Illicit Discharge Detection and Elimination Program Plan

Town of Carrboro

May 2008

Foreword

A number of past projects have found that dry-weather flows discharging from storm drainage systems can contribute significant pollutant loadings to receiving waters. If these loadings are ignored (by only considering wet-weather stormwater runoff) less than desirable improvement in receiving water conditions may occur. Illicit dry-weather flows can originate from many sources. The most important sources typically include sanitary wastewater, commercial, or industrial pollutant entries, failing septic tank systems, and vehicle maintenance activities. Other sources can contribute, depending on land use patterns and activities within the watershed.

Provisions of the Clean Water Act (1987) require National Pollutant Discharge Elimination System (NPDES) permits for storm water discharges. Section 402 (p)(3)(B)(ii) requires that permits for municipal separate storm sewers shall include a requirement to effectively prohibit problematic non-storm water discharges into storm sewers. Emphasis is placed on the elimination of inappropriate connections to urban storm drains. This requires affected agencies to identify and locate sources of non-storm water discharges into storm drains so they may institute appropriate actions for their elimination.

This Program Plan details the approach the Town of Carrboro has established for Illicit Discharge Detection and Elimination (IDDE). It is intended audience is Town staff for understanding the implementation of the program, State and Federal agency staff for oversight and review, community groups that are interested in providing reconnaissance and public awareness support, and the general public for community education. The Plan draws on work performed by the Center for Watershed Protection, Ellicott City, MD in cooperation with Robert Pitt of the University of Alabama under the sponsorship of the U.S. Environmental Protection Agency (Brown et al 2004).

In general, the content of this plan focuses on programmatic efforts. A companion technical appendix will be developed in FY 2008-2009. This plan is organized as follows:

Chapter 1. The Basics of Illicit Discharges – This chapter describes the many different sources and generating sites that can produce illicit discharges. The chapter also outlines key concepts and terminology needed to understand illicit discharges, why they cause water quality problems and the regulatory context for managing them.

Chapter 2. Carrboro's Illicit Discharge Program – This chapter presents the overall framework for Carrboro's IDDE program by outlining key components of the program. This chapter also defines program goals to guide efforts, as well as guidance on how to measure and track progress toward their achievement and review and revisit program goals and make any needed adjustments. Finally, this chapter identifies the local organizational structure for responsibility for administering the IDDE program, and references a new IDDE ordinance that establishes the legal authority.

Chapter 1: The Basics of Illicit Discharges

Studies have shown that dry weather flows from storm drain systems may contribute significantly to pollution problems (e.g., Duke 1997). Detecting and eliminating these illicit discharges can involve complex "detective work", which makes it hard to establish a rigid prescription to "hunt down" and correct all illicit connections. Frequently, there is no single approach to take, but rather a variety of ways to get from detection to elimination. As a small Phase II community, Carrboro needs simple but effective program guidance to comply with the illicit discharge component of its NPDES stormwater permit. The purpose of this plan is to provide guidance on establishing and implementing an effective Illicit Discharge Detection and Elimination (IDDE) program.

This plan draws on the experience of many communities that have been surveyed about their practices, levels of program effort, and lessons learned (CWP, 2002). These communities have taken many different approaches to solve the IDDE problem, and provided great insights on common obstacles and setting realistic expectations. Through this plan, the lessons learned have been adapted to Carrboro's local conditions.

1.1 Important Terminology and Key Concepts

This plan uses several important terms throughout the text that merit upfront explanation. This section defines the terminology to help staff perform illicit discharge detective work. Key concepts are presented to classify illicit discharges, generating sites and control techniques.

Illicit Discharge: The term "illicit discharge" has many meanings in regulation[1] and practice; this plan employs this four-part definition.

1. Illicit discharges are defined as storm drains that have measurable flow during dry weather containing pollutants and/or pathogens. A storm drain with measurable flow but containing no pollutants is simply considered a discharge.

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

3. Illicit discharges are frequently caused when the sewage disposal system interacts with the storm drain system. In Carrboro, monitoring techniques are employed by OWASA to rapidly trace sewage flows from the stream or outfall, and go back up the pipes or conveyances to reach the problem connection.

[1] 40 CFR 122.26(b)(2) defines an illicit discharge as any discharge to an MS4 that is not composed entirely of storm water, except allowable discharges pursuant to an NPDES permit, including those resulting from fire fighting activities

4. Illicit discharges from types of activities and specific source areas and operations are known as "generating sites." Knowledge about these generating sites is helpful to locate and prevent non-sewage illicit discharges. Depending on the regulatory status of specific "generating sites," education, enforcement and other pollution prevention techniques can be used to manage this class of illicit discharges.

Carrboro has defined illicit discharges as part of an illicit discharge ordinance. Some non-storm water discharges to the municipal separate storm system (MS4) are allowable, such as discharges resulting from fire fighting activities and air conditioning condensate.

Storm Drain: A **storm drain** can be either an *enclosed pipe or an open channel.* From a regulatory standpoint, **major** storm drains are defined as enclosed storm drain pipes with a diameter of 36 inches, or greater or open channels that drain more than 50 acres. For industrial land uses, major storm drains are defined as enclosed storm drain pipes 12 inches or greater in diameter and open channels that drain more than two acres. **Minor** storm drains are smaller than these thresholds. Both major and minor storm drains can be a source of illicit discharges, and both merit investigation. Some "pipes" found in urban areas may look like storm drains but actually serve other purposes. Examples include foundation drains, weep holes, culverts, etc. These pipes are generally not considered storm drains from a regulatory or practical standpoint. Small diameter "straight pipes," however, are a common source of illicit discharges in many communities and should be investigated to determine if they are a pollutant source.

Not all dry weather storm drain flow contains pollutants or pathogens. Indeed, many communities find that storm drains with dry weather flow are, in fact, relatively clean. Flow in these drains may be derived from springs, groundwater seepage, or leaks from water distribution pipes. Consequently, field testing and/or water quality sampling are often needed to confirm whether pollutants are actually present in dry weather flow, in order to classify them as an illicit discharge.

Discharge Frequency: The **frequency** of dry weather discharges in storm drains is important, and can be classified as *continuous, intermittent or transitory.* **Continuous** discharges occur most or all of the time, are usually easier to detect, and typically produce the greatest pollutant load. **Intermittent** discharges occur over a shorter period of time (e.g., a few hours per day or a few days per year). Because they are infrequent, intermittent discharges are hard to detect, but can still represent a serious water quality problem, depending on their flow type. **Transitory** discharges occur rarely, usually in response to a singular event such as an industrial spill, ruptured tank, sewer break, transport accident or illegal dumping episode. These discharges are extremely hard to detect with routine monitoring, but under the right conditions, can exert severe water quality problems on downstream receiving waters.

Discharge Flow Types: Dry weather discharges are composed of one or more possible **flow types**:

- *Sewage and septage* flows are produced from sewer pipes and septic systems.
- *Washwater* flows are generated from a wide variety of activities and operations. Examples include discharges of gray water from homes, commercial carwash wastewater, fleet washing, commercial laundry wastewater, and floor washing to shop drains.
- *Liquid wastes* refers to a wide variety of flows, such as oil, paint, and process water (radiator flushing water, plating bath wastewater, etc.) that enter the storm drain system.
- *Tap water* flows are derived from leaks and losses that occur during the distribution of drinking water in the water supply system.
- *Landscape irrigation* flows occur when excess water used for residential or commercial irrigation ends up in the storm drain system.
- *Groundwater and spring water* flows occur when the local water table rises above the bottom elevation of the storm drain (known as the invert) and enters the storm drain either through cracks and joints, or where open channels or pipes associated with the MS4 may intercept seeps and springs.

Water quality testing can be used to conclusively identify flow types found in storm drains. Testing can distinguish illicit flow types (sewage/septage, washwater and liquid wastes) from cleaner discharges (tap water, landscape irrigation and ground water). Each flow type has a distinct chemical fingerprint. (The appendix to be drafted will present potential techniques to help isolate illicit discharges that are blended with cleaner discharges. Illicit discharges are also masked by high volumes of storm water runoff making it difficult and frequently impossible to detect them during wet weather periods.)

Mode of Entry

Illicit discharges can be further classified based on how they enter the storm drain system. The **mode of entry** can either be **direct** or **indirect. Direct entry** means that the discharge is directly connected to the storm drain pipe through a sewage pipe, shop drain, or other kind of pipe. Direct entry usually produces discharges that are continuous or intermittent. **Direct entry** usually occurs when two different kinds of "plumbing" are improperly connected. The three main situations where this occurs are:

Sewage cross-connections: A sewer pipe that is improperly connected to the storm drain system produces a continuous discharge of raw sewage to the pipe.

Straight pipe: This term refers to relatively small diameter pipes that intentionally bypass the sanitary connection or septic drain fields, producing a direct discharge into open channels or streams.

Industrial and commercial cross connections: These occur when a drain pipe is improperly connected to the storm drain system producing a discharge of wash water, process water or other inappropriate flows into the storm drain pipe. Older industrial areas tend to have a higher potential for illicit cross-connections.

Sewage likely has the greatest potential to produce direct illicit discharges within Carrboro. On a national scale, the most commonly reported sewage related direct discharges are broken sanitary sewer lines (81% of survey respondents), cross-connections (71% of survey respondents), and straight pipe discharges (38% of survey respondents) (CWP, 2002).

Indirect entry means that flows 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, with the exception of groundwater seepage. The five main modes of indirect entry for discharges include:

Groundwater seepage into the storm drain pipe: Seepage frequently occurs in storm drains after long periods of above average rainfall. Seepage discharges can be either continuous or intermittent, depending on the depth of the water table and the season. Groundwater seepage usually consists of relatively clean water that is not an illicit discharge by itself, but can mask other illicit discharges. If storm drains are located close to sanitary sewers, groundwater seepage may intermingle with diluted sewage.

Spills that enter the storm drain system at an inlet: These transitory discharges occur when a spill travels across an impervious surface and enters a storm drain inlet. Spills typically occur at industrial, commercial and transport-related sites. A very common example is an oil or gas spill from an accident that then travels across the road and into the storm drain system.

Dumping a liquid into a storm drain inlet: This type of transitory discharge is created when liquid wastes such as oil, grease, paint, solvents, and various automotive fluids are dumped into the storm drain. Liquid dumping occurs intermittently at sites that improperly dispose of rinse water and wash water during maintenance and cleanup operations. A common example is cleaning deep fryers in the parking lot of fast food operations.

Outdoor washing activities that create flow to a storm drain inlet: Outdoor washing may or may not be an illicit discharge, depending on the nature of the generating site that produces the wash water. For example, hosing off individual sidewalks and driveways may not generate significant flows or pollutant loads. On the other hand, routine washing of fueling areas, outdoor storage areas, and parking lots (power washing), and construction equipment cleanouts may result in unacceptable pollutant loads.

Non-target irrigation from landscaping or lawns that reaches the storm drain system: Irrigation can produce intermittent discharges from over-watering or misdirected sprinklers that send tap water over impervious areas. In some instances, non-target irrigation can produce unacceptable loads of nutrients, organic matter or pesticides. The most common example is a discharge from commercial landscaping areas adjacent to parking lots or roads connected to the storm drain system.

Land Use and Potential Generating Sites: **Land use** can predict the potential for indirect discharges, which are often intermittent or transitory. Many indirect discharges can be identified and prevented using the concept of "generating sites," which are sites where common operations can generate indirect discharges. Both research and program experience indicates that a small subset of generating sites within a broader land use category can produce most of the indirect discharges. Consequently, the density of potential generating sites within a subwatershed may be a good indicator of the risk of local illicit discharge problems. Some common generating sites within major land use categories are listed in Table 1, and described below.

Carrboro intends to use land use as a general risk factor for illicit discharges. More specific risk factors will include the age of the sewer system, which helps define the physical integrity and capacity of the pipe network, as well as age of development, which reveals the plumbing codes and practices that existed when individual connections were made over time. The large number of new connections and/or disconnections during these phases increases the probability of bad plumbing. Carrboro intends to work cooperatively with OWASA to identify the risk of illicit sewage discharges.

Table 1: Land Use Generating Site Activity in Carrboro with the Potential to Produce Illicit Discharge

Residential	
Car Washing	Swimming Pool Discharges
Driveway Cleaning	Dumping/Spills
Septic System Maintenance	Lawn/Landscape Watering
Commercial/Institutional/Municipal	
Car Washes	Commercial Laundry/Dry Cleaning
Gas Stations/Auto Repair Shops	Nurseries and Garden Centers
Oil Change Shops	Restaurants
Building Maintenance (power washing)	Dumping/Spills
Landscaping/Grounds Care (irrigation)	Municipal Fleet Storage Areas
Public Works Yards	Outdoor Fluid Storage
Parking Lot Maintenance (power washing)	Road Maintenance (Town and State)
Vehicle Fueling	Vehicle Maintenance/Repair
Vehicle Washing	Washdown of greasy equipment and grease traps
Printing	Loading and unloading area washdowns
Outdoor material storage (fluids)	

Residential Generating Sites: Failing septic systems were the most common residential discharge reported in 33% of IDDE programs surveyed nationally (CWP, 2002). In addition, indirect residential discharges were also frequently detected in 20% of the IDDE programs surveyed, which consisted of oil dumping, irrigation overflows, swimming pool discharges, and car washing. Many indirect discharges are caused by common residential behaviors and may not be classified as "illicit" even though they can contribute to water quality problems.

Commercial Generating Sites: Illicit discharges from commercial sites were reported as frequent in almost 20% of local IDDE programs surveyed (CWP, 2002). Typical commercial

discharge generators included operations such as outdoor washing; disposal of food wastes; car fueling, repair, and washing; parking lot power washing; and poor dumpster management. It is important to note that not all businesses within a generating category actually produce illicit discharges; generally only a relatively small fraction does. Consequently, on-site inspections of individual businesses are needed to confirm whether a property is actually a generating site.

Institutional Generating Sites: Institutions such as schools and churches can be generating sites if routine maintenance practices/operations create discharges from parking lots and other areas. Some institutional sites have their own areas for fleet maintenance, fueling, outdoor storage, and loading/unloading that can produce indirect discharges.

Municipal Generating Sites: Municipal generating sites include operations that handle solid waste, water, wastewater, street and storm drain maintenance, fleet washing, and yard waste disposal. Transport-related areas such as town and state roads and rail lines can also generate indirect discharges from spills, accidents and dumping.

1.2 Finding, Fixing, and Preventing Illicit Discharges

The purpose of an IDDE program is to find, fix and prevent illicit discharges, and develop a series of techniques to meet these objectives. These primary objectives are briefly introduced below:

Finding Illicit Discharges

The highest near term priority for Carrboro's IDDE is to find any continuous and intermittent sewage discharges to the storm drain system. Observational and, where appropriate, monitoring techniques will be used to find sewage discharges. These techniques will be used to find problem areas and then trace the problem back to identify the ultimate generating site or connection. These techniques can be classified into three major groups:

- Outfall Reconnaissance Inventory
- Indicator monitoring at stormwater outfalls and instream
- Tracking discharges to their source

These techniques will be covered in detail in the companion technical appendix.

Fixing Illicit Discharges

Once sewage discharges or other connections or discharging activities are discovered, they can be fixed, repaired or eliminated. Carrboro is establishing legal authority to insure timely corrections.

Preventing Illicit Discharges

The old adage "an ounce of prevention is worth a pound of cure" certainly applies to illicit discharges. Transitory discharges from generating sites can be minimized through a targeted education program, pollution prevention practices and well-executed spill management and response plans. Details on education and pollution prevention practices will be covered in the technical appendix.

Chapter 2: Carrboro's IDDE Program

The prospect of developing and administering an IDDE program can be complex and challenging for small municipalities like Carrboro. This chapter organizes and simplifies the basic tasks proposed for Carrboro's program. Carrboro plans to pursue the program components, as follows (in general chronological order), and described in more detail in the following chapters and appendix to be developed:

1. Establish Responsibility and Authority – This component finds the right "home" for the IDDE program within the local organizational structure. It also establishes the local legal authority to regulate illicit discharges by crafting a new illicit discharge ordinance. Carrboro is proposing new Town Code provisions effective June 2008, available at http://www.townofcarrboro.org/TC/towncode.htm.

2. Complete a Desktop Assessment of Illicit Discharge Potential – The potential for illicit discharges is likely not uniformly distributed across Carrboro, but tend to be clustered within certain land uses and subwatersheds, and dependent on the age and historical maintenance of infrastructure. This program component will narrow the search for the most severe potential illicit discharge problems, through rapid analysis of existing GIS data and local knowledge of development history. Carrboro's Environmental Planner will complete this assessment in FY 2008-2009. (See the technical appendix when available for details.)

3. Search for Illicit Discharge Problems in the Field – This component involves rapid outfall screening to find problem outfalls within priority subwatersheds. Results of outfall surveys will then be used to design a more sophisticated outfall monitoring system to identify flow types and trace discharge sources. (See the technical appendix when available for details.)

4. Isolate and Fix Individual Discharges – When illicit discharge problems are found, the next step will be to trace them back to isolate the specific source or improper connection that generates them. This program component will improve local capacity to locate specific discharges, make needed corrections, and take any enforcement actions. (See the technical appendix when available for details.)

5. Prevent Illicit Discharges – Many transitory and intermittent discharges are produced by careless practices at the home or workplace. This important program component uses a combination of education and enforcement to promote better pollution prevention practices. (See the technical appendix when available for details.)

6. Evaluate Program Goals and Implementation Strategies – This program component tracks measurable goals for the overall IDDE program. Based on these goals, the Town will develop specific implementation strategies to improve water quality and measure program

success. The measurable goals will be periodically reviewed and revisited to determine if progress is being made, or implementation strategies need to be adjusted.

The Planning Department will be the lead department for Steps 1, 2, 5, and 6, and overall permit compliance and program implementation. The Environmental Planner position assumes the lead responsibility within the Department. The GIS Analyst position maintains core GIS data pertinent to the program. Sungate Engineering has performed field work to map the storm water system. The Town Attorney is providing legal support with Town Code drafting under Step 1. The Attorney will also provide legal assistance with future enforcement actions.

As the lead organization for management and maintenance of Carrboro's public infrastructure, the Department of Public Works is identified as the lead department for routine field observation (Steps 3 and 4), with the Streets Superintendent being the central contact within the Department. Public Works will be substantially supported by Zoning and Inspections staff within the Planning Department, and Fire and Rescue and Public Safety staff. From outside of Town staff, OWASA, Sungate Engineering (the Town's engineering firm), Orange County Erosion and Sediment Control and Health Department staff, and citizen volunteers primarily from the two nonprofits, the Friends of Bolin Creek and the Morgan Creek Valley Alliance will also be trained in field recognition and reporting of potential problems for follow up. Along the municipal boundary with Chapel Hill, Carrboro will closely coordinate its program with Chapel Hill's stormwater program staff.

One atypical consideration for program implementation in Carrboro is the delineation of authority and responsibility for sewage related illicit discharges since the sewage collection system is managed by a non-municipal utility, OWASA. Carrboro's IDDE program relies on OWASA's sewer ordinance and sewer lateral policy for detection and elimination of illicit sewage discharges. Detection and elimination of illicit discharges from sewer lines located in public right-of-ways will require cooperation with OWASA. Detection and elimination of illicit discharges from sewer laterals located outside public right-of-ways will require cooperation from OWASA and property owners.

Establishing clear communication protocol for the program will be paramount to successful implementation. Towards this end, Carrboro plans to enhance the existing Town webpage with additional contact information for all involved parties that clearly articulates who to contact when non-stormwater flow from the stormwater system is detected. Clear information will be provided to help point the responding party to whether the first point of contact should be emergency response (911/Fire and Rescue), OWASA, Public Works, Planning within Town government as well as other public agencies. The identified staff contacts for each of these entities will be cross trained in communication protocol to facilitate rapid and efficient response, especially for transitory events.

The ensuing chapters and appendix (to be developed) address each IDDE program component in more detail, including purpose, methods, desired product or outcome, budget

implications, and other detailed guidance for program implementation. Table 2 summarizes the specific tasks and products associated with each IDDE program component. The scheduling, costs and expertise needed for each IDDE program component are compared in Table 3.

2.1 Management Tips to Develop an Effective IDDE Program

Below are some tips on how Carrboro plans to build an effective IDDE program.

1. Carrboro will pursue detection and elimination of continuous sewage discharges first. Effective programs place a premium on keeping sewage out of the storm drain system. Continuous sewage discharges pose the greatest threat to water quality and public health, produce large pollutant loads, and can generally be permanently corrected when the offending connection is found. Intermittent, transitory, or indirect discharges are harder to detect, and more difficult to fix.

2. Carrboro has put together an interdisciplinary and Interdepartmental IDDE team. A broad range of expertise needs to be coordinated to develop the initial IDDE program, as indicated in Table 3. Diverse skills and knowledge needed for the program range from thorough review and understanding of the program through review of this plan, legal analysis, GIS, monitoring, stakeholder management, emergency response, and pipe repairs.

3. Carrboro will educate a broad audience about illicit discharges. Illicit discharge control is a new and somewhat confusing program to many staff, the public, elected officials, and other local agencies. The success of this program will in large part be a function of the success in educating all four groups.

Table 2. Task, Products, and Staffing for Carrboro's IDDE Program

Program Component	Key Tasks	Product(s)	Staffing
1. Establish Responsibility and Authority	Definitions Provisions for liability, access, inspections, enforcement Design Tracking System	Update Town Code This Plan Tracking System	Town Attorney Environmental Planner Other Town Staff and cooperators
2. Desktop Assessment of Illicit Discharge Potential	Delineate Subwatersheds Compile Mapping Layers/Data Define Screening Factors Screen Subwatersheds for Illicit Discharge Potential	Initial Storm Drain Outfall Map Maps of Priority Subwatersheds for Field Screening	Environmental Planner GIS Analyst
3. Search for Illicit Discharges in the Field	Integrate ORI data in Tracking System Follow-up Monitoring at Suspect Outfalls Develop Monitoring Strategy	Training Events Outfall Reconnaissance Inventory (ORI)	Public Works and Planning Depts Other Town Staff and cooperators
4. Isolate and Fix Individual Discharges	Develop communication protocol Trunk and On-site Investigations Corrections and Enforcement	Updated website Tracking System updates	Public Works and Planning Depts Other Town Staff and cooperators
5. Prevent Illicit Discharges	Prioritize Outreach Implement Residential, Commercial, and Municipal Pollution Prevention Programs	Training events	Environmental Planner Other Town Staff and cooperators
6. Evaluate Program Goals and Strategies	Staff meetings Board review Public input	Annual reports	Environmental Planner Other Town Staff and cooperators

Table 3. Schedule, Expertise, and Potential Need for Resources for IDDE Components

IDDE Program Component	Time Frame	Type of Expertise	Additional Resources Needed
1. Establish Responsibility and Authority	2008	Legal, Planning, Permitting	
2. Desktop Assessment of Illicit Discharge Potential	2008-2009	GIS	
3. Search for Illicit Discharges in the Field	Begin in 2008-2009	Monitoring	$ may be needed for monitoring
4. Isolate and Fix Individual Discharges	Begin in 2008-2009	Stakeholder Management; Inspections and Enforcement	Some uncertainty; Town could be challenged if considerable or complex enforcement required
5. Prevent Illicit Discharges	Begin in 2008-2009	Education	
6. Evaluate Program Goals and Strategies	Begin in 2008-2009	Data Analysis	

4. Carrboro will pursue steps to further document and understand the infrastructure. Many indirect or transitory discharges are extremely difficult to catch through outfall screening. Therefore, effective programs seek to understand the history and condition of their storm water and sewer infrastructure to find the combinations that create the greatest risk for illicit discharge. Effective programs also screen land uses to locate generating sites within targeted subwatersheds. For example, knowing the proximity of the infrastructure to the groundwater table or knowing that the sewer collection system has a long transit time can influence the indicator parameters and associated thresholds that a community chooses to target.

5. Carrboro will perform an Outfall Reconnaissance Inventory (ORI). Carrboro has already mapped the stormwater system. The ORI will build on outfalls identified during this mapping to quantify the severity of dry weather discharge problems. The ORI will be conducted regularly as part of the IDDE program. To complete the initial outfall inventory, Planning Department staff will make a series of maps and data collection sheets for field personnel to use for field data collection.

6. Carrboro will take steps to understand potential discharges before developing a monitoring plan. Monitoring could be the most expensive component of the IDDE program, so it is extremely important to understand existing discharges before committing to a particular monitoring method or tracer. Carrboro will also pursue opportunities to collaborate with OWASA and Chapel Hill for future chemical monitoring needs.

7. Carrboro will continuously review and expand, as needed, the ambient (instream) chemical and biological monitoring program. Prioritizing outfall screening and investigation can save time in the field. Carrboro plans to continue to work with Chapel Hill on an ambient chemical monitoring program, and will investigate the need to redesign the program in light of the establishment of the IDDE program. Carrboro has historically maintained a benthic

macroinvertebrate monitoring program, and will also investigate redesign of this program to support the IDDE program.

8. Utilize a simple outfall tracking system to organize IDDE data. Illicit discharges are hard enough to find if an organized system to track individual outfalls is lacking. Effective programs develop a unified geospatial tracking system to locate each outfall, and store information on its address, characteristics, photos, complaints and monitoring data. Public Works has taken the lead on developing a tracking system for stormwater inlets. Planning will take the lead in designing an outfall tracking system, and work collaboratively with Public Works and Sungate Engineering to implement the program.

9. Carrboro will outsource some IDDE reconnaissance to local watershed groups. Labor associated with outfall observation is a principal program requirement. The main emphasis is to have as many informed eyes in the community as possible. Carrboro is fortunate to have active citizen groups, including the Friends of Bolin Creek and the Morgan Creek Valley Alliance, who can help observe outfalls and stream quality, and support storm water education. Carrboro is also fortunate to share a boundary with Chapel Hill and that has an active stormwater education, and to have UNC nearby. All of these factors increase local watershed awareness and stewardship. Carrboro specifically proposes, that once the initial outfall reconnaissance inventory is complete, to assign ongoing outfall observation to a mix of Public Works staff (for outfalls primarily near streets), Recreation and Parks staff (for outfalls on or near Parks), and citizen volunteers for other outfalls . Other program participants will serve as "floating" observers of outfalls. Planning staff will keep track of who is watching which outfalls, and periodically remind those in the field to monitor assigned outfalls and turn in field observation reports for tracking.

10. Cross-train local inspectors and emergency responders to recognize discharges and report them for enforcement. Carrboro's program will ensure that, building, zoning, water and wastewater, health, and erosion control inspectors and fire and rescue staff understand illicit discharges and know whom to contact locally for enforcement.

11. Carrboro will target precious storm water education dollars. Carrboro has limited resources to perform the amount of storm water education needed to reduce indirect and transitory discharges. Consequently, Carrboro will target discharges of concern, and spend scarce dollars and times primarily in the subwatersheds, neighborhoods and sectors most likely to generate them. Carrboro will work collaboratively with the Clean Water Education Partnership, local media, the Chamber of Commerce, Advisory Boards, Chapel Hill, OWASA, UNC, and citizens groups to maximize the effectiveness and cost effectiveness of education efforts.

12. Carrboro will stress public health and safety benefits of sewage-free streams. Carrboro will *work* with OWASA to publicize the danger of sewage discharges, and notify the public and elected officials about the discharges that need to be prevented or corrected.

13. Carrboro will calibrate resources to the magnitude of the illicit discharge problem. After a few years of program implementation, Carrboro will get a better handle on the actual severity of illicit discharge problems. The program is therefore designed to be flexible and adaptive, and will shift resources to the management measures that will reduce the greatest amount of pollution.

14. Carrboro will think of illicit discharge prevention as a tool of watershed restoration. Discharge prevention is considered one of the seven primary practices used to restore urban watersheds (Schueler, 2004). Effective programs integrate illicit discharge control as a part of a comprehensive effort to restore local watersheds.

2.2: Program Goals and Implementation Strategies

This section discusses the goals and performance milestones to measure progress in Carrboro's IDDE program implementation, and most appropriate and cost effective strategies to find, fix and prevent illicit discharges. The goals and strategies ensure that scarce local resources are allocated to address the most severe illicit discharge problems that cause the greatest water quality problems in the community.

IDDE program goals (as detailed in Table 4) will be linked to stream water quality goals. Water quality goals include:

- keeping raw or poorly-treated sewage out of streams
- meeting bacteria water quality standards during dry weather flows
- reducing toxicant, nutrient and other pollutant discharges to a stream to restore the abundance and diversity of aquatic biota and help meet established TMDLs

Based on knowledge of stressors to local waterbodies, Carrboro's IDDE program is seen as one of multiple watershed protection and restoration programs. Over time as staff determine the degree to which illicit discharges contribute to impaired water quality, resources (both time and money) can be shifted amongst all the programs to most effectively meet the water resource goals.

Table 4: Carrboro's Detailed IDDE Program Goals and Schedule

Goals related to overall program administration

- Identify organizational structure for IDDE program (this plan)
- Draft and promulgate new or modified ordinance (FY 2007-2008)
- Establish a tracking and reporting system (FY 2008-2009)

Goals related to outfall assessment

- Define and characterize stormwater system and sewer sheds for all major outfalls (FY 2008-2009)
- Develop a GIS map of all outfalls, land use, and other relevant infrastructure (FY 2008-2009, and periodically after that).
- Secure analytical laboratory services, as needed (FY 2008-2009)
- Sample and trace the source of a percentage of flowing outfalls. (Initiate in FY 2009-2010 and expand and enhance where problems are observed.)
- Continue to conduct regular in-stream assessments; redesign as needed. Conduct investigations at a percentage of non-flowing outfalls with poor in-stream water quality to look for intermittent flows
- Integrate all collected stream data and citizen complaints into the tracking system. (Initiate in FY 2009-2010 and expand and enhance as needed.)

Goals related to preventing illicit discharges

- Distribute educational materials to citizens and industries. Initiate in FY 2008-2009 and expand and enhance as needed
- Conduct storm drain stenciling. In progress. (Expect to complete in FY 2008-2009)
- Publicize Orange County household hazardous waste collection (on website and in trainings; expect to complete in FY 2008-2009)
- Conduct subwatershed site reconnaissance surveys to better characterize generating site potential (FY 2009-2010)

Goals related to finding and fixing illicit discharges

- Publicize spill response plan via website (FY 2008-2009)
- Remove all obvious illicit discharges. (Ongoing)
- Train staff on techniques to find the source of an illicit discharge. (Initiate in FY 2008-2009 and expand and enhance with time)
- Inspect/dye-test selected commercial facilities. (Initiate in FY 2009-2010 and repeat periodically)
- Develop a system to track results of on-site inspections. (Initiate in FY 2008-2009 and expand/enhance as needed)
- Recruit citizen volunteers to monitor outfalls and streams by subwatershed. (Initiate in FY 2008-2009 and expand and enhance where problems are observed)
- Establish pre-approved list of plumbers and contractors to make corrections. (Initiate in FY 2008-2009 and expand and enhance with time)

2.3: Establishing Responsibility and Legal Authority

This program component is where the legal and administrative authority is established to regulate, respond and enforce illicit discharges in the community. The component also reviews local plumbing codes to ensure that inappropriate connections are prohibited. Carrboro is developing new illicit discharge control provisions in Town Code, and Carrboro's Zoning and Inspections staff will be working with OWASA to ensure that inappropriate connections are prohibited. Carrboro will also establish an IDDE tracking system for training/education of staff and to facilitate response and enforcement procedures, and also to provide access to the public for reporting.

2.4 Crafting Implementation Strategies

In order to meet program goals, Carrboro will devise cost-effective implementation strategies that are most appropriate for the types of illicit discharge problems that are discovered. The community-wide illicit discharge potential (IDP) developed during the desktop analysis should be quite helpful in choosing implementation strategies. Table 5 presents potential implementation strategies that will be geared to the findings of the IDP and subsequent program elements. Strategies should be constantly adjusted to reflect knowledge gained from field screening, reports and other monitoring information.

Table 5: Examples of General Implementation Strategies for Different Levels of Illicit Discharge Potential (IDP)

Minimal IDP

- Conduct field screening of outfalls in the context of broader watershed assessment and monitoring initiatives.
- Integrate IDDE program efforts into more comprehensive watershed assessment and restoration efforts where multiple objectives are being pursued (e.g., storm water education).
- Target and coordinate with Friends of Bolin Creek and Morgan Creek Valley Alliance as partners to accomplish inventory and data collection efforts.
- Establish communication protocol to report suspicious discharges.

Clustered IDP

- Conduct limited sampling in the suspect areas. Use outside laboratory services to avoid capital costs for special equipment.
- Select a small set of indicator parameters using the nature of historic problems and land use as a guide.
- Target education program in problem areas.
- Coordinate with local watershed groups to regularly monitor problem areas.
- Establish communication protocol to report suspicious discharges.

Severe IDP

- Establish communication protocol to report suspicious discharges.
- Conduct and repeat screening in all subwatersheds
- Plan for more rigorous sampling approach (i.e., plan for equipment expenditures/contracting for sample collection and analysis). Considerations include: expanding set of parameters to use as indicators, adopting a strategy for targeting intermittent discharges, and establishing in-stream stations to supplement screening effort. Use outside laboratory services as needed to supplement.
- Develop a community-specific chemical "fingerprint" of various flow sources to facilitate differentiation between likely flow sources.
- Develop community-wide educational messages aimed at increasing public awareness and targeted education programs tailored to problem areas.
- Coordinate with local watershed groups to regularly monitor problem areas.
- Emphasize cross-training of municipal employees to develop a broader reach of program efforts and lead by example.

Perhaps the most important implementation strategy is targeting—screening, education and enforcement efforts should always be focused on the catchments or generating sites with the greatest IDP. Ongoing adaptability is also an important program objective. Table 6 presents more detailed implementation components depending on specific issues that Carrboro could encounter.

Table 6: Potential Types of Problems and Candidate Detection and Elimination Strategies

Initial Problem	Assessment Screening Factor	Example Implementation Strategies
Aging Sewer Infrastructure	Complaints of sewage discharges Dry weather discharge/poor dry weather quality High outfall density	Institute inspection process. Select monitoring indicator parameters that focus on sewage. Develop cost share program to assist property owners with connection correction.
Aging Septic Infrastructure	Dry weather discharge/poor dry weather quality Complaints	Develop targeted education program Institute inspection process Septic to sewer conversion Develop cost share capabilities to assist property owners with upgrade of system.
Discharges from Generating Sites	Dry weather discharge/poor dry weather quality Density of generating sites Older commercial activity Complaints	Develop targeted inspection/training/technical assistance programs tailored to specific generating sites. Aggressively enforce fines and other measures on chronic violators
High Spill or Dumping Potential	Past complaints	Establish clear communication protocol for reporting Develop communitywide education program Establish protocol to regularly monitor/adopt problem sites

References

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Appendix: Technical Approach to Implementing IDDE program (to be developed in FY 2008-2009)

Desktop Assessment of Illicit Discharge Potential – This section will describe planned desktop analyses to process available mapping data to quickly characterize and screen illicit discharge problems at the community and subwatershed scale. Key factors include water quality, land use, development age, sewer infrastructure and outfall density. Rapid screening techniques are presented that define how Carrboro proposes to begin searching for illicit discharge problems

The Outfall Reconnaissance Inventory (ORI) – The section will present Carrboro's planned protocols to conduct rapid field screening of potential problem outfalls. The chapter also outlines the staff and equipment costs anticipated to conduct an ORI, and presents methods to organize, manage and interpret the data collected.

Searching for Illicit Discharge Problems in the Field – This section will summarize the proposed monitoring techniques to find illicit discharges, and discusses how to select the right combination of monitoring methods.

Chemical Monitoring – This section will present Carrboro's plan for monitoring to identify the composition of illicit discharge flows. The chapter will include a flow chart approach that utilizes ???? chemical indicators. The chapter provides specific information proper safety, handling, and disposal procedures. Simple and more sophisticated methods for interpreting monitoring data are discussed, along with comparative cost information.

Tracking Discharges to Their Source – This section will describe how to investigate storm drain systems to narrow and remove individual illicit discharges. These techniques include "trunk" investigations (e.g., video surveillance, damming, and infiltration and inflow studies) and on-site investigations (e.g., dye tests, smoke tests, and pollution prevention surveys). The pros and cons of each investigation technique are discussed, and comparative cost estimates are given. The chapter also describes the proposed tracking system needed to document discharges and local actions to respond to them.

Isolating and Fixing Individual Illicit Discharges – The methods used to find and remove illicit discharges will be briefly described in this chapter and includes a proposed citizen hotline and techniques to trace, locate and remove illicit discharge sources.

Techniques to Fix Discharges – This section provides tips on the best methods to repair or eliminate discharges. Specific advice is presented on how to identify responsible parties, develop pre-approved subcontractor lists, and estimate unit costs for typical repairs.

Preventing Illicit Discharges – Prevention is a cost effective way to reduce pollution from illicit discharges. This chapter identifies Carrboro's strategies to prevent illicit discharges.