigation

Investigation Conducted? Y N Source Identified? Y N

Name and Address of Identified Source/Owner of Discharge/Connection:

Comments:

Inspector Data

Data Sheet filled out by:	Date:

Signature:

Appendix D. Interpreting Physical Indicators

Color and Turbidity - Severity Scale 1-3 (Low-High)

Color: Brown; Severity: 2
Turbidity Severity: 2

Color: Blue-green; Severity: 3
Turbidity Severity: 2

Highly Turbid Discharge
Color: Brown; Severity: 3
Turbidity Severity: 3

Sewage Discharge
Color: 3
Turbidity: 3

Paint
Color: White; Severity: 3
Turbidity: 3

Industrial Discharge
Color: Green; Severity: 3
Turbidity Severity: 3

Blood
Color: Red; Severity: 3
Turbidity Severity: None

Failing Septic System:
Turbidity Severity: 3

Turbidity in Downstream Plume
Turbidity Severity: 2
(also confirm with sample bottle)

High Turbidity in Pool
Turbidity Severity: 2
(Confirm with sample bottle)

Iron Floc
Color: Reddish Orange; Severity: 3
(Often associated with a natural source)

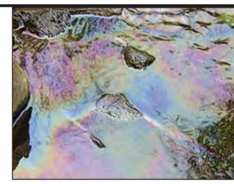
Slight Turbidity
Turbidity: 1
(Difficult to interpret this observation; May be natural or an illicit discharge)

Construction Site
Discharge
Turbidity Severity: 3

Discharge of Rinse
from Floor Sanding
(Found during wet weather)
Turbidity Severity: 3

(Center for Watershed Protection 2004)

Floatables – Severity Scale 1-3 (Low-High)

SUDS		
 Natural Foam Note: Suds only associated with high flows at the “drop off” Do not record.	 Low Severity Suds Rating: 1 Note: Suds do not appear to travel; very thin foam layer	 High severity suds Rating: 3 Sewage
OIL SHEENS		
 Low Severity Oil Sheen Rating: 1	 Moderate Severity Oil Sheen Rating: 2	 High Severity Oil Film Rating: 3

Benthic and Other Biotic Indicators

 Bacterial growth at this outfall indicates nutrient enrichment and a likely sewage source.	 This bright red bacterial growth often indicates high manganese and iron concentrations. Surprisingly, it is not typically associated with illicit discharges.	 Sporalitis filamentous bacteria, also known as “sewage fungus” can be used to track down sanitary sewer leaks.
 Algal mats on lakes indicate eutrophication. Several sources can cause this problem. Investigate potential illicit sources.	 Illicit discharges or excessive nutrient application can lead to extreme algal growth on stream beds.	 The drainage to this outfall most likely has a high nutrient concentration. The cause may be an illicit discharge, but may be excessive use of lawn chemicals.
	 This brownish algae indicates an elevated nutrient level.	

(Center for Watershed Protection 2004)

Appendix E. Possible Sources Associated with Indicator Parameters

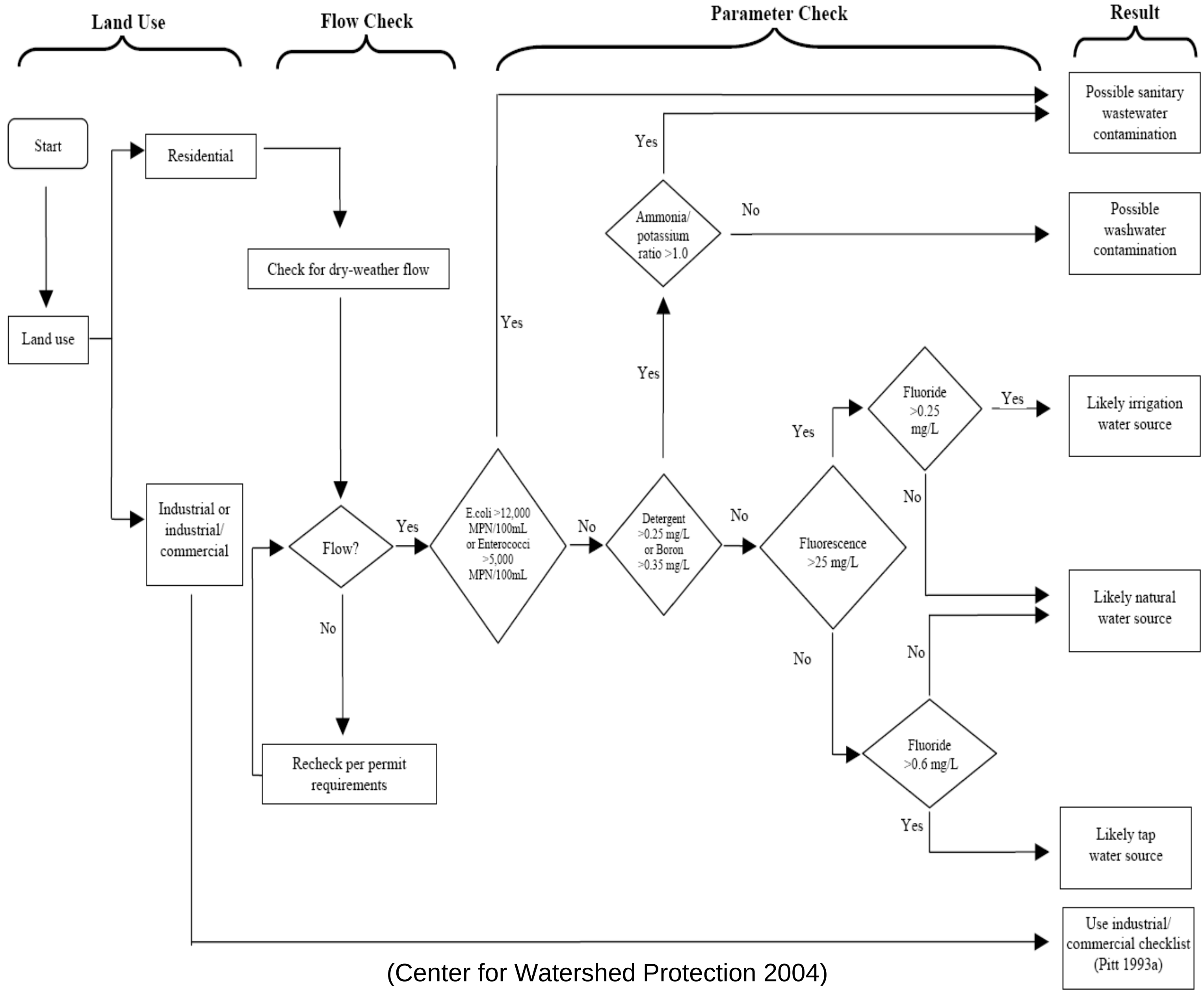
Possible Sources Associated with Indicator Parameters - A			
Indicator Parameter	**Analytical Results**	**Possible Sources**	**Comments**
Bacteria *(Total Coliform / Fecal Coliform)*	Presence / Absence	Indicator of sewage discharges	Sewage indicator if high concentrations unless wildlife sources exist in watershed
E. coli	> 12,000 mpn/100mL	Possible sanitary wastewater. Test for ammonia/potassium ratio to distinguish between sewage and washwater sources.	
E. coli	< 12,000 mpn/100mL	Test for surfactants or boron to identify presence of detergents	
Detergents	Presence / Absence *(see surfactants & boron)*	Detergents may indicate sewage or washwater discharges. The presence of detergents, combined with their absence in natural waters or tap water, may signify illegal dumping, an illicit connection, or a leaking sewer.	Sewage and washwater discharges contain detergents used to clean clothes or dishes.
Surfactants	> 0.25 mg/L	Indicator that the discharge contains detergents. Test for ammonia/potassium ratio to distinguish between sewage and washwater sources.	
Surfactants	< 0.25 mg/L	Test for Fluoride to distinguish between natural or potable sources.	
Boron	> 0.35 mg/L	Indicator that the discharge contains detergents. Test for ammonia/potassium ratio to distinguish between sewage and washwater sources.	
Boron	< 0.25 mg/L	Test for Fluoride to distinguish between natural or potable sources.	
Ammonia – N	(see Ammonia / Potassium ratio)	Indicator of sewage, since its concentration is much higher than in groundwater or tap water. High ammonia concentrations may also indicate liquid wastes from industrial sites.	
Potassium	(see Ammonia / Potassium ratio)	Found at relatively high concentrations in sewage, and extremely high concentrations in many industrial process waters. Consequently, potassium can act as a good first screen for industrial wastes, and can also be used in combination with ammonia to distinguish wash waters from sanitary wastes.	

(City of Cañon City 2007)

Possible Sources Associated with Indicator Parameters - B			
Indicator Parameter	**Analytical Results**	**Possible Sources**	**Comments**
Ammonia / Potassium ratio	> 1.0	If discharge contains surfactants, and the ratio is > 1.0, then the source is possibly sanitary wastewater.	
Ammonia / Potassium ratio	< 1.0	If discharge contains surfactants, and the ratio is < 1.0, then the source is possibly washwater.	
Fluoride	> 0.25 mg/L	If the discharge does not contain surfactants, then the source is likely tap water or irrigation source water (i.e. groundwater)	
Fluoride	> 0.60 mg/L	Indicates potable water sources in areas where water supplies are fluoridated.	
Fluoride	< 0.25 mg/L	If the discharge does not contain surfactants, then the source is likely a natural water source.	
Chlorine	Presence / Absence	Additional parameter to distinguish between a natural or potable water source. High chlorine levels may indicate a water line break, swimming pool discharge, or industrial discharge from a chlorine bleaching process.	Not a good indicator of sanitary waste water because chlorine will not exist in a "free state" for long.
Total Hardness as $CaCo_3$		Additional parameter to distinguish between a natural or potable water source. Hardness may help to distinguish groundwater from tap water and other flow types.	Hardness may be useful in communities where hardness levels are elevated in groundwater.
Conductivity / TDS		The use of conductivity as an indicator depends on whether concentrations are elevated in natural or clean waters.	
Turbidity		High turbidity is often a characteristic of undiluted dry weather industrial discharges, such as those coming from some continual flow sources, or some intermittent spills. Sanitary wastewater is also often cloudy in nature.	
pH	Very low (<3) or very high (>12)	Possible indicator of liquid wastes from an industrial source.	
Temperature		Elevated baseflow temperatures (compared to baseflows at other outfalls being screened) could be an indicator of substantial contamination by sanitary wastewater or cooling water.	Useful where the screening activities are conducted during cold months

(City of Cañon City 2007)

Indicator Parameters with Possible Sources



(Center for Watershed Protection 2004)

Industrial Discharge Indicator Parameters

Industrial Benchmark Concentration	Detergents as Surfactants (mg/L)	Ammonia (mg/L)	Potassium (mg/L)	Initial "Flow Chart" Class	Color (Units)	Conductivity (:S/cm)1	Hardness (mg/L as $CaCO_3$)	pH	Turbidity (NTU)	Best Indicator Parameters to Identify This Flow Type	Additional Indicator Parameters to Identify This Flow Type
	--	≥50	≥20		≥500	≥2000	≤10 ≥2,000	≤5	≥1,000		
Concentrations in Industrial and Commercial Flow Types											
Automotive Manufacturer[1]	5	0.6	66	**Wash water**	15	220	30	6.7	118	Potassium	
Poultry Supplier[1]	5	4.2	41	**Wash water**	23	618	31	6.3	111	Potassium	
Roofing Product Manufacturing[1]	8	10.2	27	**Wash water**	>100[2]	242	32	7.1	229	None	Potassium Color
Uniform Manufacturing[1]	6	6.1	64	**Wash water**	>100[2]	798	35	10.4	2,631	Potassium	Color Turbidity
Radiator Flushing	15	(26.3)	(2,801)	**Wash water**	(3,000)	(3,278)	(5.6)	(7.0)	-	Potassium Conductivity Color	Hardness
Metal Plating Bath	7	(65.7)	(1,009)	**Wash water**	(104)	(10,352)	(1,429)	(4.9)	-	Ammonia Potassium Conductivity Hardness	pH
Commercial Car Wash	140	0.9; (0.2)	4; (43)	**Wash water**	>61; (222)	274; (485)	71; (157)	7.7; (6.7)	156		Potassium Turbidity
Commercial Laundry	(27)	(0.8)	3	**Wash water**	47	(563)	(36)	(9.1)	-		

Best Indicators, shaded in pink, distinguish this source from residential wash water in 80% of samples in both Tuscaloosa and Birmingham, AL.
Supplemental indicators, shaded in yellow, distinguish this source from residential wash water in 50% of samples, or in only one community.
(Data in parentheses are mean values from Birmingham); Data not in parentheses are from Tuscaloosa
[1] Fewer than 3 samples for these discharges.
[2] The color analytical technique used had a maximum value of 100, which was exceeded in all samples. Color may be a good indicator of these industrial discharges and the benchmark concentration may need adjustment downward for this specific community.

(Center for Watershed Protection 2004)

Estimated Water Sample Analysis Expenses

Parameter	Analysis Cost				
	Per Sample Costs				Approximate Initial Equipment Cost (Item)
	Disposable Supplies	Analysis Time (min/ sample)	Staff Cost (@$25/hr)	Total Cost Per Sample	
Ammonia	$1.81	25[3]	$10.42	$12.23	$950[4] (Colorimeter)
Boron	$0.50	20[3]	$8.33	$8.83	$950[4] (Colorimeter)
Chlorine	$0.60	5	$2.08	$2.68	$950[4] (Colorimeter)
Color	$0.52	1	$0.42	$0.94	$0
Conductivity	$0.65[2]	4[3]	$1.67	$2.32	$275 (Probe)
Detergents – Surfactants[1]	$3.15	7	$2.92	$6.07	$0
Enterococci, *E. Coli* or Total Coliform[1]	$6.75	7 (24 hour waiting time)	$2.92	$9.67	$4,000 (Sealer and Incubator)
Fluoride[1]	$0.68	3	$1.25	$1.93	$950[4] (Colorimeter)
Hardness	$1.72	5	$2.08	$3.80	$125 (Digital Titrator)
pH	$0.65[2]	3.5[3]	$1.46	$2.11	$250 (Probe)
Potassium (High Range)	$0.50[2]	5.5[3]	$2.29	$2.79	$250 (Probe)
Potassium (Low Range)	$1.00	5	$2.08	$3.08	$950[4] (Colorimeter)
Turbidity	$0.50[2]	6[3]	$2.50	$3.00	$850 (Turbiditimeter)

[1] Potentially high waste disposal cost for these parameters.
[2] The disposable supplies estimates are based on the use of standards to calibrate a probe or meter.
[3] Analysts can achieve significant economies of scale by analyzing these parameters in batches.
[4] Represents the cost of a colorimeter. The price of a spectrophotometer, which measures a wider range of parameters, is more than $2,500. This one-time cost can be shared among chlorine, fluoride, boron, potassium and ammonia.

(Center for Watershed Protection 2004)

Appendix F. Discharge Sample Collection Procedure

(Adapted from City of Cañon City 2007)

Consistent field sampling procedures are needed to receive reliable, accurate, and defensible data.

Good field sampling incorporates eight basic elements:

- Where to Collect Samples
- When to Collect Samples
- Sample Labeling and Chain of Custody
- Sample Collection
- Preservation and Storage of Samples
- Quality Assurance / Quality Control Samples
- Safety Considerations
- Special Monitoring Techniques for Intermittent or Transitory Discharges

Where to Collect Samples

Indicator sampling occurs at there principle locations to detect illicit discharges:

- *In the Stream*: Less precise, but screens stream reaches for greatest illicit discharge potential and progress of water quality improvement over time.
- *At the Outfall*: Most common
- *Within the Storm Drain Pipe Network*: Needed to track down and isolate individual discharges.

When to Collect Samples

Indicator samples should be collected during dry weather if possible.

Sample Labeling and Tracking Sheet

Sample labels should be written using a permanent marker such as a "Sharpie" and include the following which comprise the sample identification number:

- Name of MS4
- Outfall Number
- Date and Time of Collection

Sample Tracking Sheet

- Sample ID
- Collection information
- Requested analysis
- Time and date samples were delivered to the lab

Sample Collection
Following these sample collection procedures should eliminate the potential for contamination and prevent the field crew from exposure to harmful pollutants:

- Place the label on the bottle prior to filling.
- Wear gloves when possible and wash hands with sanitary wipes after the sample is collected.
- Do not touch the inside of the lid or bottle
- A “dipper” consisting of a bottle at the end of a long pole could be used to catch flows if needed.
- A pre-measured, clean, cut-off plastic milk jug could be used in shallow flows if needed.
- Rinse the bottle three times in the water to be sampled prior to collecting the sample (if depth of flow allows)
- Fill the bottle 90% full to facilitate addition of preservatives and to allow titration/ mixing
- Add any preservatives if needed
- Place samples in an ice-filled cooler immediately to cool samples to 4°C (40°F).

Preservation and Storage of Samples
Each indicator parameter has a unique sample preservation technique and a maximum holding time for laboratory analysis. Most parameters do not require preservatives, but e. Coli and Potassium require the following:

Parameter	**Preservative**	**Procedures**
e. Coli	Sodium Thiosulfate	Preservative pre-measured in bottle
Potassium	Nitric Acid	Add 2ml/ Liter to adjust pH to 2-3

Quality Assurance / Quality Control Samples
Duplicate (replicate) samples could be taken at selected locations to check the accuracy of the analysis method and consistency of samples collected at the same site. Duplicate samples should be labeled to allow for easy identification. This could include adding -02 to the end of the sample identification number.

Safety Considerations
Safety is essential when sampling in urban stream environments where there is potential for contact with contaminated water, sharp debris and objects, and threatening individuals (both animals and humans). The following safety considerations should be made:

- Field crews comprised of at least two individuals if possible
- Sturdy boots or waders
- Gloves (latex, neoprene, or rubber)
- Notify private property owners
- Field crews could be vaccinated against Hepatitis B as a precaution if assessing suspected illicit sewage discharges
- Familiar with and follow jurisdiction's confined space entry policy.
- Traffic Control measures following jurisdictional protocol may need to be taken. Signs, cones, and orange vests may need to be used.

Sample
Point No:_____

//// Field Lab Sheet////

Description:________________

Date:_____________

____

Sampled By:__________________

____

Weather
Currently:_____________________

Time Started: _________

____

Time Finished:_________

Air Temp:____________

Precip. Last:_______________ Date of last: _________________________

YTD:_______________ ____________________________________

Field Testing:

pH:_____________

SC:_____________ uS/cm

DO:_____________ mg/L

Turbidity:_______________ NTU

TDS:___________________ g/L

Temp:__________________ C

ORP: __________________ mV

Flow:

Cross-section Info:____________________

____

____

_________gpm

Description of Water:

Odor:________________________________

____

Clarity:______________________________

Sample Bottles Filled (No. & Descr.): 13 (3 Amber 1L, 1-Clr. 1L, 2-PP .5L,

3-Amb. VOA 40mL, 2 - 250mL PP)

Sample Bottles Taken to Lab (Date & Time):______________________________________

____

General Notes or Comments:_____________________________________

____

N:\Surface Water Division\DID\STUDY\FieldSheet.xls

Appendix G. Estimated Expenses for Detailed Inspection Methods

Dye Testing

Product	Water Volume	Cost
Dye Strips	1 strip/500 gallons	$75 – $94 per 100 strips
Dye Tablets	0 – 50,000 gallons	$40 per 200 tablets
Liquid Concentrate (Rhodamine WT)	0 – 50,000 gallons	$80 – $90 per gallon $15 – $20 per pint
Powder	50,000 + gallons	$77 per lb
Dye Wax Cakes	20,000 – 50,000 gallons	$12 per one 1.25 ounce cake
Dye Wax Donuts	50,000 + gallons	$104 – $132 per 42 oz. donut
Price Sources: *Aquatic Eco-Systems http://www.aquaticeco.com/* *Cole Parmer http:/www.coleparmer.com* *USA Blue Book http:/www.usabluebook.com*		

Video Inspection

Equipment	Cost
GEN-EYE 2™ B&W Sewer Camera with VCR & 200' Push Cable	$5,800
100' Push Rod and Reel Camera for 2" – 10" Pipes	$5,300
200' Push Rod and Reel Camera for 8" – 24" Pipes	$5,800
Custom Saturn III Inspection System 500' cable for 6-16" Lines	$32,000 ($33,000 with 1000 foot cable)
OUTPOST • Box with build-out • Generator • Washdown system	 $6,000 $2,000 $1,000
Video Inspection Trailer • 7'x10' trailer & build-out • Hardware and software package • Incidentals	 $18,500 $15,000 $5,000
Sprinter Chassis Inspection Vehicle • Van (with build-out for inspecting 6" – 24" pipes) • Crawler (needed to inspect pipes >24") • Software upgrade (optional but helpful for extensive pipe systems)	 $130,000 $18,000 $8,000
Sources: USA Blue Book and Envirotech	

Smoke Testing

Equipment	Cost
Smoke Blower	$1,000 to $2,000 each
Liquid Smoke	$38 to $45 per gallon
Smoke Candles, 30 second (4,000 cubic feet)	$27.50 per dozen
Smoke Candles, 60 Second (8,000 cubic feet)	$30.50 per dozen
Smoke Candles, 3 Minute (40,000 cubic feet)	$60.00 per dozen
Sources: Hurco Tech, 2003 and Cherne Industries, 2003	

(Center for Watershed Protection 2004)

Appendix H. Sample Notice of Violation (NOV)

(Letter Head)

September 1, 2008

Citizen
22 Main Street
Yakima, WA 98901

Dear Citizen:

On August 30, 2008, Geoff Smith, Stormwater Technician and I responded to a report of a discharge to the storm drain system on property owned by you at 22 Main Street in Yakima. We did confirm the presence of ______________________________. This is to confirm the conversation I had with you. You are in the process of __________________________ and we agreed you would have the correction completed by __________________. We discussed you will _____________________________.

This discharge is in violation of the City of Yakima's Illicit Discharge Ordinance, which is required by the Clean Water Act. Please keep me informed of how the correction is proceeding. Enclosed is a copy of the Ordinance for your review.

If I can be of further assistance please do not hesitate to contact my office. We are open Mondays from 9:00 a.m. to 5:30 p.m. and Tuesday through Friday, from 8:00 a.m. to 4:30 p.m. I can be reached at (509) 576-6657.

Sincerely,

Joe Inspector
Code Enforcement Officer