



Targeted Constituents

<input checked="" type="radio"/> Significant Benefit		<input type="radio"/> Partial Benefit		<input type="radio"/> Low or Unknown Benefit	
<input type="radio"/> Sediment	<input checked="" type="radio"/> Heavy Metals	<input type="radio"/> Floatable Materials	<input checked="" type="radio"/> Oxygen Demanding Substances		
<input type="radio"/> Nutrients	<input checked="" type="radio"/> Toxic Materials	<input checked="" type="radio"/> Oil & Grease	<input type="radio"/> Bacteria & Viruses	<input type="radio"/> Construction Wastes	

Description Prevent or reduce the discharge of pollutants to stormwater from outdoor container storage areas by installing safeguards against accidental releases, installing secondary containment, conducting regular inspections, and training employees in standard operating procedures and spill cleanup techniques. This management practice is likely to create a significant reduction in heavy metals, toxic materials, oil and grease, and oxygen demanding substances.

Approach Accidental releases of materials from aboveground liquid storage tanks, drums, dumpsters, or other containers have the potential for contaminating stormwaters with many different pollutants. Materials spilled, leaked, or lost from storage containers and dumpsters may accumulate in soils or on the surfaces and be carried away by stormwater runoff.

Storage of liquid containers should preferably occur within a manufactured building so that any leaks or spills can be completely contained. In addition, a manufactured building will provide a degree of protection against natural disasters, vandalism, and other damage. It should be noted that the storage of reactive, ignitable, or flammable liquids must comply with all safety regulations and fire codes.

The most important factors in preventing pollution from entering stormwater runoff are:

- Maintain organized and safe working conditions.
- Train all employees in proper methods and procedures.
- Limit exposure of material to rainfall and stormwater runoff.
- Contain leaks and spills during transfer operations.
- Check and maintain equipment regularly for proper operation.

Related BMPs include:

- AM-06 Material Delivery and Storage
- AM-07 Spill Prevention and Control
- IC-02 Outdoor Loading and Unloading of Materials

The most common causes of unintentional releases are:

- External corrosion and structural failure
- Installation problems
- Spills and overfills due to operator error
- Failure of piping systems (pipes, pumps, flanges, couplings, hoses and valves)

Training

- Well-trained employees can reduce human errors that lead to accidental releases or spills. Operator errors can be prevented by using engineering safeguards and thus reducing accidental releases of pollutant.
- Employees should be familiar with the Spill Prevention Control and Countermeasure (SPCC) Plan. The employee should have the tools and knowledge to immediately begin cleaning up a spill if one should occur.
- Employees should periodically review material safety data sheets (MSDS). They should be aware of material content, potential hazards, and safety procedures required in the event of a spill or leak.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings). Designate a foreman or supervisor to oversee and enforce proper spill prevention and control.

Liquid Container Management

- To limit the possibility of stormwater pollution, containers used to store dangerous waste or other liquids should be kept inside a manufactured building. However, this may be impractical due to site constraints. Small inexpensive storage buildings can often be used when a permanent building is not feasible. Service bays, shacks, or even doghouses are also alternatives to be considered, provided that safety and fire codes are not violated.
- Protect outdoor liquid containers rainfall and stormwater runoff with the following measures:
 - Cover storage area with a roof
 - Minimize stormwater runoff by enclosing area with a berm or ditch
 - Use covered dumpsters to store liquid containers
- Storage of any threshold quantity of oil or hazardous materials must meet specific federal and state standards that include, as a minimum:
 - SPCC Plan
 - Secondary containment
 - Leak-detection monitoring and inspections
 - Emergency preparedness plans
- Safeguard against accidental releases by using the following equipment:
 - Overflow protection devices to warn operator
 - Automatic shutdown transfer pumps
 - Guardposts/bollards around tanks and piping to prevent vehicle or forklift damage
 - Clearly labeled tags and other identifiers, including color coding

- Restricting access to valves

- Large storage tanks, piping systems, and other types of storage systems must be inspected regularly by specially-trained professionals, such as a registered structural or mechanical engineer. An engineer can identify and correct potential problems such as loose fittings, poor welding, and improper gaskets. Tank foundations, connections, and coatings should also be inspected. Document all inspections, including photographs when appropriate.
- Regular inspection for corrosion, leaks, cracks, or other physical damage may require that the tank or piping system be emptied. Closely observe structural reactions during filling and unfilling of tanks and piping systems in order to verify integrity; this is usually the time of greatest stress for a system.

Secondary Containment

- Some common measures that are used for secondary containment include berms, dikes, vaults, double-walled tanks, and dumpsters. Some secondary containment structures need to be designed by a professional engineer with experience and training. The hydrostatic pressure of a few feet of water or other liquids can be very heavy.
- Secondary containment structures must be made of materials that will not react or degrade with the liquids in storage. Strong acids or bases may react with metal containers, concrete, and some plastics. Some organic chemicals may need certain special liners for dikes. Earthen dikes are strongly discouraged but may be okay for some applications. A wide variety of coatings are available for tanks or dikes.
- Secondary containment measures will generally require a positive means of control, such as a clearly labeled valve or plug, to prevent the release of stormwater contaminated by spills or leaks.
- Secondary containment structures should provide at least 10 percent of the volume of all of the containers or 110 percent of the volume of the largest container, whichever is greater. Secondary containment structures, which allow access for a truck or railcar may need to consider the truck or railcar to be the largest container.
- Secondary containment structures open to the weather must provide an additional allowance for rainfall. Typically a volume that corresponds to a 10-year, 24-hour storm is used, unless federal, state, or local regulations require storage for a larger rainfall event.
- Containment dikes may consist of berms, curbs, retaining walls, or manufactured walls that are designed to hold spills. Dikes are an effective pollution prevention measure for aboveground storage tanks, provided that an effective plan for managing stormwater is in place. Dikes must be inspected daily and there must be clearly designated responsibilities for releasing stormwater. Sampling of stormwater may be required prior to releasing from a diked area.
- For small volumes of storage, the least expensive form of dikes is probably curbing. Curbing is commonly used beneath piping systems that contain small diameter pipes. Curbing can redirect contaminated stormwater away from the storage area. Common curbing materials are asphalt, concrete, synthetic materials, metal, or other impenetrable materials. Inspection and maintenance should be conducted frequently on curbing, as vehicles and equipment can easily damage curbing so as to reduce the impounded storage volume.

- Dumpsters may be used as secondary containment, provided that they are properly labeled and are in good condition, without corrosion or leaky seams. All drain valves should be closed. Do not allow garbage to be placed into secondary containment dumpsters. Do not use garbage dumpsters as a temporary place for secondary containment.
- Facilities with “spill ponds” designed to intercept, treat, or divert spills should contact the Tennessee Department of Environment and Conservation (TDEC) regarding environmental compliance. Spill ponds are not currently an environmentally acceptable means of ensuring secondary containment.

Spill Cleanup

- The City of Knoxville Engineering Department and the Tennessee Department of Environment and Conservation (TDEC) both require immediate notification of all spills or leaks, in any amount, to the water or soil.
- Different amounts of spilled material may require different levels of response. Make sure that each employee knows what a “significant spill” is for each material they use, and what is the appropriate response for “significant” and “minor” spills. A significant spill should be defined after review of MSDS or other descriptive documentation that presents the contents and proper handling procedures. Consult AM-07, Spill Prevention and Control, for general information on what constitutes a minor spill or a significant spill.
- Place a stockpile of spill cleanup materials where it will be readily accessible. Train employees in spill prevention and cleanup procedures for the site. Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Clean up leaks and spills immediately using dry methods when possible. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then used cleanup materials are also hazardous and must be sent to either a certified laundry or disposed as hazardous waste. Do not discharge hazardous materials into sanitary sewer system without contacting Knoxville Utilities Board (KUB) and receiving written permission.
- Many businesses, commercial facilities and industries are required to have a SPCC Plan. The SPCC Plan must have procedures for specific chemicals that are frequently used. The SPCC Plan must contain emergency contact numbers in addition to telephone numbers for emergency response organizations and regulatory agencies.

Maintenance

- Inspect storage areas at least weekly and during rainfall events to be sure that stormwater pollution is not being generated. Verify that designated storage areas are kept clean and well organized. Verify that dikes and curbing maintain the ability to retain stormwater.
- Repair and replace perimeter controls, containment structures, and enclosures as needed to keep them properly functioning. The frequency of repairs may depend on the age of the facility.
- Conduct routine weekly inspections that includes the following items:
 - External corrosion and structural failure
 - Evidence of spills and overfills due to operator error
 - Piping system (pipes, pumps, flanges, coupling, hoses, and valves)

- Loose fittings and improper or poorly fitted gaskets
- Tank foundations, connections, and coatings

Limitations Space limitations or site constraints may preclude indoor storage.
Storage sheds must meet building & fire code requirements.
Costs may be prohibitive when covering a large loading/unloading area.

References **31, 33, 34, 35, 98, 99, 103, 138** (see BMP Manual Chapter 10 for list)