Identifying Illicit Connections

Illicit Discharge Detection and Elimination

Description

Illicit connections are defined as "illegal and/or improper connections to storm drainage systems and receiving waters" (CWP, 1998). A discharge of industrial wastewater to a storm sewer is "illicit" because it would ordinarily require a permit under the Clean Water Act. Many building owners or operators are not aware that improper connections exist in their facilities. Identifying and removing illicit connections is a measure for reducing storm water pollution. In extreme cases of illicit dumping, legal action is necessary.

One of the ways to identify illicit connections is by inspecting storm drain system using video equipment (Source: Drain Patrol, no date)

From 1987 to 1998, Wayne County, Michigan, investigated 3,851 businesses and industries for illicit connections to the county's storm sewer system. Of those investigated, about 8 percent had illicit connections, and where one illicit connection was found, there was an average of 2.4 improper connects at that business. To prioritize the investigation, the county relied on Standard Industrial Classification (SIC) codes of the businesses. The prioritization system was found to be successful in locating illicit discharges (Johnson and Tuomari, no date; Tuomari, no date). The City of Hialeah, Florida, uses its storm water management plan to emphasize illicit discharge detection and removal as part of its overall monitoring activities. There are at least 252 outfalls in the city, 72 of which drain into city rights-of-way. After considering the costs associated with removing illicit discharges, the city chose a proactive field screening program approach to remove these discharges (City of Hialeah, 1999).

Applicability

Identifying illicit and improper connections are necessary for all sewer systems, especially in areas where pollutants with unknown sources have been detected in receiving waters. The level and types of industrial activities and the surrounding land uses and ordinances will affect the methods used to identify illicit connections.

Implementation

Some practices used to discover and prevent illicit connections are

- Instituting building and plumbing codes to prevent connections of potentially hazardous pollutants to storm drains.
- Organizing structures to be inspected by building age, with older buildings identified as priorities. Buildings whose processes have the potential to affect water quality also should be given priority.

- Mapping each area to be surveyed and indicating the route of the sewer system and the locations of storm drains on the map. This enables planners to estimate the likely locations of illicit connections. A Geographic Information System (GIS) is an appropriate tool for identifying illicit discharges. The location of illicit discharges can be maintained by a geo-coded address. The attributes for illicit discharges are SIC code, owner/occupant information, inspection schedule, inspection dates, and comments (Huey, 2000).

To help municipalities detect illicit connections to storm sewers, the North Central Texas Council of Governments (NCTCOG) used GIS to develop a 1/4-mile grid cell overlay for the entire 16-county NCTCOG region. The initial report suggested that illicit connections were not as prevalent in the North Central Texas area, and sewage material was observed in about 10 percent of the sites (NCTCOG, 2000).

The City of Greensboro, North Carolina, is using GIS technology as part of its storm water management program. This GIS system is used to in conjunction with the program's monitoring aspect to identify illicit connections. More information on this program can be found at *www.ci.greensboro.nc.us/stormwater/dynamic%5Fwatershed%5F management%5Fpro.htm* (Bryant et al., 1999 and City of Greensboro, 2000).

- Survey individual buildings to discover where connections to storm drains exist.
- Inspect sewer lines with television equipment to visually identify all physical connections.
- Compare the results of the field tests and the video inspection with the known connections on the map. Suspicious areas should be further investigated.
- Institute mandatory inspections for new developments or remodeling to identify illicit connections to the storm sewer system.
- Remove and test sediment from the catch basins or equivalent structures.
- Inspect connections in question to determine whether they should be connected to the storm drain system or to the sanitary sewer. Use methods of identification such as dye testing, visual inspection, smoke testing, or flow monitoring, as described below.
    - *Dye Testing*. Flushing fluorometric dye into suspicious downspouts can be useful to identify illicit connections. Once the dye has been introduced into the storm system via the connection in question, the water in the collection system is monitored to determine whether an illicit connection is present.
    - *Visual Inspection.* Remotely guiding television cameras through sewer lines is another way to identify physical connections.

- *Smoke Testing.* Smoke testing is another method used to discover illicit connections. Zinc chloride smoke is injected into the sewer line and emerges via vents on connected buildings or through cracks or leaks in the sewer line. Monitoring and recording where the smoke emerges, crews can identify all connections, legal and illegal, to the sewer system. Mechanisms on drains should prevent the smoke from entering buildings; however, in some instances, this will occur. It is important to notify the public that the smoke is non-toxic, though it should be avoided as it can cause irritation of the nose and throat for some people.

- *Flow Monitoring.* Monitoring increases in storm sewer flows during dry periods can also lead investigators to sources of infiltration due to improper connections.

- *Infrared, Aerial, and Thermal Photography.* Researchers are experimenting with the use of aerial, infrared, and thermal photography to locate dischargers by studying the temperature of the stream water in areas where algae might be concentrated and in soils. It also examines land surface moisture and vegetative growth. This technique assumes that a failing OSDS, for example, would have more moisture in the surface soil, the area would be warmer, and the vegetation would grow faster than in the surrounding area (Johnson and Tuomari, no date).

On November 17 and 30, 1999, the Arkansas Department of Health used infrared technology to identify illicit discharges from septic systems into Lake Conway, Arkansas. Lake Conway, located in Faulkner County, Arkansas, is a man-made lake used mostly for recreational fishing. Approximately 90 percent of the residents within 1 mile of the lakefront have onsite wastewater treatment systems. Of the 2,500 to 3,500 residents who living within 300 feet of the shoreline, only 250 are connected to the public sewer system. Most of these systems are more than 30 years old and were installed before state regulations. The inspector used a state policy helicopter that was equipped with a Forward Looking Infrared imaging system, video equipment, and a global positioning system. The results of this two-day survey indicated that there are approximately 380 malfunctioning and improperly constructed septic systems within 300 feet of the lakefront (Eddie, 2000). Facility owners should be required to correct the problem by eliminating the discharge and connecting to the sanitary sewer system

Some agencies use a priority system for identifying illicit discharges. According to the Southeast Michigan Council of Governments (1987, cited in Tuomari, no date), a priority scheme for detecting illicit discharges from businesses should be as follows:

1. Automobile-related businesses/facilities and heavy manufacturing

2. Printers, dry cleaners/laundries, photo processors, utilities, paint stores, water conditioners, chemical laboratories, construction companies, and medium light manufacturing

3. Institutional facilities, private service agencies, retail establishments, and schools

Limitations

There are several limitations to programs to detect illicit connections. First, a local ordinance is necessary to provide investigators with access to private property in order to perform field tests (Ferguson et al. 1997). Second, rain fall can hamper efforts to monitor flows and visual inspections. In addition, smoke testing and dye testing may become more difficult, depending on the severity of the storm event. Smoke testing has roughly the same efficiency as door-to-door investigation, and both smoke and dye testing are more accurate than visual inspection.

Despite the difficulty in identifying these connections due to budget and staff restraints, it is important to understand that these connections are illegal and should be identified and reported regardless of cost. Jurisdictions can offset some of these costs by encouraging the reporting of illicit discharges by employees, thereby saving expense on inspectors and directing resources more efficiently.

Maintenance Considerations

Identifying illicit discharges requires teams of at least two people (volunteers can be used), plus administrative personnel, depending on the complexity of the storm sewer system. To help identify illicit discharges, the City of Raleigh, North Carolina, has illicit discharge regulations and dry weather screening for illicit discharges and connections. By taking baseline samples throughout the city, pollution control efforts can be better established for future identification of illicit discharges. This inventory, combined with the city's mapping effort, will be added to the city's GIS to allow for improved tracking of illicit discharges and spills (City of Raleigh, 1998).

Effectiveness

An illicit discharge detection program can be an effective method to reduce the quantity of industrial or commercial pollutants that enter the storm drain system. For example, the Department of Environmental Protection in Montgomery County, Maryland, has an illicit discharge detection and elimination program called "Pipe Detectives," which uses volunteer monitoring and community hotlines to identify suspicious discharges (MCDEP, 1997). When discharges are reported, DEP consults maps of the surrounding areas and targets those areas for additional monitoring to narrow the search for the illicit connection. In one instance, a "milky white" discharge was reported in an area with many small businesses and large apartment buildings. Businesses were sent informational letters advising them of the illegal discharge and requesting their assistance in identifying it by allowing DEP to survey the properties. Through this cooperative effort, three illicit connections were detected and removed, including a sink that was used to wash paintbrushes (the source of the milky white discharge).

The City of Denver Urban Drainage and Flood Control District (UDFCD) in an independent agency whose functions include master planning, design and construction, maintenance, floodplain management, and management of the South Platte River. The master planning aspect includes major drainageway master planning, outfall systems planning, preparation of drainage criteria manuals for local governments and the district, support of special projects, and wetland projects. The City of Denver has a Storm Drainage Master Plan, which identified $100 million in necessary drainage improvements. The district uses pollutants and education materials to limit illicit discharges to storm drains (City of Indianapolis and Marion County, 2000).

As part of the Rogue River National Wet Weather Demonstration Project, Wayne County, Michigan, offers training for illicit discharge elimination. Four training courses are offered: Overview, Basic Investigations, Advanced Investigations, and Prevention of Construction-Related Illicit Discharges. More information on these training opportunities can be found at *http://www.wcdoe.org/rougeriver/techtop/index.html*.

EPA's Surf Your Watershed (*http://www.epa.gov/surf*) can help citizens and business/industry owners identify into which watershed their storm drains flow.

The Conservation Technology Information Center (CTIC), a non-profit data and technology information transfer center, has created *Know Your Watershed* (*www.ctic.purdue.edu/KYW*). This web site allows individuals to learn their watershed address by entering their city, county, or river name, or their ZIP code.

Cost Considerations

The cost of smoke testing, dye testing, visual inspection, and flow monitoring can be significant and time-consuming. Site-specific factors, such as the level of impervious area, the density and ages of buildings, and type of land use will determine the level of investigation necessary. Case studies in Michigan have estimated the cost of two field staff and required support at $182,000 to $187,000 annually (Ferguson et al., 1997). Wayne County's budget for illicit detection investigations was $735,151 from 1996 to 1997 and $599,041 for 1997 through 1998 (Johnson and Tuomari, no date).

Many programs offset some of their cost by encouraging the reporting of illicit discharges by employees, thereby saving expense on inspectors and directing resources more efficiently. Programs have also saved money by using student interns to locate and map dry weather flows from outfalls, or by contracting with academic institutions to perform outfall monitoring.

Some programs have used funds available from "environmental fees" or special assessment districts to fund their illicit connection elimination programs. The Huron River Pollution Abatement Project used annual assessments of the city of Ann Arbor and a per parcel basis for the rest of the district to fund the costs of illicit connection removal efforts. The project provided Washtenaw County with a total of $1.7 million over the life of the program to finance their efforts. Fort Worth, Texas, charges an "environmental fee" to local residents and businesses to fund storm water-related efforts, including illicit connection detection. Approximately $2.5 million dollars a year is raised through these fees.

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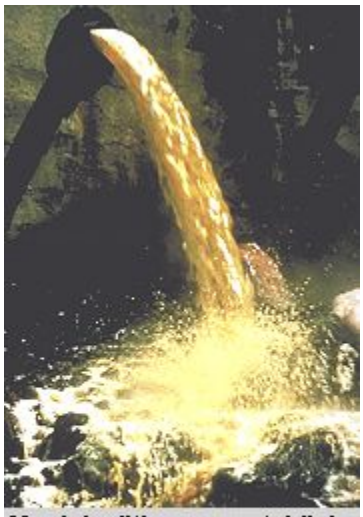
Wastewater Connections to the Storm Drain System

Illicit Discharge Detection and Elimination

Description



Municipalities can establish a program to inspect storm drain systems for connections to the sanitary sewer system to prevent discharge of untreated wastewater to waterbodies

An illicit discharge is considered to be a discharge composed of non-storm water that enters the storm drain system through an unwarranted connection. Storm sewer systems are sometimes employed as an inexpensive or convenient alternative to proper disposal of wastewater to treatment plants. These illegal wastewater discharges can occur as illicit connections from commercial or business establishments or illegal dumping into storm drain inlets. Illicit connection detection and elimination programs seek to prevent contamination of ground and surface water supplies by regulation, inspection, and removal of these illegal sources of wastewater discharge.

Pollutants that may be found in these untreated wastewater discharges include raw sewage, heavy metals, oil and grease, solids, detergents, chlorine, potassium, ammonia and nutrients. These pollutants can have implications for both human health and the aquatic environment. Bacterial contamination from raw sewage can spread disease and close waters to fishing and swimming, and heavy metals are known to be toxic to aquatic organisms. Excessive nutrient loads can lead to eutrophication in lakes, reducing oxygen levels, and affecting aquatic species.

An example of an illicit wastewater connection is a cross-connect of a shop drain to the storm sewer. This type of improper connection often occurs in automobile-related facilities (garage/repair, tire stores, service stations, muffler/transmission shops, car washes, and auto dealerships). The Wayne County, Michigan, illicit connection investigation program found that the majority of illicit connections in nonresidential facilities were drains connected to storm sewers (Johnson, 1998). Many times the connection of the shop drain to the storm drain system is unknown to the business owner, and may not be evident in architectural plans. Shop drains that may potentially be connected to the storm sewer include floor drains, wash sinks, sump pumps and solvent sinks.

Applicability

Illicit connection programs tend to concentrate their efforts on areas where nonresidential facilities are located. The USEPA has estimated that approximately 60 percent of the businesses known to use or store petroleum products were improperly connected to the storm sewers systems (USEPA, 1991, as referenced by the Rouge River National Wet Weather Demonstration Project). These improper connections often happen during new construction activities. Inadequate mapping of the internal plumbing connections for a building can lead to wastewater being discharged incorrectly to storm drains. Sewer maps may also be incorrect, leading to cross connections between the sanitary sewer lines and the storm sewer system.

Thorough inspection and verification by monitoring during the entire construction phase can prevent the illegal connection of wastewater sources during new construction. For existing facilities, the location of improper connections will require the use of field screening procedures, source testing protocols, and visual inspection.

Design Considerations

Programs that address illicit connections, including wastewater connections, typically use a combination of monitoring, inspection, and public outreach to achieve the goal of eliminating improper discharges to the storm drainage system. With many communities facing limited budgets and resources, it is important that investment in an illicit detection program have the greatest return possible.

Field monitoring is an essential component of an illicit detection program and is very valuable for creation of a cost-effective program. Monitoring drains that have dry weather flows will allow program mangers to focus their illicit detection investigations on those outfalls that do not meet water quality standards. Once an outfall is identified as having a high priority through visual inspection, there are a few ways to find the source of the problem. Using closed circuit television testing may reveal a connection that is discharging suspicious material. Spot testing at storm drain manholes upstream of the outfall may aid in isolating an area where the problem discharge is coming from. Infrared and thermal photography have also been used to identify suspect discharges.

Once an area is identified as requiring further investigation, a letter should be sent to facility owners or operators in that area to that alert them that their facility has been selected for an illicit connection inspection. An inspection appointment is made, and field crew determines the location of storm and sanitary sewer manholes and the locations of all plumbing fixtures in the facility. Using either a trace dye or smoke test, the facility is monitored for any illicit connection. If the dye is seen in the storm sewers or smoke is seen in the facility, an inspection team identifies the likely source of the illicit connection.

If a plumbing fixture is found to be connected to the storm sewer, or discharging to either surface water or the ground, the facility is informed of the violation. The facility is given a time frame in which to respond to the violation. Following this period, the fixtures are retested. If the connection has not been corrected, further disciplinary action may be taken if the business or property owner has not provided a description of the corrective actions that were taken.

The general housekeeping practices of a facility should also be examined during an inspection. Issues such as proper storage of hazardous materials and where wastewater from cleaning equipment is emptied should be reviewed with facility operators. This check will help eliminate potential sources of pollutants entering the storm sewers system.

An inspection program of existing septic systems to identify failing systems will also prevent wastewater discharges to storm drains or receiving waters. Requiring inspection of on-site wastewater systems at the time of property transfer and developing a database that tracks septic system pumpouts can help this effort. This process could be done in cooperation with the local health department.

Limitations

A number of limitations might occur during the establishment and operation of an illicit connection program. One is the time and effort it takes to inspect each individual site if program managers plan to inspect all the facilities within their community. Many times illicit connection programs are just one aspect of a public works' or environmental department's mission, so the ability to monitor and inspect nonresidential facilities may be limited by staff availability. In some instances, agencies primarily use citizen complaints to identify potential sources of illicit connections due to staff requirements. Citizens can play an important role in monitoring and inspecting the system to save the municipality money. Louisville and Jefferson counties in Kentucky employ students in the summer to conduct dry weather sampling and system inspections. Monterey, California, has trained citizen volunteers to help with outfall sampling (NRDC, 1999).

Another limitation is the issue of public access to private property. Inspectors responsible for illicit discharge detection and elimination must have access to private property to identify and remove the connections that are the source of illegal non-storm water discharges. An ordinance guaranteeing "right of entry" to private property is critical to allowing inspectors to identify and take corrective actions on individual sources of illicit discharges.

A final limitation is the intermittent nature of illicit discharges. Because wastewater discharges from illicit connections do not necessarily happen on a consistent basis, it is difficult to identify areas where these connections exist unless constant monitoring occurs.

Maintenance Considerations

Two-person teams should be capable of performing field investigations and inspections. The number of teams required in a program will be based on the size of the community, the number of nonresidential facilities to be inspected, and the number of storm drain outfalls to be monitored.

Effectiveness

The effectiveness of illicit discharge programs at removing pollutants from storm water has not received extensive study at this time. Some program managers have estimated the amount of pollutants they believe to have been removed by their programs (see the fact sheet on Industrial Connections, as well as below), but percentage estimates for individual pollutant removal effectiveness are currently difficult to locate. Table 1 from the Wayne County Illicit Connection Control Program shows the estimated reduction in pounds of pollutants due to illicit connection elimination for the years 1991−1994.

Table 1. Estimated pounds of pollutants removed by illicit connection control program, 1991−1994 (Source: Wayne County Dept. of Public Health Illicit Connection Investigation Program Quarterly Report)

Pollutant	Pounds Removed
Ammonia	165
Chlorine	54
Potassium	34
Total Phosphorus	148
Biological Oxygen Demand	2,010
Chemical Oxygen Demand	5,800
Flow, Storm Water to Sanitary System	850,000 (gallons/year)
Surfactants as MBAs?	2,554
Suspended Solids	2,010
Total Solids	6,790
Volatile Solids	2,800

Illicit connection elimination programs have been identified by the USEPA as an important tool in protecting urban water quality. EPA's Nationwide Urban Runoff Program (NURP) recognized the importance of addressing pollutants from inappropriate entries to the urban storm drain system (Lalor and Pitt, 1999). A recent example from the state of Virginia further illustrates the need for such programs. In 1998, sanitary sewer lines from nine condos inside a large housing complex were found to have been inadvertently connected to a roof drain that drained to storm sewer pipes. This cross-connection into the storm drainage system went undetected by authorities (despite periodic odor complaints by local residents) for more than 27 years. While this problem has been fixed, more than 6 million gallons of raw sewage were estimated to have been discharged into the Four Mile Run stream over the course of that 27 years (NVRC, 2001).

Examples such as these demonstrate the need for illicit connection elimination programs. By preventing wastewater discharges to the storm drain system, these programs reduce pollutant loads and protect water quality and the aquatic environment from the effects of these non-storm water discharges.

Cost Considerations

The costs of illicit connection detection and elimination programs vary with the intensity of effort and the amount of staff dedicated to the program. Wayne County, Michigan, has an average annual cost of $187,000 for their program. This budget pays for a full-time, two-person field crew and one part-time field crew and allows them to perform 325 to 350 site inspections annually.

Some programs have offset the cost of field monitoring by using volunteers to adopt outfalls and monitor stream quality. Citizen hotlines broaden the involvement of the public in illicit discharge surveillance. These measures help identify areas where inspection crews can focus their efforts.

Another way to save staff time and money is by establishing a certification program. This program could identify properties that have checked their buildings and found no illicit connections. If inspectors know what buildings have been evaluated, time could be saved when tracking down contamination.

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Illegal Dumping

Illicit Discharge Detection and Elimination

Description

A "No Dumping" sign discourages illegal dumping by threatening arrest (Source: @Home WebSpace, Neuskool, 2000)

Illegal dumping is disposal of waste in an unpermitted area, such as a back area of a yard, a stream bank, or some other off-road area. Illegal dumping can also be the pouring of liquid wastes or disposing of trash down storm drains. It is often called "open dumping," "fly dumping," and "midnight dumping" because materials are often dumped in open areas, from vehicles along roadsides, and late at night. Illegally dumped wastes are primarily nonhazardous materials that are dumped to avoid paying disposal fees or expending the time and effort required for proper disposal (USEPA Region 5, 1998).

Applicability

Illegally dumping wastes down storm drains and creating illegal dumps can impair water quality. Runoff from dumpsites containing chemicals can contaminate wells and surface water used as sources of drinking water. Substances disposed of directly into storm drains can also lead to water quality impairment. In systems that flow directly to water bodies, those illegally disposed-of substances are introduced untreated to the natural environment. For example, the state of Oklahoma has 2,446 illegal dumps, which will cost $3,922,000 to clean up. As part of its pollution prevention efforts, the Oklahoma State University's Cooperative Extension Service has developed a series of posters and other displays to promote awareness of the problems that result from illegal dumping.

Implementation

Municipalities and organizations all over the United States have implemented programs to stop the illegal dumping of trash and used materials. The most important method of implementing such programs is public education. To ensure their effectiveness, some programs allow for citizen reporting of illegal dumpers, who can then be fined, sentenced to jail, or be required to perform community service.

Some clues can help citizens identify illegal dumpers (Fairfax County, 2000):

- Illegal dumping often occurs late at night and before dawn.
- There is often no company name on the construction vehicles or equipment.
- The construction activity occurs on a site with no company advertising sign.
- There is no construction entrance adjacent to the roadway (an area of large stone and gravel placed to keep mud off streets).

In 1993 the North Central Texas Council of Governments (NCTCOG) initiated a public outreach program called *Our Water—Take It Personally*. The campaign includes storm water stenciling that reads "Don't Dump—Protect Our Water." In 1993 NCTCOG won the Keep Texas Beautiful President's Award for its efforts to address illegal dumping. Tarrant County, Texas, has initiated an aggressive public reporting program to stop illegal dumping. Work with public and private entities to develop a manual, *Storm Water Quality Best Management Practices for Industrial Activities—North Central Texas*, has also been successful (NCTCOG, 2000a, 2000b).

The Dallas County Illegal Dumping Hotline (1-888-335-DUMP) is a 24-hour hotline for citizens to report illegal dumping in Collin, Dallas, Denton, Ellis, Erath, Hood, Hunt, Johnson, Kaufman, Navarro, Palo Pinto, Parker, Rockwell, Somervell, Tarrant, and Wise counties. Citizens are asked to leave as much information as possible—city and county of the incident, specific street location, license plate number and description of vehicle, personal description of violator, type of waste dumped, caller's name and telephone number, date of violation. As an incentive to report illegal dumping, a $50 reward is given to reporting individuals if their information leads to an arrest (the City Web, 1998).

Earthwater Stencils, Inc., supports storm water pollution prevention by providing materials such as posters, stencils, and brochures to community-based storm drain stenciling and related programs in local watersheds. Their web site (*www.earthwater-stencils.com*) offers information on how and where to stencil and how to obtain stenciling materials.

Clean Ocean Action, a nonprofit organization that focuses on the New Jersey/New York coast, has designated 2 weeks of the year as "Storm Drain Stencil Week." They offer free storm drain stenciling kits to teachers and also have available a variety of lesson plans and activities about storm drains.

Effectiveness

Illegal dumping regulations must be enforced. In Chicago, Illinois, penalties for dumping without a permit can include fines up to $2,000, 6 months in jail, and up to 200 hours of community service. Violators are liable for up to three times the cost of cleaning up a site, and city contracts can be terminated. Vehicles are subject to seizure and impoundment, with the owner of record liable for a $500 fine in addition to towing and storage fees. Finally, owners or occupants of any unimproved parcel of real estate must remove any abandoned or derelict motor vehicle, garbage, debris, refuse, litter, or miscellaneous waste. Violations can result in fines of $200 to $1,000 per day. These regulations are promulgated under Ordinances 7-28-440 and 7-28-450, Municipal Code, City of Chicago (USEPA Region 5, 1998). Hawaii has instituted a similar program. In 1998 Governor Cayetano enacted a law that imposes fines and jail time on individuals or groups that operate or use illegal dumps. Open dumps throughout the state have been found to lead to groundwater and surface water pollution, as well as odor problems and fires of hazardous materials. The sites are often at least 5 acres and are not visible from public roads because they are on private property or behind closed gates (HDOH, 1998).

Local police department or other public entities can play a major role in catching illegal dumpers. The Central Oklahoma Trash Cop Program, which consists of environmental officers hired to catch and prosecute litterers and illegal dumpers in four counties, was begun with $160,000 obtained through fundraising efforts by a local community group, Oklahoma City Beautiful. The program will be sustained by fines collected from offenders (USEPA Region 5, 1998).

Reliance on public reporting is an important factor in the effectiveness of anti-illegal dumping programs. Municipalities can develop citizen reporting hotlines or web site forms. Program administrators must ensure that these reports are followed up and that the reporter receives a notice of the results. Otherwise, the incentive for reporting could be lost. San Diego County (California) has a toll-free telephone number and a web site reporting form (*www.co.san-diego.ca.us/cnty/cntydepts/landuse/env_health/stormwater/sw_report_dumping.html*) for reporting illegal dumping. Citizens are encouraged to report anyone seen dumping anything onto street surfaces or into the storm drains in the county.

In some cases, citizens have been rewarded for helping clean up illegal dumpsites. PhilaPride, a nonprofit group in Philadelphia, Pennsylvania, promotes neighborhood participation in cleanup and enforcement activities. The program is funded primarily by corporations that have had dumping problems on their properties, such as the Conrail Corporation, which contributes up to $25,000 each year (USEPA Region 5, 1998). A community group in Detroit, Michigan, uses a county grant to pay residents to bring illegally dumped tires to drop-off locations. A local waste hauler donates services to transport the tires to a tire shredder, which shreds them at no charge. A local bank donates money to cover disposal costs (USEPA Region 5, 1998).

Design Considerations

Illegal dumping programs might also include monitoring of roads that have often been used for trash disposal. Other methods are as simple as public education, such as storm drain stenciling (See Storm Drain Stenciling fact sheet). Both programs depend on citizen reporting of illegal dumpers.

Storm drain stenciling is an effective method of raising public awareness of the impacts of storm water runoff on water quality. Stenciling neighborhood storm drains reminds car owners not to dump their motor oil down the drain. It helps all neighbors realize that throwing their trash down the storm drain could have negative effects on their local river. Storm drain stenciling programs can be started by any local group, such as the Boy Scouts, a school class, or a neighborhood association. It is an activity that is quick, easy, and fun.

Limitations

Determining which storm drains to stencil is a vital step. Groups must ensure they have the proper authority's permission to paint storm drains. In terms of reporting illegal dumpers, citizens must be assured that their efforts to contact reporting agencies will result in action by authorities. The city of Jacksonville, Florida, has a citizen complaint form on its web page at *www.coj.net/pub/resd/airwater/CCFORM.HTM*.

Some of the categories of complaints are "discharge of pollutants to storm drains, ditches, rivers or creeks," "overflowing manholes or pump stations," "uncontrolled erosion from land clearing activities," and "pumping of muddy water into creeks, storm drains, or ditches." City staff have established a goal of contacting complaint submitters within 24 hours (City of Jacksonville, 2000).

Maintenance

Municipalities should set goals for reducing the number of illegal dumping acts. The city of Sacramento, California, has set a goal of stenciling 45,000 storm drains throughout the city.

Citizen participation and reporting are important steps in maintaining an anti-illegal dumping program. Furthermore, proper enforcement must be implemented to discourage others from performing these illegal acts.

Cost Considerations

Costs for implementing illegal dumping programs vary. Storm drain stenciling by volunteers is inexpensive because there are only small costs for the stencils and paints. Cash incentives like the $50 reward offered in Dallas County are likely to be minimal costs, because the rewards would not be granted until after a conviction. Actual monitoring by local police or another authority can be more expensive and would require funding in the locality's budget.

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