



Department of Environmental Resources

THE DO'S AND DONT'S ON IMPLEMENTING A SUCCESSFUL ILLICIT CONNECTION PROGRAM

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ABSTRACT

The Rouge River Watershed which is located in southeastern Michigan encompasses approximately 467 square miles in a highly urbanized area. Sources of pollution to the River include industrial, municipal point sources, combined sewer overflows (CSO), storm water runoff, abandoned dumps, discharge from illicit connections, failed septic systems and re-suspension of contaminated sediments. The United States Environmental Protection Agency (USEPA) grant has provided funding to the Rouge River National Wet Weather Demonstration Project (Rouge Project) since 1992. The project is designed to identify efficient and cost effective controls of wet weather pollution. Innovative storm water control technologies are being evaluated for CSO controls, wetland creations, grassy swales, detention ponds, illicit discharge elimination just to mention a few.

Wayne County's illicit connection program began in 1987 on a "shoe string budget." This paper will summarize the process to develop the program prior to federal funding. It will describe state, county, and municipal collaboration, constraints on program development, the four elements of the program, summarize the findings, examples of unusual discoveries, and new directions.

State, county, and municipal governments agreed to the need for an illicit connection program and developed a basic strategy to implement a program. The commercial and industrial community was selected for investigation because of the lessons learned from the Huron River Pollution Abatement Program in Washtenaw County, Michigan. The county would operate the program and the municipality and state would provide support.

Constraints included, the budget, objective to find and eliminate illicit connections with a compliance effort, eliminate the excessive use of time or money to conduct an outfall survey, and lack of computer resources. After investigation it was determined that dye testing was the quickest, easiest way to meet the objective.

The four elements of the program are, selecting an area for investigation, facility inventory, site visit and appropriate follow up. Selecting an area to investigate was done by reviewing available information, complaint history, water quality data, land use etc. A facility inventory is needed to initiate record keeping, determine facilities to visit, and inform facilities of the program. This inventory was accomplished with a Bresser's Index and windshield surveys. The purpose of the site visit is to dye test plumbing fixtures to assure they are connected to the sanitary sewer, and observe general

"housekeeping". Appropriate follow up is determined by what was observed at the site visit.

From October 1987 through December 1998, 3,851 facilities have been inspected. Seven hundred and twenty five violations were found at 304 facilities. These results indicate a measure of 2.4 violations per facility, and approximately 8 percent of the facilities had violations. The most common violations were floor drains 39.5 percent.

As the program progressed, other concerns have developed, failing septic systems and illicit connections in residential areas. This is accomplished by intensive investigations of hot zones identified by an overall sampling program and data review.

KEYWORDS

Illicit connections, illicit discharges, Rouge River, dye test

INTRODUCTION

The Rouge River system, located in southeast is a fan-shaped basin that drains 467 square miles in Wayne, Oakland and Washtenaw Counties of southeastern Michigan. Approximately 267 square miles 60 percent of the watershed is located within Wayne County. The system originates in glacial moraines (heterogeneous coarse sand and gravel) and traverses the former lake bed of primal Lake Erie (silty clay with sandy/gravel overburden) to the Detroit River. The river system has four major branches, the Main, Upper, Middle and Lower Branches. **(See Figure 1 - Rouge River Basin)**. Current land use in the basin is primarily urban and industrial and more rural in the western portion of Wayne County. Near the mouth the basin is heavily industrialized due to its proximity to the Detroit River and navigability for ocean going vessels. A significant portion of the land adjacent to the river is in public stewardship, approximately 50 stream miles.

The Rouge River basin lies within the largest population center of the state, with the population approaching 1.5 million people. The portion of the basin within Wayne County has a population of 1,182,581. However, only 413,093 people within Wayne County are on a separate sewer system, the remaining are on combined sewers. (SEMCOG, 1988)

Sources of pollution to the River include industrial, municipal point sources, CSOs, storm water runoff, abandoned dumps, discharge from illicit connections, failed septic systems and re-suspension of contaminated sediments. The USEPA grant has provided funding to the Rogue Project since 1992. The project is designed to identify efficient and cost-effective controls of wet weather pollution. Innovative storm water control technologies are being evaluated for CSO controls, wetland creations, grassy swales, detention ponds, and illicit discharge elimination just to mention a few.

In 1988, the Rouge River Remedial Action Plan (RAP) was completed. The RAP serves as a planning document for the clean up of the river. It described the current impacted uses, **(See Table 1 - Summary of Impacted Uses)** of the river and recommended corrective actions **(See Table 2 - Summary of Recommended Corrective Actions)** to clean up the river. One strategy that could be implemented quickly was to eliminate

illicit connections.

During the development of the RAP, state, county and municipal governments recognized the need for an illicit connection elimination program. Wayne County's illicit connection program began in 1987 on a "shoe string budget." This paper will summarize the process to develop the program prior to federal funding. It will describe state, county, and municipal collaboration, constraints on program development, the four elements of the program, summarize the findings, examples of unusual discoveries, and new directions.

Table 1-Summary of Impacted Uses

Designated Uses	Number of Impaired Subbasins
Water contact	Basin wide
Water Fishery	9 of 11 subbasins
Water Supply-Industrial/Agricultural	10 of 11 subbasins
Canoeing/Navigation	7 of 11 subbasins
General Aesthetics	Basin wide

Source: Southeast Michigan Council of Governments, June 1988

Table 2-Summary of Recommended Corrective Actions

- Separate sanitary sewer improvements
- Optimize exiting combined sewer system
- Develop local combined sewer overflow control plans
- *Implement a program to remove improper connections to the storm sewer*
- Implement new/updated storm water management plans
- Study and implement resource improvements (habitat enhancement, etc.)
- Control industrial pollutants at the source
- Continue monitoring programs
- Implement financing mechanisms to pay for improvements
- Issue NPDES permits for CSO and storm water discharges

Source: Southeast Michigan Council of Governments, June 1988

METHODOLOGY

A five-point basic strategy was developed to implement the program.

- The State of Michigan would provide funding through grants to start and implement a program.
- The County of Wayne, Department of Public Health would operate the program, and work toward voluntary compliance to have a facility correct its violations.
- The local municipality would provide support such as sewer maps, site access issues, knowledge of their sewer systems and enforce their plumbing code if the County could not achieve voluntary compliance.
- The commercial/industrial community was selected for investigations because of lessons learned from the Huron River Pollution Abatement Program in Washtenaw County, The Huron River Program found that 14 percent of facilities had violations.
- The term illicit connection was broadly defined beyond the "classical" definitions of sanitary plumbing fixtures connected to a storm sewer. The definition included what we now call illicit discharges, situations where polluting materials can move over land to a storm sewer, surface water or ground (e.g., a chip dumpster leaking oil that runs across a parking lot to a storm drain).

The development of the program had to grapple with a variety of constraints and realities. The funds granted to the County for operation of the program was \$107,000 for a two year period. Since this was a new program, different types of equipment had to be purchased (e.g., radios, gas meters, traffic control equipment, etc.) . It was determined that two full-time field people and a part-time program manager were needed. Another constraint was that the granting agency wanted illicit connections found and eliminated, "the biggest bang for the buck" concept. Agencies did not want money spent on research or on an outfall survey. A reality was that computer resources beyond basic word processing and database were not available to the program. After considering the constraints, and consultation with the Huron River Abatement Program staff, it was determined that dye testing targeted facilities was a cost-effective method of meeting the objective to remove illicit connections. The program started in October 1987 with the Wayne County Department of Public Health, Environmental Health Division. In December 1994, the program was transferred to the newly created, Wayne County Department of Environment, Watershed Management Division.

The four elements of the program are, selecting an area for investigating, facility inventory, site visit and appropriate follow up.

Selecting and prioritizing areas for investigation was a cooperative effort between Wayne County and the Southeast Michigan Council of Governments (SEMCOG), a regional planning agency. To meet grant objectives, it was determined that a selected area would be limited to the geographical area of a storm sewer system or drainage service area (DSA) based on hydrology. Five factors were used to rank DSAs for investigation, outfall size, drainage area acreage, land use, priority businesses and water quality data/complaint history (SEMCOG 1989). It was not practical to determine the size of every DSA within the basin. Outfall size was used as a surrogate for drainage area. It was assumed that the larger the outfall, the larger the area served by the sewer system. Once general areas were selected based on the outfall size, the actual drainage area acreage area was determined from sewer maps. The drainage area was used in conjunction with land use and priority business data to help rank geographical areas for investigation; land use was also a factor. Since the

industrial/commercial community was targeted, it was important that a substantial portion of a DSA be industrial or commercial. The type of business was also a factor in prioritizing areas for investigation. Businesses were assigned a priority value of one through three based on the type of business. (**See Table 3 - Prioritization Scheme for Businesses**). Facilities with a priority of one or two were considered more important to investigate. Therefore, DSAs that had more priority one and two businesses were ranked higher for investigation. The number of hazardous waste generators and the number of facilities on Michigan's Critical Materials Register within a DSA was also considered. Reviewing available water quality data would indicate areas in the river system that had water quality problems, therefore, assisting in prioritizing DSAs.

Table 3-Prioritization Scheme for Businesses

Priority	Description
1	Automobile Related Businesses/Facilities and Heavey 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

Source: Southeast Michigan Council of Governments, September 1987

A very important factor was complaint history, sometimes the only factor. A storm drain that had numerous complaints indicated a known problem. The first two areas investigated, Red Run Drain and Paren. Drain (**See Figure 2 - Perrin and Red Run Drains**) were investigated based on their complaint history with Michigan Department of Environmental Quality (MDEQ). The drains had numerous complaints concerning discolored water.

A facility inventory is needed to initiate record keeping, determine facilities to visit, and inform facilities of the program. Once an area was selected for investigations and the geographic boundaries identified, the address ranges for the streets in the area were determined. A list of facilities for the address range was culled from a Bresser's Index (a telephone directory listed by address). The list was verified and additions or deletions made to list by going to the field and walking down the street ("windshield survey") confirming the names and addresses of businesses. Once the list was verified, it would be entered into a computer database. Upon completion of data entry, notification letters would be sent to targeted facilities explaining the program and informing them of a future visit and starting a file for the site. The appropriate municipal contact person was sent a copy of the letter and a list of facilities that it was mailed to.

After selecting an area for investigation, County staff met with the municipal

mayor/supervisor and staff. The meeting had four purposes.

- Explain to the city the county's role.
- Clarify support needed from the city, such as sewer maps, traffic control, enforcement of plumbing codes and help with site access if needed.
- Establish the municipal's contact person for the county.
- And the most important of all, start building a working relationship between county and city staff.

Some communities were very active and worked closely with the county, whereas some communities helped with maps, system knowledge, and only desired to be notified of compliance issues.

The purpose of the site visit was to dye test facilities and observe general "housekeeping." A representative number of plumbing fixtures are dye tested to assure that they are connected to a sanitary sewer. Standard building practices dictate that plumbing fixtures (e.g., restrooms, kitchen areas, janitorial closets, etc.) within a building are nested together. It is assumed that plumbing fixtures within the same restroom adjoining rooms retreat to the same sewer. Therefore, there is no need to test every toilet, sink or urinal.

A dye test is accomplished with a crew of two in radio communications. One person is stationed at an open manhole for the sanitary sewer severing the building, and the second person is in a building and drops dye into a plumbing fixture and flushes with water. The inside person radios to the outside person when the dye is dropped. The outside person radios back when the dye is observed in the sanitary sewer. The inside person moves to another plumbing fixture and the process is repeated. Alternating between dyes can speed up the process. Every dye drop must be accounted for. The location of the fixture for each dye drop is recorded by staff. If a dye drop does not appear in the sanitary sewer, it is redone to determine if it is in the storm sewer or nearby surface waters. When dye does end up in a surface water or storm sewer, the district MDEQ Office, Wayne County Emergency Management and local municipality (e.g. fire, public works) are notified of the dye release to the environment and the expected location.

Generally, "housekeeping" issues address the exterior of the building. Are their chip dumpsters leaking oil, and does it run across the parking lot to the storm sewer? Are signs of ground contamination, discolored soils, etc., present? Is there anything that is causing water, ground or air contamination?

The appropriate follow up is determined by what was observed during the site visit. If no violations were found, a thank you letter is sent to the facility acknowledging their participation, and closing the file. If a facility has an illicit connection, a violation letter is sent giving the facility 30 to 90 days to correct it. If a facility fails to compile with our request, the municipal plumbing inspector or building department become involved. If the municipality cannot gain compliance, the facility is referred to the MDEQ. If a housekeeping problem is noticed, the appropriate agency is notified. When an illicit connection has been eliminated, it is confirmed by this department. When a correction has been confirmed, a confirmation/thank you letter is sent to the facility thanking them for their participation and closing the file.

RESULTS

From October 1987 through December 1998, 3,851 facilities have been inspected. Seven hundred and twenty-five violations were found at 304 facilities. This is two point four (2.4) violations per facility, approximately 8 percent of the facilities had violations. The most common violations were floor drains approximately 40 percent (**See Figure 3 - Graphic Summary of Violations, and See Table 4 - Types of Violations**). These are the most common violations because of past building practices. Floor drains were allowed to discharge to the storm system in the 1940s, 50s, and 60s. A majority of these floor drains only receive flow when the floors were washed. It is also important to point out that 219 or 30 percent of the violations were sinks and toilets, discharging contaminated water. An unusual finding was the horse washing/washing machine category. This discovery was made at a horse race track that stables 600 horses. Each horse was washed once per day (80 to 110 gallons of water per each horse). The facility had 98 concrete pads scattered throughout the stable area for washing horses. Each pad also had a washing machine used to wash horse blankets. The discharge from these pads went to a county drain.

Illicit connections can also be the result of new construction or renovations. For example, a brand new 54 room motel was found to have its entire sanitary system retreating to a storm sewer. A large supermarket in a strip mall was closed and the space was divided into a hardware store and meat market. The meat market space contained the cooler and facilities (restrooms, lunchroom). New restrooms and a lunch room had to be constructed for the hardware store. Construction crews broke through the concrete floor and found a horizontal drain pipe and tied all of the plumbing fixtures into it. Unfortunately, this line was a lead from the storm water roof conductor in the center of the building to the storm sewer in the alley. These are the types of violations may happen infrequently, but may have a significant localized impact on the river.

A significant program change took place when it became a goal to increase the recreational use (canoeing) of the river. The only impairments to this goal were the high bacteria levels which did not meet the bathing beach standards in dry weather. The program focused on looking for and eliminating sources of bacteria. This meant that residential areas had to be investigated, in addition to the institutional community (e.g., hospitals, schools, colleges, prisons, etc.). The residential areas are investigated by identifying "hot zones" based on the overall sampling program and data review. Once a hot zone is identified, an intensive sampling program is initiated. The outfalls in the area are investigated and/or sampled. If an outfall demonstrates a problem, further investigation is done by sampling strategic locations within the system until the source is narrowed down to a city block or two. At this point the city is asked to take an active role. The city may choose to televise the sewers, smoke test the sewers or dye test the homes. Institutional facilities in the "hot zone" are dye tested. Septic systems in the "hot zone" are inspected by the health department, generally a walk-over looking for visual signs of system failure (e.g., ponding water, excessive vegetative growth, cheater pipes etc.).

Table 4-Types of Violations
(October 1987 through December 1998)

Type of Violation	Number	Percent
Floor Drains	204	28.1
Trench Drains	30	4.1
Catch Basins	55	7.6
Catch Basins with oil separators	46	6.3
Sinks	141	19.4
Toilets	71	9.8
Horse washing, washing machines	98	13.5
Drinking Fountains	21	2.9
Sump Pumps	14	1.9
Swimming pool sump drains	14	1.9
Machinery process water	4	0.6
Direct Discharge	1	0.1
Outdoor trailer washing	1	0.1
Condensate lines	4	0.6
Other (Not specified)	11	1.5
Oily discharge to ground	1	0.1
Floor sinks	7	1.0
Urinals	1	0.1
Failing Septic Systems	1	0.1
**Down spouts	24	
Total number of violations	725	

The total number of violations does not include the 24 down spouts connected to a sanitary sewer.

CONCLUSIONS

This technique can be an effective way to begin looking for illicit connections in the industrial/commercial community. It does not necessarily require sampling or an outfall survey. However, this technique does not address the residential issue, therefore, a significant problem may be overlooked.

The intensive investigation of the "hot zone" concept is an evolutionary step of an illicit connection program. It targets an area, and demands that an agency investigate the entire community, industrial, commercial, residential and institutional, to eliminate a recognized water quality problem.

Developing and maintaining a cooperative working relationship with the municipality has been essential to the effectiveness of the program. If there is one measure that could be changed, it is not to limit the geographical area of investigation to the hydrology of the system. It is also recommended that the area boundaries be identified by easily recognizable surface features in the field (e.g., roads, rail lines, etc.).

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