Pollution Prevention/Good Housekeeping for Municipal Operations

Regulatory Text

You must develop and implement an operation and maintenance program that includes a training component and has the ultimate goal of preventing or reducing pollutant runoff from municipal operations. Using training materials that are available from EPA, your State, Tribe, or other organizations, your program must include employee training to prevent and reduce storm water pollution from activities such as park and open space maintenance, fleet and building maintenance, new construction and land disturbances, and storm water system maintenance.

Guidance

EPA recommends that, at a minimum, you consider the following in developing your program: maintenance activities, maintenance schedules, and long-term inspection procedures for structural and nonstructural storm water controls to reduce floatables and other pollutants discharged from your separate storm sewers; controls for reducing or eliminating the discharge of pollutants from streets, roads, highways, municipal parking lots, maintenance and storage yards, fleet or maintenance shops with outdoor storage areas, salt/sand storage locations and snow disposal areas operated by you, and waste transfer stations; procedures for properly disposing of waste removed from the separate storm sewers and areas listed above (such as dredge spoil, accumulated sediments, floatables, and other debris); and ways to ensure that new flood management projects assess the impacts on water quality and examine existing projects for incorporating additional water quality protection devices or practices. Operation and maintenance should be an integral component of all storm water management programs. This measure is intended to improve the efficiency of these programs and require new programs where necessary. Properly developed and implemented operation and maintenance programs reduce the risk of water quality problems.

BMP Fact Sheets

Source controls

Pet waste collection

Automobile maintenance

Vehicle washing

Illegal dumping control

Landscaping and lawn care

Pest control

Parking lot and street cleaning

Roadway and bridge maintenance

Septic system controls

Storm drain system cleaning

Alternative discharge options for chlorinated water

Materials management

Alternative products

Hazardous materials storage

Road salt application and storage

Spill response and prevention

Used oil recycling

Materials management

Materials management

Alternative Products

Pollution Prevention/Good Housekeeping for Municipal Operations

Description

Using alternatives to toxic substances drastically reduces their presence in storm water and receiving waters. The most common toxic substances found in the home are cleaners, automotive products, and pesticides. Fertilizers, paints, and fuels are among other common hazardous substances frequently found in ground water because of improper disposal (WEF and ASCE, 1998).

Examples of alternative products include rechargeable batteries, baking soda, olive oil, vegetable oil, a lemon, a toothbrush, and a rag

Applicability

The promotion of safer alternative products should be coupled with other programs designed to reduce the presence of hazardous or toxic materials in homes and storm water runoff. Examples of such programs are hazardous materials collection, good housekeeping or material management practices, oil and automotive waste recycling, and spill response and prevention (WEF and ASCE, 1998).

Examples of commonly used products and safer alternatives are as follows (adapted from Washington State Department of Ecology):

- *Aerosols*. Pump-type or non-aerosol products should be used.
- *Art supplies*. One should purchase water-based paints or inks. They should not contain lead or other toxic materials.
- *Batteries*. Rechargeable batteries are a cost-effective alternative to disposable batteries.
- *Chemical fertilizers*. Composting yard clippings and food scraps is an option. Manure (in measured amounts) is another alternative to chemical fertilizers.
- *Gasoline*. Not driving at all is the best way to reduce gasoline use. Purchasing a super-efficient or electric vehicle is the next best alternative. Carpooling, walking, bicycling, and public transportation are other viable options.
- *Household cleaners and detergents.* Baking soda is an excellent cleanser with mild abrasive power that can be used in lieu of heavy-duty cleansers. A mixture of 1 quart water and 2 tablespoons of vinegar can be used as a window cleaner. Three parts olive oil mixed with one part white vinegar can be used for a wood cleanser. Borax and lemon juice make an excellent toilet cleaner. Many other non- or less-toxic alternatives to harsh cleansers exist. A listing of these alternatives can be found at *www.healthdept.co.pierce.wa.us/sourceprotection/alter.html*.

- *Motor Oil*. Re-refined motor oil should be used. Doing so will spur the market for recycled motor oil and decrease reliance on new oil supplies.
- *Pesticides*. Keeping homes and gardens free from food and breeding areas for insect pests prevents the need for pesticides. Onion, garlic, and marigold plants help keep garden pests at bay.

Implementation

One of the best ways to encourage homeowners to switch to alternatives to potentially harmful products is to educate them (see Proper Disposal of Household Hazardous Wastes fact sheet). Municipalities can compile a list of alternative products and post it on their web site, publish it in a newsletter, include it as an insert in a utility bill, or produce magnets or other household products with a select list of nonhazardous alternatives. Municipalities might choose to include commercially available products that have been shown to be "green" alternatives to harsh chemicals.

Limitations

In some cases, alternative products may not be readily available. In addition, cost can be a limiting factor. For example, until recently, environmentally friendly de-icing materials for roads were significantly more expensive than traditional salt (Babcock 1998). Effectiveness of alternatives may be an issue.

The biggest impediment to instituting widespread use of alternative products is public awareness. Municipal staff must convince people to change old habits or to try new products.

Effectiveness

The use of alternative products prevents their hazardous waste counterparts from being disposed of improperly and contaminating storm water.

Cost Considerations

The majority of the cost for this BMP is composed of staff hours. An alternative products campaign should be instituted in conjunction with other public awareness programs; therefore, municipalities should not experience significant cost increases.

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Hazardous Materials Storage

Pollution Prevention/Good Housekeeping for Municipal Operations

Description

Failure to properly store hazardous materials dramatically increases the probability that they will end up in local waterways. Many people have hazardous chemicals stored throughout their homes, especially in garages and storage sheds. Practices such as covering hazardous materials or even storing them properly, can have dramatic impacts.

Signs on hazardous material storage containers indicate the dangers associated with each substance

Applicability

Hazardous material storage is relevant to both urban and rural settings and all geographic regions. The effects of hazardous material leakage may be more pronounced in areas with heavier rainfall, due to the greater volume of runoff.

Siting and Design Considerations

EPA (1992) has outlined some management considerations for hazardous materials. They are as follows:

- Ensuring sufficient aisle space to provide access for inspections and to improve the ease of material transport.
- Storing materials well away from high-traffic areas to reduce the likelihood of accidents that might cause spills or damage to drums, bags, or containers.
- Stacking containers in accordance with the manufacturers' directions to avoid damaging the container or the product itself.
- Storing containers on pallets or equivalent structures. This facilitates inspection for leaks and prevents the containers from coming into contact with wet floors, which can cause corrosion. This consideration also reduces the incidence of damage by pests (insects, rodents, etc.).
- Delegating the responsibility for management of hazardous materials to personnel trained and experienced in hazardous substance management.

Covering hazardous materials and areas where such materials are handled reduces potential contact with storm water and wind. Storage areas, outdoor material deposits, loading and unloading areas, and raw materials should all be covered or enclosed. Priority should be given to locations of the most hazardous substances (USEPA 1992).

Residents waiting to dispose of their household hazardous waste should store it properly until their hazardous waste collection day (Kopel,1998). One storage technique requires a plastic container with a lid (e.g., a 5-gallon bucket). The container should be filled halfway with (unused) kitty litter. The hazardous substance in its own original container should be put into the kitty litter-filled plastic bucket. The bucket lid should be fastened, and the contained marked clearly, kept far away from children, and anyone else who might ingest it. Corrosion will be reduced if the container is stored on a shelf, rather than on a concrete or dirt floor.

Limitations

The lifespan of the cover or structure must be taken into account, depending on the hazardous nature of the stored materials. Tarpaulins and plastic sheets may not last in certain types of climatic conditions. If a roof or other structure is required, the lifespan will increase. Any storage facility must meet local fire and building codes (Ferguson, et al. 1997).

Maintenance Considerations

Maintenance of hazardous material storage areas consists mostly of inspection and employee training (Ferguson, et al. 1997). Storage spaces and containers should be routinely inspected for leaks, signs of cracks or deterioration, or any other signs of release.

Effectiveness

Improved storage of hazardous materials is effective at reducing contamination of storm water runoff and receiving waters if proper storage and maintenance techniques are used.

Cost Considerations

Estimates of costs for storing and covering materials vary depending on the substance and type of operation. Ferguson et al. (1997) estimated the costs of a pre-fabricated building at $6 to $11 per ft^2, and the cost of a 6-inch thick concrete slab at $3.50 to $5.00 per ft^2. All hazardous materials should be protected from exposure to storm water regardless of the expense. To offset the cost of covering or enclosing hazardous materials, consider changing procurement, inventory, and disposal practices to minimize the amount of materials stored onsite.

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Road Salt Application and Storage

Pollution Prevention/Good Housekeeping for Municipal Operations

Description

The application and storage of deicing materials, most commonly salts such as sodium chloride, can lead to water quality problems for surrounding areas (Koppelman et al., 1984). Salts, gravel, sand, and other materials are applied to highways and roads to reduce the amount of ice during winter storm events. Salts lower the melting point of ice, allowing roadways to stay free of ice buildup during cold winters. Sand and gravel increase traction on the road, making travel safer.

During storage, road salt should be covered to prevent salt from lumping together or being lost with storm water runoff

Applicability

This practice is applicable to areas that receive snowfall in winter months and require deicing materials. Municipalities in these areas must ensure proper storage and application for equipment and materials.

Siting and Design Considerations

Many of the problems associated with contamination of local waterways stem from the improper storage of deicing materials (Koppelman et al., 1984). Salts are very soluble when they come into contact with storm water. They can migrate into ground water used for public water supplies and also contaminate surface waters.

More information about road deicing materials can be found at the American Association of State Highway and Transportation Officials web page at *www.transportation.org/aashto/home.nsf/FrontPage*.

Limitations

Road salt is the least expensive material for deicing operations; however, once the full social costs are taken into account, alternative products and better management and application of salts become increasingly attractive options.

Maintenance Considerations

Covering stored road salts may be costly; however, the benefits are greater than the perceived costs. Storing road salts correctly prevents the salt from lumping together, which makes it easier to load and apply. In addition, covering salt storage piles reduces salt loss from storm water runoff and potential contamination to streams, aquifers, and estuarine areas. Salt storage piles should be located outside the 100-year floodplain for further protection against surface water contamination.

During road salt application, certain best management practices can produce significant environmental benefits. The amount of road salt applied should be regulated to prevent oversalting of motorways and increasing runoff concentrations. The amount of salt applied should be varied to reflect site-specific characteristics, such as road width and design, traffic concentration, and proximity to surface waters. Calibration devices for spreaders in trucks aid maintenance workers in the proper application of road salts. Alternative materials, such as sand or gravel, should be used in especially sensitive areas.

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Spill Response and Prevention

Pollution Prevention/Good Housekeeping for Municipal Operations

Description

Spill response and prevention plans should clearly state measures to stop the source of a spill, contain the spill, clean up the spill, dispose of contaminated materials, and train personnel to prevent and control future spills.

A person works to prevent a spill from entering a storm sewer (DAWG, 2000)

Applicability

Spill prevention and control plans are applicable to construction sites where hazardous wastes are stored or used. Hazardous wastes include pesticides, paints, cleaners, petroleum products, fertilizers, and solvents.

Siting and Design Considerations

Identify potential spill or source areas, such as loading and unloading, storage, and processing areas, places where dust or particulate matter is generated, and areas designated for waste disposal. Also, spill potential should be evaluated for stationary facilities, including manufacturing areas, warehouses, service stations, parking lots, and access roads.

Material handling procedures and storage requirements should be defined and actions taken to reduce spill potential and impacts on storm water quality. This can be achieved by

- Recycling, reclaiming, or reusing process materials, thereby reducing the amount of process materials that are brought into the facility
- Installing leak detection devices, overflow controls, and diversion berms
- Disconnecting any drains from processing areas that lead to the storm sewer
- Performing preventative maintenance on storm tanks, valves, pumps, pipes, and other equipment
- Using material transfer procedures or filling procedures for tanks and other equipment that minimize spills
- Substituting less- or non-toxic materials for toxic materials.

Provide documentation of spill response equipment and procedures to be used, ensuring that procedures are clear and concise. Give step-by-step instructions for the response to spills at a particular facility. This spill response plan can be presented as a procedural handbook or a sign.

The spill response plan should

- Identify individuals responsible for implementing the plan
- Define safety measures to be taken with each kind of waste
- Specify how to notify appropriate authorities, such as police and fire departments, hospitals, or publicly-owned treatment works for assistance
- State procedures for containing, diverting, isolating, and cleaning up the spill
- Describe spill response equipment to be used, including safety and cleanup equipment.

Education is essential for reducing spills. By informing people of actions they can take to reduce spill potential, spills will be reduced and/or prevented. Some municipalities have set up 1-800 numbers for citizens to call in the event of spills. This is helpful for ensuring that spills are cleaned up in a safe, proper, and timely manner.

Limitations

A spill prevention and control plan must be well planned and clearly defined so that the likelihood of accidental spills can be reduced and any spills that do occur can be dealt with quickly and effectively. Training might be necessary to ensure that all workers are knowledgeable enough to follow procedures. Equipment and materials for cleanup must be readily accessible and clearly marked for workers to be able to follow procedures.

Maintenance Considerations

Update the spill prevention and control plan to accommodate any changes in the site or procedures. Regularly inspect areas where spills might occur to ensure that procedures are posted and cleanup equipment is readily available.

Effectiveness

A spill prevention and control plan can be highly effective at reducing the risk of surface and ground water contamination. However, the plan's effectiveness is enhanced by worker training, availability of materials and equipment for cleanup, and extra time spent by management to ensure that procedures are followed.

Cost Considerations

Spill prevention and control plans are inexpensive to implement. However, extra time is needed to properly handle and dispose of spills, which results in increased labor costs.

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Used Oil Recycling

Pollution Prevention/Good Housekeeping for Municipal Operations

Description

Used motor oil is a hazardous waste because it contains heavy metals picked up from the engine during use. Fortunately, it is recyclable because it becomes dirty from use, rather than actually wearing out. However, as motor oil is toxic to humans, wildlife, and plants, it should be disposed of at a local recycling or disposal facility. Before disposal, used motor oil should be stored in a plastic or metal container with a secure lid, rather than dumped in a landfill or down the drain. Containers that previously stored household chemicals, such as bleach, gasoline, paint, or solvents should not be used. Used motor oil should also never be mixed with other substances such as antifreeze, pesticides, or paint stripper.

Used oil can be disposed of at a waste collection facility, where it will be collected and later sent to a recycling facility

Used motor oil is recycled in a number of different ways. It can be *reprocessed* into fuel for heating and cooling homes. Reprocessing is the most common method of recycling used oil in the United States. Approximately 750 million gallons of used oil are reprocessed every year and marketed to asphalt plants, steel mills, boilers, pulp and paper mills, cement/lime kilns, and a number of other places. Motor oil can also be burned in furnaces for heat or in power plants to generate electricity for homes, businesses, or schools. It can also be blended for marine fuels, mixed with asphalts for paving, or be used in industrial burners. Used motor oil can also be used in specially designed municipal garages, space heaters, and automotive bays. Finally, used motor oil can be re-refined into lubricating oils that meet the same standards as virgin/new oil. All of these methods of recycling help to conserve valuable energy resources.

When establishing oil recycling programs, municipalities should provide the public with the proper informational resources. Programs should encourage the public to contact local service stations, municipal governments, the county government office, or the local environmental or health departments, if they are unsure where to safely dispose of their oil. The public can also call 1-800-RECYCLE or contact Earth's 911 at *www.1800cleanup.org/* for more information. Finally, state government contacts, who might be able to provide information about oil recycling, can be obtained by the public at *www.noraoil.com/Contact/contact.html*.

Municipalities also need to address oil filter recycling in their recycling programs. Programs should encourage the public to check with local collection facilities to determine whether oil filters are recycled locally. The Filter Manufacturers Council, which was established in 1971 to monitor regulatory and technological developments that affect the oil industry, can also be used as a resource for the public. The Council operates a hotline (1-800-99-FILTER) and a web site (*www.filtercouncil.org/*) to provide information about state regulations and companies that transport, recycle, and process used oil filters. If oil filters are not recycled locally, empty filters should be wrapped in newspaper and disposed of with regular household waste. Oil filters must always be drained of oil, whether recycling or disposing of the filter. The public should also check with trash collectors to determine if their state permits disposal of oil filters in landfills.

Applicability

Motorists that have their oil changed can be classified as a do-it-yourselfer or a do-it-for-me. Do-it-yourselfers change their own oil because they want to save money, they enjoy it, or they take pride in the quality of their own workmanship. According to a recent survey, more than 30 percent of motorists change their own oil. Between 43 and 62 million gallons of used oil were collected and recycled by do-it-yourselfers in 1997 (API, 2000). Therefore, it is important that do-it-yourselfers recycle their used oil. Do-it-for-mes have their oil changed at places such as service stations or quick lubes; they should be sure to check if their mechanic recycles motor oil.

To make recycling motor oil more convenient for the do-it-yourselfers, oil recycling programs should be located throughout all communities. Although oil recycling programs are appropriate in any community, urban areas are in particular need of programs, as more motor oil is used in these areas to maintain a larger number of vehicles. Therefore, oil recycling programs should more heavily target urban areas and provide a greater number of facilities for recycling oil in these areas.

Implementation

Oil recycling programs can be implemented easily throughout the country. Two types of programs currently in use are drop-off locations and curbside collection. Drop-off locations include service stations, recycling centers, auto parts retail stores, quick lubes, and landfills. These locations are effective because they are familiar, convenient, permanent, and well located. Additionally, sites that are permanent allow for effective publicity for recycling programs. Curbside collection programs allow consumers to put their oil out on the curb for collection, as they already do with their other recycling and trash. While this program is more convenient for the user, it requires a hauler to come and collect the oil. Oil recycling programs that use drop-off locations for collection are implemented by local governments, state governments, service stations, quick lubes, auto parts retailers, oil processors, or any combination of the above. Curbside collection programs are implemented by municipal or private waste haulers, municipal or private recycling haulers, or a combination of any of the above.

Local Recycling Programs. Many states, cities, and communities have developed their own recycling programs. For example, the California Integrated Waste Management Board sponsors a used oil recycling program that develops and promotes alternatives to illegal oil disposal. This is accomplished through a statewide network of collection opportunities and outreach efforts that publicize and encourage used oil recycling.

The program provides useful information for the public, including collection locations, certification information, proposed regulations, used oil facts, and a number of other resources. More information about this program can be found at *www.ciwmb.ca.gov/usedoil/Default.htm*. Other cities with used oil programs are King County, Washington; Kansas City, Missouri; Clark County, Ohio; and New Carollton, Maryland. All of these programs can be used as models for other communities to develop their own programs.

National Recycling Programs. In 1991, the American Petroleum Institute (API) established a used oil collection and recycling program. This program works to educate the public about collecting and recycling used oil, making oil collection more convenient, and ensuring that this valuable resource is handled appropriately. Information about API's Used Motor Oil Program is available at *www.recycleoil.org*. API has also developed model legislation, based on Florida's program, to encourage collection and recycling of used oil. Florida's legislation specifically requires states to create a special fund to help cities and towns establish used oil collection facilities. Additionally, it emphasizes the importance of educating the public about oil recycling. Guidance for developing collection programs, in the form of API's model legislation as well as guidebooks and publications, can be found at *www.recycleoil.org/legislative.htm*.

Benefits

Recycling used motor oil is beneficial to the environment, the public health, and the economy. If oil is improperly disposed of in landfills, ditches, or waterways or dumped on the ground or down storm sewers, it can migrate into surface and ground water. It takes only one gallon of oil to contaminate one million gallons of drinking water (USEPA, 2000). This same oil can also seriously harm aquatic plants and animals. Submerged vegetation is especially affected by oil because the oil blocks sunlight from entering the water and hinders photosynthesis. As motor oil causes 40 percent of the pollution in America's waterways (Mississippi DEQ), water pollution could dramatically decrease if that same oil was recycled.

It is also beneficial to recycle motor oil because one gallon of re-refined oil produces 2.5 quarts of lubricating oil, while 42 gallons of crude oil are necessary to produce this same amount. It also takes three times as much energy used to refine crude oil to lubricating oil than it does to re-refine used motor oil. If the 180 million gallons of recoverable motor oil that are thrown away each year were recycled, this would produce enough energy to power 360,000 homes annually. Finally, if the 1.3 billion gallons of oil wasted each year by the United States were re-refined, it would save 1.3 million barrels of oil a day (Mississippi DEQ).

Recycling used motor oil is also beneficial in protecting public health. As oil circulates through a car's engine, it collects rust, dirt, metal particles, and a variety of contaminants. Engine heat can also break down oil additives, producing acids and a number of other substances. Exhaust gases and antifreeze can also leak into oil when the engine is in use. When any of these substances mix with oil, the toxicity of oil is greatly increased. Then, if oil is disposed of improperly and enters the water or air, public health can be seriously threatened.

Recycling used motor oil is also beneficial to the economy. Oil is a valuable resource that can be re-refined and reused in combustion engines. As oil is a non-renewable resource, it will become increasingly more difficult to find new reserves in the future. Therefore, recycling will provide time to develop alternative fuels and lessen dependence on foreign oil suppliers.

Limitations

One limitation to recycling oil is the possibility of contamination during collection. If oil is mixed with other substances or if storage containers have residues of other substances, this can contaminate oil and make it a hazardous waste. In these cases, collection facilities are responsible for disposing of this hazardous waste and abiding by appropriate rules. Another limitation is educating the public. While oil recycling programs can be effective, it is often difficult to effectively educate the public and convince them of the importance of recycling oil. This limitation can be addressed if municipalities include recycling information in utility bill inserts, newspaper ads, and mailings. A last limitation is that some might find it inconvenient to take their oil to a recycling facility. People may not have time to drive their oil to a facility or the facility may be difficult to find. When this happens, people are more likely to dispose of their oil improperly.

Effectiveness

According to a 1998 survey, 30 percent of motorists change their oil themselves. Of those people, 12 to 15 percent report that they improperly dispose of their oil. While most people claim that they put the oil in the trash, 3 to 5 percent say that they dispose of their oil in a storm drain system. Based on this survey, more than half of do-it-yourselfers improperly dispose of used motor oil. A 1994 survey reports that of the 28 percent who are do-it yourselfers, 17 percent report improper disposal. These statistics can be improved through better advertisement of recycling facilities and by making recycling more convenient for the public.

Costs

Costs for used motor oil recycling programs vary depending on whether a community has already established similar types of recycling programs. Major costs associated with oil recycling programs include advertisement costs and oil collection costs. While service stations and collection facilities often allow the public to drop off their oil free of charge, these facilities must pay a recovery service to collect and dispose of their accumulated oil. One such recovery service, US Filter, charges an annual fee of $179 for unlimited waste oil removal, or a $79 fee for one-time oil removal, from service stations, small garage owners, and other types of collection facilities. Costs for programs also vary, depending on whether oil is collected by curbside pickup or at drop-off facilities. As fees will vary, check with a local recovery service for more specific information about oil collection fees.

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Materials Management

Pollution Prevention/Good Housekeeping for Municipal Operations

Description

Responsibly managing common chemicals, such as fertilizers, solvents, paints, cleaners, and automotive products, can significantly reduce polluted runoff (WEF and ASCE, 1998). Such products must be handled properly in all stages of their useful lives. Materials management entails the selection of the individual product, the correct use and storage of the product, and the responsible disposal of associated waste(s).

Applicability

In many cases, industries can implement simple housekeeping practices in order to manage materials more effectively. Proper management reduces the likelihood of accidental spills or releases of hazardous materials during storm events. In addition, health and safety conditions at the facility will improve.

Some simple practices for managing materials are improving maintenance of industrial machinery, establishing material storage and inventory controls, improving routine cleaning and inspection of facilities where materials are stored or processed, maintaining organized workplaces, and educating employees about the benefits of the above practices (USEPA, 1992).

Maintenance Considerations

Maintenance associated with materials management should be designed to minimize the amounts of materials used and the wastes generated by industrial processes. Procedures for operation and maintenance can easily be integrated into an industry's management plan. Simple processes, such as routine cleaning of work spaces, proper collection and disposal of wastes, maintenance of machinery, regular inspections of equipment and facilities, and training employees to respond to spills or leaks, have significant effects on reducing storm water runoff.

Another consideration is regular material inventories. Such inventories reduce the occurrence of overstocking hazardous materials, increase knowledge about what hazardous materials are present and how they are stored, and provide documentation of proper handling of hazardous materials. An inventory of hazardous materials present at a particular site consists of three major steps (USEPA, 1992):

- Identify all hazardous and nonhazardous substances present in a facility. This can be accomplished by reviewing all purchase orders for the facility and walking through the facility itself. Compile a list of all chemicals present in a facility and obtain a Material Safety Data Sheet (MSDS) for each one.
- Label all containers with the name of the chemical, unit number, expiration date, handling instructions, and health or environmental hazards. Much of this information will be found on the MSDS. Often, insufficient labeling leads to improper handling or disposal of hazardous substances.
- Make special note on the inventory of hazardous chemicals that require special handling, storage, or disposal.

Cost Considerations

The major costs of these BMPs can be attributed to additional labor. Depending on the extent of the program, varying amounts of staff hours will be required for the necessary education of municipal employees, local businesses, and the public. In addition, posters and bulletin boards that encourage the proper management of materials should be displayed throughout the facility.

References

WEF and the ASCE. 1998. *Urban Runoff Quality Management*. WEF Manual of Practice No. 23 and ASCE Manual and Report on Engineering Practice No. 87. Water Environment Federation, Technical Practice Committee, Water Quality and Ecology Subcommittee, Alexandria, VA, and American Society of Civil Engineers, Urban Water Resources Research Council, Reston, VA.

USEPA. 1992. *Storm Water Management for Industrial Activities*. U.S. Environmental Protection Agency, Office of Water, Washington, DC.