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Combined Sewer Overflow Management Fact Sheet
Pollution Prevention

DESCRIPTION

This fact sheet describes the use of pollution prevention best management practices (BMPs). These practices are intended to both reduce the volume of pollutants entering a combined sewer system (CSS), and to help reduce the number of combined sewer overflows (CSOs) that occur during storm water runoff producing events.

Combined sewer systems (CSSs) are wastewater collection systems designed to carry both sanitary sewage and storm water runoff in a single pipe to a wastewater treatment plant. Combined sewer overflows occur during wet weather periods when the hydraulic capacity of the CSS becomes overloaded. This causes overflows at discharge points within the CSS. Substantial water quality and habitat benefits can be achieved by keeping pollutants out of the CSS, and thus out of CSO discharges. This can often be accomplished through the implementation of a pollution prevention program. Pollution prevention involves the use of materials, processes, and practices that reduce or eliminate the creation of pollutants and waste at the source.

Pollution prevention is broadly applicable, and is one of the Nine Minimum Controls (NMCs) every CSS community is expected to implement. Pollution prevention generally relies on low technology practices that are applied by many individuals and commercial and industrial establishments. Successful programs should include public education, municipal participation, and proper regulation. Examples include:

- Solid waste management
- Waste reduction and recycling
- Commercial/Industrial pollution prevention
- Street cleaning
- Catch basin maintenance
- Water conservation
- Fertilizer and pesticide control
- Erosion and sediment control at construction sites

Many of these practices overlap those addressed in other components of the NMCs, including: operating and maintaining the CSS; maximizing collection system storage and flow to wastewater treatment plants; reviewing and modifying pretreatment programs; and controlling solids and floatables in CSO discharges. A comparison the efforts and relative cost of implementing pollution prevention technologies is presented in Table 1. These practices are further described in the sections below:

Solid Waste Management

Solid waste management (SWM) can play an important role in reducing the amount of litter and pollutants that enter the CSS. Successful SWM programs must address issues of bulk waste disposal (e.g. household appliances, batteries, and tires), illegal dumping by both businesses and residential property owners, hazardous waste collection and disposal, street debris and animal waste removal. Programs may also include banning or substituting

TABLE 1 A COMPARISON OF POLLUTION PREVENTION TECHNIQUES

TECHNOLOGY	Implementation Effort	Relative Cost	Role of Public Education	Required Maintenance
Solid Waste Management	**M**	**L**	**H**	**M**
Waste Recycling and Reduction	**M**	**L**	**H**	**M**
Commercial/Industrial Pollution Prevention	**M**	**L**	**L**	**L**
Street Cleaning	**M**	**M**	**L**	**H**
Catch Basin Maintenance	**M**	**M**	**L**	**H**
Water Conservation	**L**	**L**	**H**	**L**
Fertilizer and Pesticide Control	**L**	**L**	**H**	**L**
Sediment and Erosion Control	**M**	**L**	**L**	**M**

HIGH: **H** MODERATE: **M** LOW: **L**

products and packaging materials that do not readily degrade in the environment.

Waste Reduction and Recycling

Waste reduction is the design, purchase, manufacture, or use of products and materials which limit the amount of solid waste generated. Recycling is the recovery and reuse of waste materials. Waste reduction and recycling reduce the total amount of solid waste generated by a community. This helps limit the amount of trash that finds its way into the CSS.

In the home, reusing and recycling common materials such as plastic and paper reduces pollution and eliminates the need for disposal. A well-organized recycling program for homeowners with clearly marked containers, established transfer locations, and regular collection schedules can be very effective in reducing the total amount of solid waste produced. For industry, waste reduction and recycling can improve environmental compliance, lower accident rates, and reduce regulatory liabilities, reporting requirements and insurance rate. Waste reduction and recycling can also increase profits by reducing the costs of waste disposal, handling, treatment, and the purchase of raw materials.

Commercial and Industrial Pollution Prevention

Commercial and industrial establishments contribute large amounts of pollutants to CSSs. These pollutants originate as either industrial waste or storm water runoff discharged directly to the CSS. Adherence to pretreatment requirements, the development of spill control plans, and the prevention or minimization of industrial discharges during wet weather periods can reduce the amount of industrial waste in CSOs. Employing best management practices (BMPs) such as providing temporary covers for outside storage areas, using rain-proof dumpsters, performing vehicle maintenance in covered bays, and maintaining good housekeeping for all areas exposed to storm water runoff, is important. Other examples of BMPs to prevent commercial and industrial pollution include the installation of oil and grease traps in catch basins (inlet chambers which provide access for runoff to enter the CSS) that service commercial and industrial areas, and the use of covered areas and/or reverse berms to redirect runoff away from truck and railcar load/offload areas. When coordinated in an overall pollution prevention plan, these practices

can reduce both storm water volume and pollutants discharged to a CSS during wet weather periods.

Street Cleaning

Street cleaning can be an effective means of reducing the accumulation of street debris. Street debris is typically composed of food and beverage wrappers and containers, paper and plastic bags, leaves, and sand/soil. Frequent cleaning limits the quantities of dirt, debris, and pollutants including floatables, entering the CSS during wet weather events. Sweeping also contributes to improved water quality by reducing nutrient, BOD, bacterial and metal loads delivered to the CSS.

Catch Basin Maintenance

Regularly scheduled catch basin cleaning can prevent debris, sediment, and floatables from accumulating in the CSS. Cleaning prevents potential clogging of the basins, which helps both to avoid localized flooding and to maintain basin sediment trapping ability. The available options for catch basin cleaning are manual cleaning, vacuum cleaning, and cleaning with eductor equipment. Catch basin cleaning is also beneficial to collection system performance because it reduces the likelihood of fouling or damaging downstream pumping equipment, and it prevents sediment buildup that can reduce capacity and accelerate CSO events.

Water Conservation

Water conservation can be defined as practices, techniques, and technologies that improve the efficiency of water use. An effective water conservation program helps to reduce CSOs by reducing sanitary flow. This reduction provides a net increase in CSS collection and treatment capacity for storm water during storm events.

Fertilizer and Pesticide Control

Fertilizers and pesticides washed from the ground surface and transported with runoff into CSSs during wet weather events can be contained in CSO discharges. Fertilizers, which contain high levels of nitrogen and phosphorous, contribute to eutrophication of receiving waters. In addition, pesticides are potentially toxic to aquatic life. While the individual contribution of pollutants from a homeowner's lawn, the grounds of a business establishment, or a municipal park may be small, the cumulative impact on water quality may be significant. The control of urban fertilizer and pesticide levels involves convincing residents, institutions, and municipal departments to adhere to handling and application techniques that limit pollutant runoff. Integrated pest management (IPM) programs that provide information on alternatives to traditional fertilizer, pesticide, and herbicide practices are currently being developed within local and state governments.

Sediment and Erosion Control

Sediment and erosion control practices can play an important role in reducing the volume of storm water and the amount of sediment delivered to the CSS during wet weather periods. Well-managed soil retains rainwater, and tends to keep sediment on site. In contrast, poorly-managed soil, particularly at construction sites, produces unnecessary runoff and increased sediment loads. Activities that accelerate erosion include: removing vegetative cover; compacting or disturbing the soil; changing natural drainage patterns; and increasing the amount of impermeable surfaces.

The impact of increased sediment and erosion on the CSS can be substantial. System capacity is reduced by the excess storm water, leading to larger and more frequent overflows. In addition, sediment often clogs catch basins and contributes to inefficient operation of the CSS. Receiving waters are also impacted as sediment increases turbidity, upsets natural habitat and aquatic life, and adds undesirable nutrients, metals, and other toxic substances.

APPLICABILITY

Pollution prevention prevention programs should be applicable in all CSO communities. By relying on a combination of public awareness programs and community initiatives, these programs can play a significant role in reducing CSOs. and other toxic substances.

ADVANTAGES AND DISADVANTAGES

Solid Waste Management

The illegal disposal of household trash and chemicals is a major problem in most CSO communities. Public education is essential to solving this problem. In addition to raising awareness of waste disposal issues, programs must provide direction to the general public. People need accurate information on recyclable waste materials. Clear and concise instructions for preparing all types of household wastes, including bulk wastes, for curbside pickup or drop-off must be disseminated. Maintaining convenient hours of operation for waste drop-off facilities will make it easier for residents to properly dispose of waste items. Frequently emptying municipal trash receptacles, so that they remain empty and clean, will prevent spillover and encourage their use. The stenciling of storm drain catch basins serves to educate the public about the connection between storm runoff and receiving waters, and the dangers of dumping waste, such as paintbrush residues and concrete truck washout, into CSS inlets. To prevent animal waste from entering the CSS, municipalities can institute a so called pooper-scooper regulation and place signs near popular walking trails or common areas reminding people to clean up after their pets.

Waste Reduction and Recycling

Like solid waste management, recycling relies on voluntary cooperation. Public education will be an essential part of any successful recycling effort. Recycling involves encouraging the reuse of materials in both household and industrial settings. Many reusable substances, such as motor oil and cleaning products, require special storage containers and recycling techniques.

Setting a recycling goal for the community is important. However, it takes time for recycling programs to become established and to have a measurable impact. To encourage participation recycling must be made convenient. Providing reliable curbside collection may be the best way to encourage household participation. Pick-ups should occur on a regular schedule, as often as once a week. Drop-off centers where residents may leave recyclable materials at scheduled times can also be established. Offices can contract with paper recyclers for onsite pickup of waste paper and other recyclables.

Commercial and Industrial Pollution Prevention

Pretreatment requirements can be reviewed and modified to control the amount and characteristics of industrial waste entering the CSS. Sewer use ordinances, rules, and regulations can be implemented to control pollutant concentrations, and, in some instances, the timing of discharges to the CSS. CSO communities can provide technical assistance and incentives for pollution prevention to commercial and industrial establishments. Additionally, CSO communities can implement broad programs that encourage commercial and industrial establishments to participate in pollution prevention programs, and they can recognize successes. These programs include strategies for reducing the volumes of industrial wastes generated through: material substitution; process modification; chemical and water use reductions; sensible chemical storage; spill prevention, and good housekeeping.

Street Cleaning

Street sweeping services are provided by either municipal or contracted personnel. The overall effectiveness of a street cleaning program is primarily a function of the frequency and regularity of the cleanings. The frequency of street sweeping is determined by need, the number of miles to be served, and local budget constraints. Other factors for consideration include climatic conditions (e.g., rainfall frequency and season), the size of particles captured by the cleaning, and street-parking regulations. Because parked cars prohibit the street cleaner from removing curbside litter, enforcement of parking regulations is essential.

Sweeping programs tend to be implemented city-wide, not just in areas serviced by CSOs. Budget constraints may require that sweeping efforts be timed to be most effective. Early spring cleanings are essential in areas subject to winter salt, sand, and cinder applications. Late fall sweepings are essential in areas with sustained winter rains. In

general, street sweeping provides appreciable aesthetic benefits that go well beyond CSO control.

Catch Basin Maintenance

Implementing a successful catch basin cleaning program requires a commitment to regularly-scheduled cleaning and maintenance. Catch basins should be cleaned whenever material deposited in the bottom of the basin reaches a height greater than one-third of the depth from the basin bottom to the lowest opening into or out of the basin. Catch basin cleaning is thought to mitigate the "first flush" effect, which occurs when the initial major storm water flow into a catch basin re-suspends deposited material and flushes it out through the outflow pipe. A study comparing the effect of different cleaning schedules found that quarterly cleanings appear to be the most effective in reducing pollutant loads.

Water Conservation

Water conservation programs should be combined with a strong public education component that emphasizes the financial and environmental benefits associated with water conservation and water use efficiency. Water conservation tips can be sent to customers in newsletters that accompany water bills. Local ordinances can be developed to ensure that water conservation practices are standardized. Utilities can also offer technical advice and incentives to customers to encourage water conservation.

Fertilizer and Pesticide Control

Users must receive instruction on how to safely handle and properly apply fertilizer and pesticide products. Public education programs should emphasize that "more is not better," and that the lowest effective dose listed on the label for any one application should always be used. Care should also be taken to identify pests correctly so that the proper pesticide is selected, and inappropriate materials are not wastefully applied. Education about alternative pest control measures can also be valuable. Information about beneficial insects, proper planting dates, and companion cropping systems should be disseminated for consideration. The caretakers of large parcels of urban land, including local parks departments and other institutions, should be encouraged to lead the way and demonstrate the responsible use of fertilizers and pesticides. Finally, the use of Class A biosolids to replace or supplement synthetic fertilizer in turfgrass establishment can greatly reduce the quantity of runoff and its pollutant content.

Erosion and Sediment Control

Soil erosion within the CSS is most prevalent in open space areas, at construction sites, and within streambanks. Open space is largely comprised of lawns in residential areas, open areas at educational, corporate and medical institutions, and government-owned land, including parks. The practices most suitable for lawns and parks are maintaining a vegetative cover and, where applicable, using grassed drainageways and terraces that hold the soil in place and allow water to infiltrate on-site.

For construction sites, planning prior to disturbance is essential. The planning should address controlling erosion by preserving existing vegetation, controlling sediment on site, and post construction activities. The strategy is to spread and slow storm water runoff when possible, and to ensure that concentrated flows do not erode drainageways. Silt fences, filter fabrics, and straw wattles can effectively retain sediment on disturbed slopes. Fabrics must be selected with an appropriate pore size to ensure maximum sediment control for the type of soil encountered. Rock check dams, woodchip-filled bags, and hay bales can be effective sediment traps in drainageways. Small onsite stilling ponds, designed to slow runoff and allow settling, can also be effective. Construction entrance protection is needed to prevent tracking of sediments onto public streets via truck tires. Protection includes laying a woven geotextile fabric across the entranceway and at least 50 feet into the site. Three-inch minus rock is then placed over the fabric. On very large construction sites, wheel washes are often used as an additional sediment control strategy. Additionally, environmentally-oriented landscaping, mulching, and seeding will contribute to erosion and sediment control. CSO communities should consider the development of standards and recommended practices for sediment

and erosion control to guide new development and redevelopment projects.

IMPLEMENTATION

Solid Waste Management

Jefferson County, KY, has opened a permanent center for the disposal of household chemicals, such as paint thinners and solvents, cleaning solutions, lawn chemicals, and waste oils. The center is called AHaz Bin and operates two days per week on a year round basis. AHaz Bin has an annual operating budget of $250,000. During 1996, AHaz Bin collected approximately 68,040 kilograms (150,000 pounds) of household chemicals from 2,080 households. More than 85 percent of the waste was either recycled or used in fuel blending.

Waste Reduction and Recycling

Louisville, KY, provides garbage collection once a week and conducts a simultaneous recycling program that collects newsprint, glass, plastics, and tin and aluminum cans. The program collects approximately 15.2 million kilograms (15,000 tons) of material each year, of which 75-80 percent is fiber. The City has found a private contractor who will purchase fibers for 2 cents per kilogram ($25/per ton). This money is used to offset costs associated with all aspects of solid waste management.

The Industrial Materials Exchange (IMEX) is an element of the King County, WA, hazardous waste management program, and has been active since 1989. IMEX's goals are to conserve energy and resources, and to protect the environment by helping businesses and organizations find alternatives to the disposal of valuable materials or wastes. IMEX has an annual operating budget of $250,000, which is used to help businesses find markets for industrial by-products, surplus materials, and wastes. Potential wastes are reused to the mutual benefit of the supplier of the surplus material, the user, and the environment.

Commercial and Industrial Pollution Prevention

As part of its outreach effort, The Rouge River National Wet Weather Demonstration Project in Michigan initiated the Rouge Friendly Business Program. The Program works with small business owners to help them complete a facility management self-assessment form. The program then suggests the implementation of source controls, such as: storage and disposal of non-hazardous materials, grease handling, and managing outdoor work areas. The Program recognizes and promotes businesses which make the suggested changes and demonstrate river-friendly pollution prevention practices. As of June 1997, 17 businesses have been officially recognized.

Street Cleaning

New York City's street sweeping program cleans just over 50 percent of the city's 18,800 curb kilometers (11,700 curb miles). Streets are cleaned on a regular schedule that ranges between one and three sweepings per week. Alternate-side-of-the-street parking regulations support the sweeping program. There are also ordinances in place which prohibit littering and require property owners to clean sidewalks and gutters daily. Enforcement agents patrol commercial areas and fine owners who fail to maintain sidewalks and gutters.

South Portland, ME, utilizes contracted sweeping services to sweep the entire 160 kilometers (100 miles) of city roadways each spring. This process yields more than 1,500 cubic meters (2,000 cubic yards) of material annually. City streets are then continually maintained by city personnel and equipment throughout the summer and fall months. On average, an additional 750 cubic meters (1,000 cubic yards) of debris is picked up during this period.

Catch Basin Maintenance

An in-depth study of floatable discharges to New York Harbor was recently completed. The final report recommended that the City adopt a two year cycle for cleaning catch basins, which number well over 100,000 city-wide. In trying to meet this goal,

the City cleaned 63,500 catch basins in 1996. Approximately 32,000 were scheduled cleanings, and the remaining were the result of complaints phoned into the City's Department of Environmental Protection.

Water Conservation

As part of its Water Smart Technology Program, Seattle Water in Washington offered technical assistance and financial incentives to commercial customers to encourage installation of water conservation technologies. The financial incentives included refunds of as much as 50 percent of the installed cost for an approved conservation project. Through June 1997, the incentive program spent $1.2 million, and has seen a savings of approximately 0.9 MGD. Seattle Water also created a toilet rebate program. The program offers rebates of $100-$150 for each fixture replaced. Through June 1997, the toilet program has spent $1.4 million, and installed more than 8,000 fixtures with an estimated water savings of 0.8 MGD. In total, the programs have conserved approximately 1.7 MGD for the $2.6 million spent.

Fertilizer and Pesticide Control

The local hazardous waste program in King County, WA, sponsors an annual Green Gardening Program. The program focuses on integrated pest management (IPM). Major program components include working with schools, hosting tours of gardens grown with little or no pesticides, and holding workshops for nursery store staff, master gardeners, and professional grounds managers. Nearly 2,000 people participated in the various activities in 1996, and 41 percent of participants said they were very likely to adopt green gardening methods. Additionally, the Washington State University Cooperative Extension promotes the Green Gardening Program in its weekly newspaper column for ten weeks each spring.

Sediment and Erosion Control

The Louisville and Jefferson County Metropolitan Sewer District (MSD) in Kentucky developed erosion control standards for the county. The standards require erosion controls (silt fence placement) to be in place before the soil is disturbed, and will stipulate that any site left 14 days without activity be stabilized. Additionally, no more than 500 linear meters (1,500 linear feet) of earth can be disturbed at one time.

In addition, the local governments of Louisville and Jefferson County are working together to reduce the generation of household and industrial wastes. The MSD modified wastewater rates to encourage industrial water conservation and pretreatment. Additionally, an erosion control plan is now a required component for construction activities. MSD developed a set of minimum requirements which can be easily inserted into most construction plans. Recently, MSD offered instruction in sediment and erosion control to private design engineering firms and contractors who frequently work on municipal projects and to government employees involved in planning, design, construction, and inspection. Complementing that work, the Department of Solid Waste Management and Services (SWMS) has reduced the amount of household waste entering local landfills by providing separate weekly collections for recyclable and compostable waste. To further encourage waste reduction, SWMS has reduced residential garbage collection from twice to once per week. Also, the Jefferson County Department of Environmental Protection and Management has opened a permanent center for the disposal of household hazardous waste. The combined efforts have yielded the collection of 170 million kilograms (168,000 tons) of recyclable materials in 1996, the recycling or reuse of more than 85 percent of the household hazardous waste brought to the center, and decreased water demands from a growing population.

COSTS

Cost comparisons for the wide range of strategies used for pollution prevention are difficult to make without consideration of site-specific factors. The following section summarizes the range of costs representative of each pollution prevention technique:

Solid Waste Management

Costs vary greatly depending on the type of program implemented and the size of the community.

Waste Reduction and Recycling

The costs associated with municipal recycling programs are typically between one and two dollars per household per month. This estimate includes expenses of 7.4 to 7.8 cents per kilogram ($75-80 per ton) to collect the recyclables. However, recyclables often generate $0.02-0.025 per kilogram ($20-25 per ton) in revenue.

Street Cleaning

Cost will depend on the frequency of cleaning, the number of cars on the street, the degree of enforcement of parking regulations, the volume of litter, and the types of labor and machinery employed. Cost will also depend on the landfill tipping fees associated with the removed debris. The reported costs of sweeping vary widely, but average $62 per curb kilometer ($100 per curb mile).

Catch Basin Maintenance

The cost to clean catch basins can range from $65 to $110 per basin, depending on the type of equipment used. This figure includes machine rental, fuel, and labor costs. The purchase cost for vacuum trucks ranges from $150,000 to $200,000 for trucks having a capacity of 7.6 to 12.2 cubic meters (10 to 16 cubic yards) of material. Recent technological advances have produced high performance vacuum sweeping trucks that can also clean out catch basins. Maintenance costs are estimated by a manufacturer to range from $12,500 to $15,000 per truck per year. The cost estimate does not include fuel, but reflects costs for routine maintenance materials and mechanic-time.

Water Conservation

Costs are closely tied to program specifics. Incentive programs average a one-time cost of $0.25-0.50 cents per liter ($1 to $2 per gallon) of water saved per day.

Sediment and Erosion Control

Blankets/Fencing

Netted erosion control blankets average $0.75 per square meter ($0.65 per square yard) for straw and $1.35 per square meter ($1.15 per square yard) for coconut-based material (50 square meter/60 square yard blankets). Tight-knit coconut fiber rolls, for long steep slopes, average $2.40-4.20 per square meter ($2.00-3.50 per square yard). Synthetic blankets average $4.80 per square meter ($4.00 per square yard). Silt fences (with pocketed post slots) are sold by the 30.5 meter (100 foot roll), with prices starting at $0.11 to $0.15 per linear meter ($0.35 to $0.50 per linear foot), uninstalled.

Vegetative Controls

Vegetative controls include broadcast seeding and hydroseeding. Typical costs for simple broadcast seeding with an economical erosion control seed mix are $245-$620 per hectare ($100-$250 per acre). Commercial hydroseeding averages $1980-$2470 per hectare (800-$1000) per acre. The cost of supplying any needed water to the site can result in significant additional costs. Devices aimed at keeping seed in place during germination include straw mulch ($2.00-$4.00 per bale) and straw wattles ($4.25 per linear meter, or $1.30 per linear foot).

Inlet Protection

Catch basin inlet protection can include inlet bags, grate wraps, woodchip-filled mesh bags, and rock/block/screens. Inlet bags and grate wraps average $60-$75 per unit. Woodchip filter bags, where available, average $2.75 per 25 centimeter by 75 centimeter (10 inch by 30 inch) bag. Rock/block/screen average $12-$15 per inlet, although most of this material can later be used for construction purposes.

Construction Entrance Protection

Woven geotextile fabric costs average $1.10-$2.30 per square meter ($0.90-$1.90 per square yard). Three-inch minus rock costs average $6.50-$8.75 per meter ($6.00-$8.00 per yard) plus delivery charges.

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