

Chapter 4. Source Control Measures

Source Control Principles

Source control measures are designed to prevent pollutants from contacting site runoff, leaving the site and entering the municipal storm drain system or local waterways. Development and redevelopment projects are required to employ source control measures appropriate to the planned site operations/activities (see Table 3-3 in Chapter 3, **Steps to Managing Stormwater Quality**).

This design manual addresses source control measures that can be implemented as part of the project design process. As noted in Chapter 1, it does not include ongoing behavioral-based, operational source control measures such as good housekeeping practices, spill control procedures and employee training. For information about operational best management practices to reduce stormwater pollution, consult the local permitting agencies, visit www.beriverfriendly.net (select “Industrial/Commercial Element”), and/or look for that information in the *California Stormwater Best Management Practice Handbook* (www.cabmphandbooks.com).

Source control measures apply to both stormwater and prohibited non-stormwater discharges. Non-stormwater discharges include anything not composed entirely of stormwater (such as cooling water, process wastewater, etc.). Stormwater that is mixed or commingled with other non-stormwater flows is considered non-stormwater. Local, state or federal permits may be required for discharges of stormwater and non-stormwater to the storm drain system or a water body. To verify this, check with your local permitting agency.

Exceptions to non-stormwater discharge prohibition include the following (provided that any such discharge does not cause or contribute to the violation of any receiving water limitations):

- Water line flushing
- Landscape irrigation
- Diverted stream flows
- Rising ground waters
- Uncontaminated ground water infiltration
- Uncontaminated pumped ground water
- Discharges from potable water sources
- Foundation drains
- Air conditioning condensate
- Uncontaminated irrigation water
- Springs
- Water from crawl space pumps
- Footing drains
- Lawn watering
- Individual residential car washing
- Flows from riparian habitat and wetlands
- Dechlorinated swimming pool discharges

- Discharges or flows from emergency firefighting activities

Selecting Source Control Measures for Your Project

Use Table 3-3 to determine which source control measures are required for your project.

Some of the source control measures described in this chapter suggest discharging potentially polluted site runoff to the sanitary sewer system. This requires prior approval of the local sanitation district and may require a permit. Discharges of certain types of flows to the sanitary sewer system may be cost prohibitive due to connection fees and flow charges. Appendix C provides permitting and contact information for the various sanitation district agencies in this area.

Source Control Fact Sheets

This chapter includes fact sheets for all of the source control measures listed in Table 3-3. Each fact sheet describes the purpose of the control measure, applicability, design requirements, and any operation and maintenance issues that may affect its design.

References

The following general references were used to develop this chapter and the fact sheets found at the end of this chapter:

- California Stormwater Quality Association, *California Storm Water Best Management Practice Handbook for New Development and Redevelopment*, January 2003 (Revised September 2004). <http://www.cabmphandbooks.com>
- City of Austin, Texas, *Earth-wise Guide to Irrigation*, <http://www.austintexas.gov/sites/default/files/files/Watershed/growgreen/irrigation.pdf>.
- City of Olympia, Washington, *Water Wise Irrigation*, <http://m.olympiawa.gov/city-utilities/drinking-water/conservation.aspx>.
- City of Portland, *City of Portland Stormwater Management Manual*, September 2004 (Revised 2008). <https://www.portlandoregon.gov/citycode/article/12548>
- City of Sacramento, Department of Utilities, *Frequently Asked Questions: Water Conservation Ordinance and Water Efficiency*, <https://www.cityofsacramento.org/Utilities/Conservation>
- City of Sunnyvale, *The City of Sunnyvale Stormwater Quality BMP Guidance Manual for New and Redevelopment Projects*, October 2003 (Revised December 2011). http://qcode.us/codes/sunnyvale/?view=desktop&topic=12-12_60-12_60_040
- Portland Water Bureau, *Irrigation Fact Sheet*, <http://www.portlandoregon.gov/water/article/268759>.
- River-Friendly Landscaping, *The Seven Principles of River-Friendly Landscaping (RFL)*, <http://www.msa.saccounty.net/sactostormwater/RFL/principles.asp>, accessed 6/12/13.

- Sacramento Stormwater Management Program, *BMPs for Industrial Stormwater Pollution Control*, 2001. <http://www.waterresources.saccounty.net/stormwater/documents/industrial-BMP-manual.pdf>
- Sacramento Stormwater Quality Partnership, *Guidance Manual for On-Site Stormwater Quality Control Measures*, January 2000.
- State of Washington, Department of Ecology, *Stormwater Management Manual for Western Washington*, Volume 1, February 2005 (Revised 2012). <http://www.ecy.wa.gov/programs/wq/stormwater/manual.html>
- University of Nevada, Reno, *Using Fertilizers Properly, A Tahoe Landscape BMP Fact Sheet for Lake Tahoe*, Fact Sheet 94-11.

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Efficient Irrigation

Purpose

This fact sheet provides details about efficient irrigation for the purpose of reducing water use and dry weather runoff from excess irrigation for residential and commercial projects. Improper irrigation generates runoff that transports bacteria, fertilizers and pesticides to local natural waterways. Some jurisdictions have specific water conservation ordinances that outline how customers can save water by adjusting their irrigation schedules to prevent overspray and runoff. Below are links to some of the jurisdiction's water conservation codes.

- City of Elk Grove: Chapter 14.10 Water Efficient Landscape Requirements
<http://www.codepublishing.com/CA/ElkGrove/html/ElkGrove14/ElkGrove1410.html#14.10>
- City of Folsom: Municipal Code, Title 13 Water and Sewage – Chapter 13.26 Water Conservation
http://www.folsom.ca.us/depts/city_clerk/charter.asp
- Citrus Heights: Municipal Code, Chapter 98 – Utilities, Article II. - Water, Division 3. – Use and Conservation
<http://library.municode.com/index.aspx?clientId=13326>
- City of Sacramento: Water Efficient Landscape Requirements-Chapter 15.92: Landscaping Requirements for Water Conservation
http://www.qcode.us/codes/sacramento/?view=desktop&topic=15-15_92-15_92_010
- City of Galt Water: Chapter 13.10: Water Conservation
<http://www.codepublishing.com/CA/galt/>
- County of Sacramento and City of Rancho Cordova: Title 14 Agricultural Activities And Water Use And Conservation
http://qcode.us/codes/sacramentocounty/view.php?topic=14-14_10&frames=on

Some ordinances have strong enforcement measures including fines for repeat offenders. By following a few simple steps for efficient irrigation, residents can make a positive impact on local water quality.

Applicability

Efficient irrigation should be implemented to the maximum extent practicable for all landscaped areas that require irrigation and in accordance with Model Water Efficient Landscape Ordinance AB 1881.

Design Requirements

General

Most irrigation systems can easily be designed or updated to offer maximum water use efficiency and prevent runoff. A well-designed irrigation system will deliver the appropriate amount of water needed, but will not generate excess runoff or overspray onto impervious surfaces. Automatic shutoff valves that turn off irrigation systems when there is a broken pipe or sprinkler head, or when it is raining, should be incorporated into the design. Timers should be installed to control the schedule of the irrigation. Landscapes should include drought tolerant vegetation where feasible, reducing the required frequency of watering.

Smart irrigation controllers can automatically adjust the rate and timing of irrigation based on soil and weather conditions. These systems often use historic weather data as well as site-specific data and include underground sensors that monitor soil moisture. Smart systems will not only automatically shut off when it is raining, but can also make automatic seasonal adjustments.

Manual Irrigation

There are a variety of products available to make hand watering easy – soaker hoses, automatic shutoff hose nozzles, and portable sprinklers. When watering manually, allow water to soak into the ground by using slow spray patterns as opposed to a constant and direct watering stream; many commercially available portable sprinklers incorporate a rotor action to meet this need.

Drip/Micro Spray Irrigation

Drip irrigation is the most effective way of getting water directly to plant roots. This is done by delivering small amounts of water to the ground over a longer period of time. This eliminates wasted water to misting, foliage blockage, and overspray, and also significantly reduces the potential for runoff. These systems work very well in areas with clay soils; which are more prone to irrigation runoff, or cobble/rocky soils, which can drain too quickly. There are several different types of drip irrigation systems that are available – bubblers, micro sprayers and drippers. Drip systems require a low pressure water system. This can be achieved by installing a pressure regulator to an existing in-ground system. These systems can clog over time from lime build up and suspended particles - installing filter systems can help alleviate this problem. Most systems come pre-packaged with user installation and operation instructions.

Scheduling

- To reduce water loss from evaporation, water landscapes before 10 a.m. or after 6 p.m.
- Spring and Summer- irrigate no more than three times per week.
- Fall and Winter- keep systems turned off as much as possible and irrigate no more than once per week when necessary.
- Reduce the frequency of irrigation during and immediately after rain events. Automatic shut off devices can be used to automatically stop irrigation during a rain event.
- New landscaping may require more frequent irrigation for root establishment.

Operation & Maintenance

- Check for broken sprinkler heads and leaks monthly. Leaks are easy identified by looking for wet spots, areas that are overgrown or weak water outputs.
- Cap, close (tighten small screw on top), or remove any unnecessary sprinklers.
- If a sprinkler head is blocked by foliage move the sprinkler head, install a riser, or eliminate the foliage.

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Fueling Areas

Purpose

This fact sheet specifies how to locate and design vehicle and equipment fueling areas so that pollutants do not enter the storm drainage system and receiving waters. Leaked engine fluids and spilled fuel inevitably accumulate on the pavement around fueling areas, and they contain toxic materials and heavy metals that are not easily removed by stormwater treatment devices. The design requirements on this fact sheet are intended to prevent spilled fuel and other potential pollutants (such as oil and grease, solvents, car battery acid, and coolant) from contacting stormwater runoff or entering the storm drainage system.



Covered fueling area. Photo source unknown

Applicability

This fact sheet applies to design of fueling areas at new development or significant redevelopment of retail or commercial gasoline outlets, automobile maintenance/repair facilities, corporation yards, and any other facility incorporating a permanent fueling area. This fact sheet is intended for use during facility design and therefore does not address mobile fueling operations. It also does not include requirements for design of bulk fuel terminals (fuel farms). Contact the local permitting agency for requirements applicable to that type of industrial development.

Design Requirements

To protect water quality, design vehicle or equipment fueling areas as explained in Table FA-1. Design requirements on this fact sheet are intended to supplement (not supersede) those in other codes (such as the Building, Fire, and Zoning Codes and the hazardous waste requirements in Title 22, California Code of Regulations, as applicable). Discuss any potential conflicts with the local permitting agency early in the planning process before proceeding with design.

Fueling Areas



Interceptor drains on the fueling pad perimeter at this retail gasoline outlet in Folsom catch spills and incidental contaminated wash water and direct it to an onsite 750-gal underground containment tank.



This retail gasoline outlet in Folsom has perimeter drains around both the concrete fueling pad and the concrete fuel transfer area. The drain carries spills and runoff to an onsite underground containment tank.

Operation and Maintenance

The design features required by this fact sheet need to be maintained and properly operated and may be subject to inspections by local fire and/or sanitary sewer agencies, depending on the configuration.

Table FA-1. Design Requirements for Fueling Areas to Protect Water Quality

Design Feature	Requirement
Paving	<ul style="list-style-type: none"> ▪ Use Portland cement concrete for the surface of the fuel dispensing area, which is defined as the entire area between adjacent fuel pumps and extending out at least 6.5 ft. beyond the outer edges of the perimeter pumps. Asphalt is not permitted. ▪ Use Portland cement concrete for the surface of the fuel transfer area. Asphalt is not permitted. ▪ Use asphalt sealant to protect any asphalt paved areas surrounding the concrete fueling and transfer areas.
Cover	<ul style="list-style-type: none"> ▪ Cover the fueling area with a roof structure or canopy unless the fueling area will be used routinely for oversized equipment or vehicles (such as cranes) that cannot be accommodated under cover. In such cases, special drainage requirements will apply; check with local permitting agency. ▪ Design the cover height per the building code (CBC 311.2.3.2 minimum cover height is currently 13'-6"). ▪ Extend the cover at least 5 feet beyond the fuel dispensing area.

Design Feature	Requirement
Grading/ Drainage	<ul style="list-style-type: none"> ▪ Design drainage system so that runoff from the roof/canopy is directed to an on-site vegetated area prior to connection to the storm drain system. ▪ If possible, design the fuel dispensing and transfer area pads with adequate slope to keep minor spills on the pad and encourage proper cleanup. Check this with the local permitting agency. ▪ Do not place a storm drain inlet in or near the fuel dispensing area (discharge to the storm drain system is not allowed). Check with local permitting agency to determine if there are minimum spacing requirements between fueling area and nearest inlet. ▪ Hydraulically isolate the fuel dispensing and transfer areas from the rest of the site to contain spills and incidental wash water, prevent run-on, and prevent stormwater runoff from carrying pollutants away. Use one of the following methods: <ul style="list-style-type: none"> ▪ Berms: Design the pad as a spill containment pad with a sill or berm raised at least 4 inches (raised sills are not required at open gate trenches that connect to an approved drainage control system.) ▪ Perimeter drains: Locate drains around the perimeter of the pad. Drain accumulated water in one of two ways, depending on local permitting agency requirements: 1) to an onsite containment system (for eventual pump-out and off-site disposal), or 2) to the sanitary sewer, if equipped with automatic shutoff valve (see next section of table). ▪ Ensure that all grading, grade breaks and berms comply with applicable ADA requirements for disabled access.
Onsite Containment System	<ul style="list-style-type: none"> ▪ If the local permitting agency and fire district (in some cases two different agencies) allows the connection of inlets or interceptor drains in the fuel dispensing and/or transfer area(s) to an onsite containment tank, then size the tank according to applicable requirements.
Connections to sanitary system	<ul style="list-style-type: none"> ▪ If the sanitary sewer connection permitting agency allows inlets or interceptor drains that drain the fuel dispensing and/or transfer area(s) to connect to the sanitary sewer, equip such inlets and drains with a shutoff valve <u>or</u> spill control manhole (see below) to keep fuel out of the sanitary sewer in the event of a spill. See appendix “C” for contact information for the local sanitary sewer connection agencies. ▪ Spill control manhole option: Install manhole on the discharge line of the fueling pad (before the sanitary sewer line tie in); extend the tee section 18 inches below the outlet elevation and provide 60 cubic feet of dead storage volume (for oil, grease, and solids) below the outlet elevation.
Signage	<ul style="list-style-type: none"> ▪ If not otherwise required, post signs that state, “Do not top off gas tanks” to prevent spills. ▪ Post sign(s) explaining the operation of any shut-off valves for facility employees, if applicable.
<p><i>These requirements are intended to supplement, not supersede, those found in other codes (e.g., building, plumbing, fire). If conflicts are identified, consult with the local development permitting agency and other agencies as needed (e.g., fire, sanitation district) for resolution.</i></p>	

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Landscaping

Purpose

Proper planning and design of landscaping is an easy way to positively impact local and regional water quality. Aside from the aesthetic value that is created, a well-designed landscape is an effective source control measure that can reduce runoff volume, peak flow rate, pollutant load, and water usage.

Applicability

The source control options provided in this fact sheet must be considered within all new development and redevelopment projects, and incorporated to the maximum extent practicable.



2500 River Plaza, City of Sacramento

Design Requirements

When designing landscape to reduce water quality impacts, the following design principles should be considered:

- Incorporate natural depressions, rain gardens and/or swales into the design to maximize natural water storage and infiltration opportunities. Refer to the Bioretention Planter and Vegetated Swale BMP Fact Sheets.
- Protect existing slopes and channels (additional guidance can be found in the City of Sacramento Manual for Grading and Erosion and Sediment Control¹, from CASQA and/or other local agency publications).
 - Protect disturbed slopes and channel crossings as quickly as possible.
 - Use methods to slow runoff flow where appropriate to prevent erosion.
- Organic fertilizers should be used instead of synthetic fertilizer because they are less soluble in water and less likely to be transported to natural water ways by stormwater runoff. In some cases, use of organic wood mulch can eliminate the need to use any fertilizers.

¹ <http://www.sacstormwater.org/ConstructionandNewDevelopment/ConstructionandNewDevelopment.html>

Landscaping

The Sacramento Stormwater Quality Partnership has adopted several principles of “river-friendly” landscaping. These include the following:

- Landscape locally – take into account the existing site characteristics.
- Landscape for less to the landfill – compost onsite plant debris and select plants that require minimal pruning.
- Nurture the soil – amend the soil with compost before planting and mulch regularly after planting.
- Conserve Water – minimize the use of lawns and select drought resistant Californian & native plant varieties.
- Conserve Energy – plant trees to shade homes and reduce unnecessary outdoor lighting.
- Protect water & air quality – Minimize the use of pesticides.
- Create and protect wildlife habitat – preserve existing vegetation and select native plants.

Operation and Maintenance

General

- Reduce the potential for dry weather runoff by installing efficient irrigation systems (see Efficient Irrigation BMP Fact Sheet).
- Over watering after fertilizer application can leach nitrogen into the surrounding water ways.
- Apply fertilizer only in the spring and fall (if needed).
- Sweep up all fertilizer, soil and plant clippings off of paved surfaces to prevent contact with stormwater runoff.
- Limit soil compaction when constructing landscaped areas. Compaction will reduce the amount of runoff that can be stored and infiltrated.

Fertilizer Application

If fertilizers are improperly applied, the nutrients they contain will bypass the plant and end up polluting stormwater runoff. These nutrients can cause detrimental algae blooms in the receiving creek. It is very important to follow the instructions included with the fertilizer for application. There are several different fertilized application methods:

- Surface Application – a fertilizer spreader should be used to apply evenly over an area.
- Soil Incorporation – the best method for applying low soluble nutrients like potassium and phosphorus is to place it into a hole or a trench dug around an individual plant.
- Foliage Spraying - spraying a fertilizer solution onto the leaves of plants is an efficient way to apply micro nutrients such as zinc and iron. It is not recommended for applying potassium or phosphorus.

Table L-1 Fertilizer Comparison

Fertilizer Type*:	Nutrient Origin	Advantages	Disadvantages
Organic	Remains or byproduct of ounce-living organisms, such as compost, bone meal, sewage sludge and fish emulsion	Improves soil health, less leachable, contains multiple nutrients	High cost per unit of nutrient
Inorganic (synthetic)	Synthesized from non-living materials. They are typically salts like ammonium sulfate, potassium chloride and potassium phosphate.	Low cost, consistent nutrient levels, readily available to plants, easy to handle	Potential loss by leaching, more easily over-applied

*Use of mulch can reduce or eliminate the need to apply fertilizer

References Used to Develop This Fact Sheet

- California Stormwater Quality Association, *California Storm Water Best Management Practice Handbook for New Development and Redevelopment*, January 2003 (revised September 2004). www.cabmphandbooks.com
- River-Friendly Landscaping, *The Seven Principles of River-Friendly Landscaping (RFL)*, <http://www.msa.saccounty.net/sactostormwater/RFL/principles.asp>, accessed 6/12/13.
- University of Nevada, Reno, *Using Fertilizers Properly, A Tahoe Landscape BMP Fact Sheet for Lake Tahoe*, Fact Sheet 94-11.

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Loading Areas

Purpose

This fact sheet specifies how to design loading/unloading areas to minimize the chance of spills and leaks and to keep any spilled/leaked materials out of the storm drain system and receiving waters. Potential pollutants addressed depend on the operations and materials being handled, but may include toxic compounds, oil and grease, nutrients, suspended solids, fluids leaked from delivery vehicles, and/or other contaminants. Leaked fluids from delivery vehicles can also accumulate in the loading area.



*Delivery loading/unloading area.
Photo source unknown*

Applicability

Refer to Table 3-3 regarding the project land use types that need to comply with this fact sheet. The design requirements provided in this fact sheet are primarily intended for new development. If applied to significant redevelopment, the requirements would only apply in the case of complete redesign of the loading area.

Design Requirements

To protect water quality, design loading/unloading areas as explained in Table LA-1. These requirements are not intended to supersede other codes or other loading dock design or access requirements established by individual companies; discuss any potential conflicts with the local permitting agency early in the planning process before proceeding with design. It is recognized that some land uses (e.g., food-handling, chemical distribution, hazardous materials) have a greater potential to pollute stormwater if spills were to occur than other land uses and the level of control needed therefore varies. However, most times agency planners/reviewers will not know the use of the building at the time of plan approval. Further, warehouses and other buildings often have tenant turnover and use/materials handled will change over time. Therefore, a single set of design requirements is provided in order to address all anticipated land use types.

Operation and Maintenance

The design features required by this fact sheet need to be maintained and properly operated. This includes proper handling and disposal of any materials which may accumulate in the spill

Loading Areas

containment vault. In addition, features may be subject to inspections by local fire and/or sanitary sewer agencies, depending on the configuration.

Table LA-1. Design Requirements for Loading Areas to Protect Water Quality

Design Feature	Requirement
Paving	<ul style="list-style-type: none"> ▪ Pave the loading area with an impervious paving material that is compatible with materials that will be loaded/unloaded. For example, use Portland Cement Concrete if gasoline or other materials that react with asphalt will be loaded/unloaded.
Cover	<ul style="list-style-type: none"> ▪ Several options are presented for covering the active loading area, to minimize the exposure of pollutants to rainfall and runoff; check with the local permitting agency on which of the options will be allowed for the project: ▪ Option 1. If feasible, design the facility so loading/unloading occurs inside an indoor loading bay. This is the best option from the perspective of protecting stormwater quality. If this is not feasible, consider the next option. ▪ Option 2. For buildings with less than 10 bays, provide a roof overhang that extends at least 10 feet beyond the loading dock (or the building face, if there isn't a loading dock). If the building includes 10 or more bays or a cover is deemed otherwise not feasible, consider the next option and proceed to "Grading/Drainage" element of this table. ▪ Option 3. Use of a door skirt that fits snugly to both the trailer end and the building door during material transfers maybe allowed on a case-by-case basis. Check with the permitting agency for verification.
Grading/Drainage	<ul style="list-style-type: none"> ▪ Direct runoff from roof downspouts away from the loading/unloading areas. ▪ Design outdoor loading areas so that the first 6 ft. of pavement, as measured from the dock face (or from the building if there is no elevated loading dock) is hydraulically isolated to prevent runoff/runoff. This can be accomplished with berms, grading, or interceptor drains. See Figure LA-1 for suggested configuration using interceptor drains; check acceptability of this method with local permitting agency. ▪ Option 1: Drain the hydraulically isolated area to a pretreatment device (e.g., oil/water separator) then to the sanitary sewer (discharge to the storm drain system is not allowed); equip the system with an emergency spill shut-off/diversion valve as described below. Verify that this is acceptable to the local permitting agency; the agency may require a cover on the entire area draining to the sanitary sewer. ▪ Option 2: For projects that can't connect to the sanitary sewer, loading areas can be hydraulically isolated from the rest of the site drainage system using any approved treatment BMP. The selected treatment BMP shall be designed to treat the WQF or WQV from the loading dock area, plus 312 gallons. The selected treatment BMP must be solely dedicated to treating runoff from the loading area. A maintenance agreement will be required for the selected treatment BMP. ▪ Refer to Appendix C for sanitary sewer connection and contact information.

Design Feature	Requirement
Spill Control Diversion Valve and Containment Tank	<ul style="list-style-type: none"> ▪ Equip the drainage system with an emergency spill shut-off/diversion valve. ▪ The bypass on the shut-off valve should flow to an adequately-sized* spill containment vault located a safe distance away from structures due to potential for explosive/fire reaction (see Figure LA-1). This is subject to approval of local permitting agency and fire department/district (could be two different agencies). <p><i>*The size of the spill containment vault should be equal to 125% of the volume of the largest container handled at the facility. If this is not known, assume that 250 gal is typically largest size handled at the loading areas. Containment vault would be 312 gal in this case.</i></p>
Indoor Loading Areas – no obstruction zones	<ul style="list-style-type: none"> ▪ If loading is designed to occur indoors (beyond a bay door), provide a 10-ft. no obstruction zone within the building to allow the truck to extend inside and to provide a staging area. Clearly identify the no obstruction zone on the building plan. Clearly mark the no obstruction zone at an interior transfer area using bright or fluorescent floor paint.
Signage for Spill Control Features	<ul style="list-style-type: none"> ▪ Provide signage to identify the location and simple use instructions of any spill control/response design features (such as shutoff valves or spill response kits).
<p><i>These requirements are intended to supplement, not supersede, those found in other codes (e.g., building, plumbing, fire). If conflicts are identified, consult with the local development permitting agency and other agencies as needed (e.g., fire, sanitation district) for resolution.</i></p>	

Loading Areas

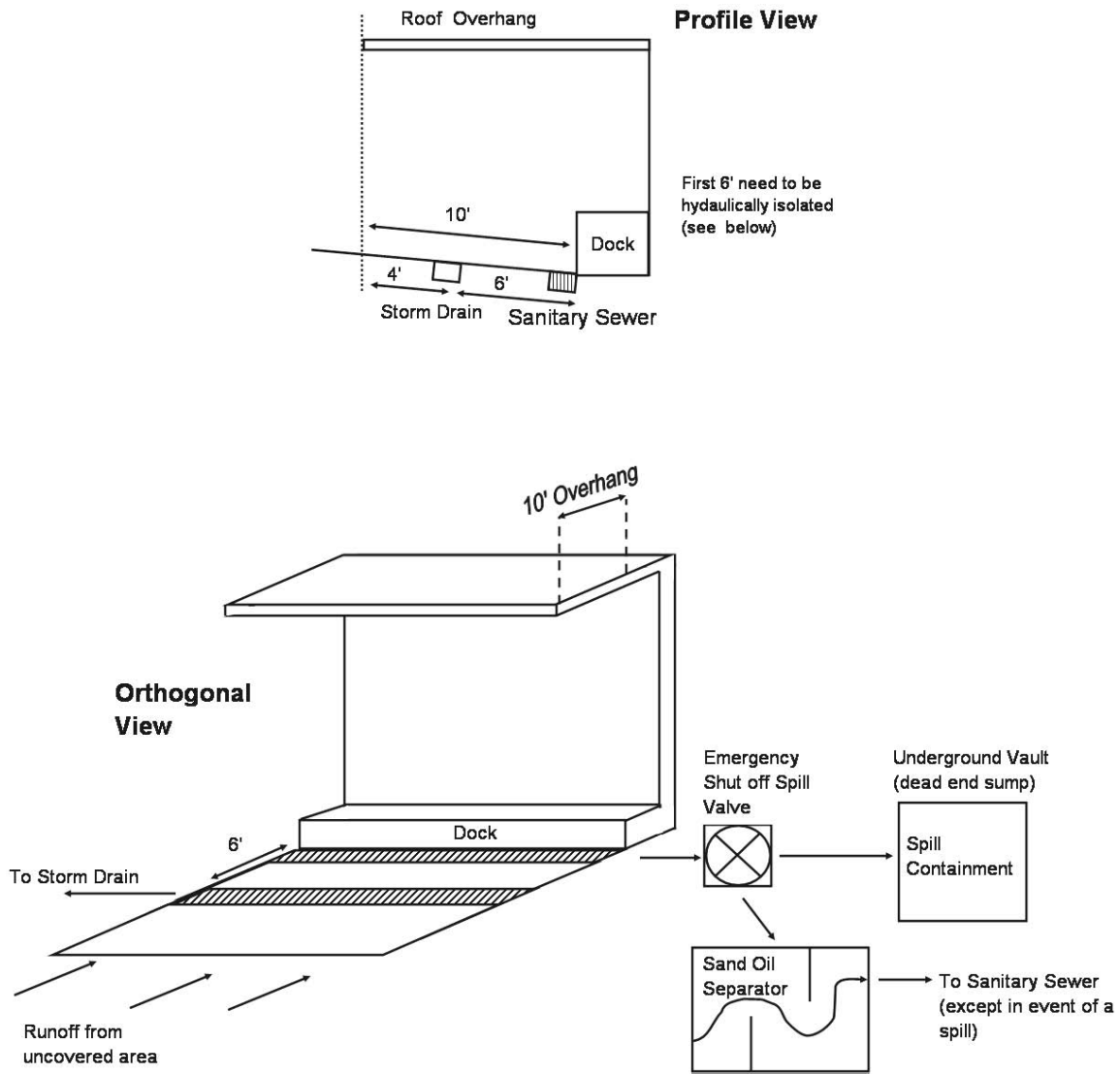


Figure LA-1. Recommended Loading Area Drainage Design

Outdoor Storage Areas

Purpose

This fact sheet specifies how to locate and design outdoor material storage areas so that materials do not get washed off-site with runoff and become sources of pollutants to the local municipal storm drain system, creeks and rivers. Such materials, including raw, by- and finished products, are not allowed in the storm drain system. Proper design of storage areas will also help ensure that stormwater and other site water does not come into contact with the stored materials and leach out pollutants. Potential pollutants addressed depend on the material stored, but may include toxic compounds, heavy metals, nutrients, suspended solids, and more.



*Covered outdoor storage area.
Photo: Sacramento County EMD, Water Protection Division*

Applicability

Refer to Table 3-3 regarding the project land use types that need to comply with this fact sheet. This fact sheet does not address storage of solid and recycling wastes; see the Waste Management Areas fact sheet elsewhere in this chapter.

Design Requirements

To protect water quality, design outdoor material storage areas as explained in Table OS-1. If possible, determine the types and quantities of materials likely to be stored prior to design.

Design requirements in this fact sheet are intended to supplement (not supersede) those in other codes (such as the Building, Fire, and Zoning Codes and the hazardous waste requirements in Title 22, California Code of Regulations, as applicable). Discuss any potential conflicts with the local permitting agency early in the planning process before proceeding with design. In addition, certain industries are subject to the State's Industrial Stormwater General Permit, which is also intended to protect stormwater quality: see

http://www.waterboards.ca.gov/water_issues/programs/stormwater/gen_indus.shtml regarding covered industries and applicable requirements.

Operation and Maintenance

The design features required by this fact sheet need to be maintained and properly operated. This includes proper handling and disposal of materials which accumulate in a secondary containment area, if applicable. In addition, features may be subject to inspections by local fire and/or sanitary sewer agencies, depending on the configuration.

Table OS-1. Design Requirements for Outdoor Storage Areas to Protect Water Quality

Design Feature	Requirement
Size and Location	<ul style="list-style-type: none"> ▪ Size the storage area large enough for the expected materials and plan for segregation. ▪ Considering planned activities and traffic flow, locate the storage area where it will be convenient but not in the way of truck and vehicle traffic. ▪ Locate storage in a secure place to protect against vandalism and minimize accidents.
Paving	<ul style="list-style-type: none"> ▪ Construct the storage area base with a material impervious to leaks and spills. Contact your local permitting agency to determine if gravel surfaces are acceptable under certain conditions (e.g., storage of inert bulk materials).
Cover	<ul style="list-style-type: none"> ▪ Install a roof or other cover acceptable to the local permitting agency that extends beyond the storage area (enough to keep rain out), or use a storage shed or cabinet. ▪ If solid bulk materials (such as, wood chips and other landscaping materials, sand, lumber, scrap metal) will be stored and it isn't feasible to cover the storage area, then omit the cover and follow the drainage requirements for uncovered storage areas (see the next section).
Grading/ Drainage	<ul style="list-style-type: none"> ▪ Direct runoff from downspouts/roofs away from storage areas. ▪ Hydraulically isolate the area using grades, berms or interceptor drains, to prevent run-on from surrounding areas or the runoff of spills. Refer to other fact sheets in this chapter for various options on how to accomplish this. ▪ Drainage Options for uncovered storage areas: (discharge to the storm drain system is not allowed) <ul style="list-style-type: none"> ○ If liquids (non-flammable, non-combustible) will be stored in the area, gently slope the storage area to drain to a dead-end sump. Accumulated water in the sump must be pumped to the sanitary sewer, an on-site stormwater quality treatment control measure, or land disposal, as appropriate based on the quality of the water and the sanitary sewer permit requirements. Refer to Appendix C for sanitary sewer connection and contact information. ○ If solid bulk materials will be stored in the area, slope and arrange the storage area to minimize contact between stormwater and stored materials (such as wood chips, plant materials, and compost) that can leach potential pollutants.
Secondary Containment for Bulk Liquids ¹	<ul style="list-style-type: none"> ▪ See notes above for liquids. ▪ As a general rule, size the secondary containment to accommodate at least 125% of the volume of the largest container or 10% of the volume of all the containers. ▪ If liquids will be stored in tanks, approved double-walled tanks can generally be used in lieu of other secondary containment. Verify this with the local permitting agency.

Notes: 1. Secondary containment is simply a structure/facility (such as a second container or bermed area) that would catch any spills or leaks from the primary storage container. Secondary containment is considered spill insurance.

Outdoor Work Areas

Purpose

This fact sheet pertains to work areas that are outdoors or that open to the outdoors. It specifies how to design such work areas to keep pollutants from contacting stormwater runoff and being carried into the storm drain system or receiving waters. Potential pollutants addressed depend on the work area but include any materials used on site or that could leak from vehicles or equipment. This includes: oil and grease, toxic substances, caustic or acidic substances, heavy metals, sediment, organic matter (depletes oxygen levels as it decays in water) and litter.



*Paved and covered outdoor work area.
Photo: CASQA, 2003*

Applicability

Refer to Table 3-3 regarding the project land use types that need to comply with this fact sheet. This fact sheet addresses outdoor processing and manufacturing areas, as well as general “work” areas. Also, this fact sheet includes some requirements specific to vehicle repair areas, since auto repair shops are one of the priority project categories identified by the stormwater regulations (see Table 3-1 in Chapter 3). However, note that the most appropriate location for vehicle repair is indoors. All outdoor facilities will be subject to the approval of the local permitting agency.

Design Requirements

To protect water quality, use the requirements shown in Table OW-1 when designing work areas that are outdoors or open to the outdoors. The requirements are intended to keep such pollutants from soaking into the ground or reaching the storm drainage system and creeks and rivers. Alternative designs may be approved provided water quality is protected to an equal or greater extent. Check with the local permitting agency for verification.

Design requirements in this fact sheet are intended to supplement (not supersede) those in other codes (such as the Building, Fire, and Zoning Codes and the hazardous waste requirements in Title 22, California Code of Regulations, as applicable). Discuss any potential conflicts with the local permitting agency early in the planning process before proceeding with design. In addition, certain industries are subject to the State’s Industrial Stormwater General Permit, which is also intended to protect stormwater quality:

see http://www.waterboards.ca.gov/water_issues/programs/stormwater/gen_indus.shtml regarding industries subject to the rules and applicable requirements.

Operation and Maintenance

The design features required by this fact sheet need to be maintained and properly operated. This includes proper handling and disposal of materials which may accumulate in containment devices/areas, ensuring that covers are not removed from outdoors work areas, and drains do not become disconnected. In addition, features may be subject to inspections by local fire and/or sanitary sewer agencies, depending on the configuration.

Table OW-1. Design Requirements for Outdoor Work Areas to Protect Water Quality

Design Feature	Requirement
Paving	<ul style="list-style-type: none"> ▪ Pave the work area with an impervious surface. Use Portland cement concrete (or equivalent smooth impervious surface) where vehicles or equipment will be repaired or hazardous materials could be used.
Cover	<ul style="list-style-type: none"> ▪ Conduct vehicle maintenance/repair indoors. Cover any other work areas that are not fully enclosed.
Grading/Drainage	<ul style="list-style-type: none"> ▪ Locate the work area away from storm drain inlets. ▪ Hydraulically isolate the area using grades, berms or interceptor drains, to prevent run-on from surrounding areas or the runoff of spills. Refer to other fact sheets in this chapter for various options on how to accomplish this. ▪ Design a repair/maintenance bay drainage system to capture all wash water, leaks, and spills. Connect drains to an oil/water separator and drain to the sanitary sewer. Direct connection to the storm drain system is prohibited. ▪ Drain other work areas addressed by this fact sheet to a containment area, sanitary sewer, or pretreatment facility (which in turn discharges to the sanitary sewer or storm drain as approved by the local permitting agency), as appropriate. The appropriate drainage destination will depend on potential pollutants and whether it is feasible to cover the work area. Discuss the project with the local permitting agency to determine the best solution, and whether a shut-off valve or other spill control device is warranted. ▪ If the site will include air compressors or other equipment that automatically produces small amounts of contaminated blowdown water, connect the blowdown to the sanitary sewer, subject to approval of the local permitting agency. ▪ Where processing operations are planned that will release wash water or process liquids, drain the area to the sanitary sewer (assuming approval is obtained). ▪ See Appendix C for sanitary sewer connection and contact information.
Spill Control	<ul style="list-style-type: none"> ▪ Some agencies may require a shut-off/diversion valve, drain plug, or drain cover, to keep spills from entering the storm drainage system. Check with local permitting agency. ▪ Provide secondary containment structures where wet material processing occurs, to contain any spills or unplanned releases. Double wall containers can only be used with permission from local permitting agency.
Signage	<ul style="list-style-type: none"> ▪ If the area drains to an inlet with a shut-off valve, post a sign locating the valve and explaining its operation.

Storm Drain Inlet Markings and Signage

Purpose

This fact sheet provides details about permanent “No dumping-drains to creek/river” messages at storm drain inlets and “No dumping” signs at public access points to channels and creeks on the development project site, where applicable. Storm drain markings are intended to help stop illegal dumping by alerting people that the drain leads directly to a waterbody and dumping is prohibited. Signs at access points to creeks and channels serve as reminders that dumping is illegal at these locations.



*Inlet marking directly in concrete
Photo source: County of Sacramento*

Applicability

As indicated in Table 3-3, permanent storm drain inlet markings are required on all new drain inlets (also known as catch basins) installed in development/ redevelopment projects. Signs are also required at public access points to any creeks or drainage channels within or adjacent to the site.



*Pre-fabricated inlet marker
Photo source: County of Sacramento*

Design Requirements

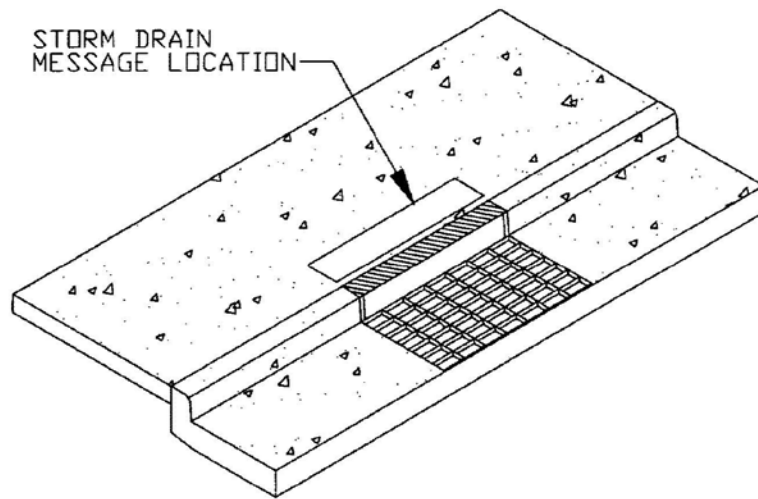
To protect water quality, follow the requirements shown in Table SD-1 to create consistent “no dumping” messages at storm drain inlets and public access points at creeks and channels.

Operation and Maintenance

The legibility of storm drain inlet messages and signs must be maintained to ensure effective pollution prevention over time.

Table SD-1. Design Requirements for Storm Drain Inlet Markings and Signage

Design Feature	Requirement
Location	<ul style="list-style-type: none"> ▪ Identify all storm drain inlets on the improvement plans and indicate they must be marked with appropriate storm drain messages. ▪ Locate the message on each inlet as described in the next section.
Message Layout and Content	<ul style="list-style-type: none"> ▪ Follow the message layout, content, and other specifications provided by the local permitting agency. Each agency may have its own design. See Figure SD-1 for an example detail. ▪ For signs posted at access points to waterways, consult the local permitting agency for their required/preferred message and style. ▪ Alternatively, obtain approval from the local jurisdiction for a different layout/message that clearly prohibits dumping using words or graphical icons. ▪ Consider the use of bilingual messages where appropriate based on local population.
Method of Application	<ul style="list-style-type: none"> ▪ Permanently apply the message at storm drain inlets by stamping it in concrete, affixing as a tile or cast-iron plate, or using an alternative approach approved by the local jurisdiction. ▪ For area drain markers, make sure any inset tiles or plates are flush with the surface of the inlet to avoid a tripping hazard. ▪ Consider permanently affixing signs at access points to creeks and channels.



NO DUMPING!
FLOWS TO RIVER 

NO DUMPING!
FLOWS TO CREEK 

NO DUMPING  **I LIVE**
DOWNSTREAM

NOTES:

1. STORM DRAIN MESSAGE SHALL BE APPLIED IN SUCH A WAY AS TO PROVIDE A CLEAR, LEGIBLE IMAGE.
2. STORM DRAIN MESSAGE SHALL BE PERMANENTLY APPLIED DURING THE CONSTRUCTION OF THE CURB AND GUTTER USING A METHOD APPROVED BY THE LOCAL AGENCY.
3. FOR AREA DRAIN INLETS, STORM DRAIN MESSAGE SHALL BE PLACED ADJACENT AND PARALLEL TO THE LONG AXIS OF THE DRAIN.
4. LETTERS SHALL BE 1-1/2" IN HEIGHT. DIMENSIONS OF STORM DRAIN MESSAGE SHALL NOT EXCEED 12" X 33".
5. IF THE MESSAGE IS STAMPED IN CONCRETE, THE DEPTH SHOULD BE APPROXIMATELY 0.25".
6. IF AN ALTERNATIVE STORM DRAIN MESSAGE IS PROPOSED, IT SHALL BE APPROVED BY THE LOCAL AGENCY.

Figure SD-1. Storm Drain Inlet Message

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Wash Areas

Purpose

This fact sheet specifies how to locate and design permanent wash areas for vehicles and equipment (including restaurant mats) so that wash water does not enter the storm drain system and receiving waters. Wash water typically carries an array of pollutants harmful to the aquatic environment. Potential pollutants depend on what is being washed but typically include oil and grease, metals, suspended solids, soluble organics, food waste, fats/oils/greases from food, and/or detergents or other cleaning chemicals.



*Central Wash Area in Apartment Complex Parking Lot.
Source: City of Palo Alto, California*

Applicability

Table 3-3 indicates the project land use types that need to comply with this fact sheet if a permanent wash area (including steam cleaning) is planned for the development project. In these cases, the wash area must be designed according to the design requirements specified in this fact sheet. Some permitting agencies may require the inclusion of a permanent designated wash area for some land uses. Check with the local permitting agency for verification. This fact sheet also pertains to the washing of equipment in outdoor areas, particularly, restaurant mats and similar equipment, which can send food waste and fats, oils and grease to the storm drain system.

Design Requirements

To protect water quality, design equipment and vehicle wash areas following the requirements in Table WA-1. Design requirements on this fact sheet are intended to supplement (not supersede) those in other codes. Discuss any potential conflicts with the local permitting agency early in the planning process before proceeding with design.

Operation and Maintenance

The design features required by this fact sheet need to be maintained and properly operated. In addition, actuated valve installations may be subject to inspections by the local sanitary sewer agency. See Appendix C for sanitary sewer connection and contact information.

Table WA-1. Design Requirements for Equipment and Vehicle Wash Areas to Protect Water Quality

Design Feature	Requirement
<i>Small Equipment Wash Areas – Applies to washing of restaurant mats and other kitchen supplies, as well as small equipment used at other commercial facilities.</i>	
Size and Location	<ul style="list-style-type: none"> ▪ Locate the designated wash area indoors. ▪ Provide a sink or contained wash area large enough to accommodate the largest item that will typically be washed.
Drainage and Pretreatment	<ul style="list-style-type: none"> ▪ Drain the sink/wash area to the sanitary sewer (or a zero-discharge water recycling system, subject to approval of permitting agency). ▪ For food-handling facilities: equip the wash area with a grease interceptor to meet the approval of the applicable permitting agency.
<i>Vehicle and Large Equipment Wash Areas</i>	
Size and Location	<ul style="list-style-type: none"> ▪ Locate the wash area such that access is from paved areas only (to prevent tracking of sediment). ▪ Size vehicle and equipment wash areas to extend at least 4 ft. in all directions around the largest piece of equipment/vehicle to be washed. ▪ For vehicle wash areas where vehicle size is unknown, size the wash area to be at least 25 ft. long and 15 ft. wide.
Paving	<ul style="list-style-type: none"> ▪ Pave the wash area with asphalt or concrete.
Cover	<ul style="list-style-type: none"> ▪ Cover the entire wash area with a roof or other type of approved permanent canopy. For covers 10 feet high or less, extend at least 3 feet beyond the perimeter of the hydraulically isolated wash area. For covers higher than 10 feet, extend at least 5 feet beyond the wash area. ▪ For new development in infill areas, or for redevelopment projects where there is no space to add a covered wash area, or for airport facilities, a diversion valve is required (see the Grading/Drainage section of this table). ▪ New facilities servicing oversized vehicles (bus, fire trucks) are required to provide a cover. Redevelopment of such facilities should consider addition of a shut-off/diversion valve if a cover is not feasible.
Grading/Drainage – General	<ul style="list-style-type: none"> ▪ Hydraulically isolate the wash area to contain the wash water and prevent runoff from leaving the area and run-on from surrounding areas from entering the wash area. Use grade breaks, berms, or interceptor drains (around the perimeter or in the entrance and exit zones) to accomplish this.
Drainage – Covered Areas	<ul style="list-style-type: none"> ▪ Connect the covered wash area to an appropriate pretreatment device (e.g., oil/water separator), then to the sanitary sewer. ▪ Alternatively, install a zero-discharge water recycling system. ▪ For any of these options, first obtain approval from the applicable permitting agency. See Appendix C for sanitary sewer connection and contact information.

Design Feature	Requirement
Drainage – Cover not feasible	<ul style="list-style-type: none"> ▪ When a cover is not feasible (see “cover” discussion earlier in this table), connect the hydraulically isolated area to the storm drain system and equip the drainage system with a shut-off/diversion valve that can temporarily redirect polluted wash water to the sanitary sewer when washing activities are taking place. ▪ Various types of actuated valve configurations have been used in the Sacramento area for truck washing areas and children’s water parks. Diversion valves could be triggered when the water supply faucet is turned on or by a rain gage. Check with the local permitting agency early in the planning process before proceeding with design of this type of system. ▪ See Appendix C for sanitary sewer connection and contact information.
Trash Receptacle	<ul style="list-style-type: none"> ▪ Locate a covered garbage receptacle within or immediately adjacent to a vehicle wash area to provide a convenient means for people to dispose of trash and keep the materials out of the storm drain system.
Signage	<ul style="list-style-type: none"> ▪ Post signs that clearly identify the facility’s intended use for employees and tenants. ▪ Post signs that prohibit: <ul style="list-style-type: none"> ○ the use of cleaning products that contain hazardous substances (hydrofluoric acid, muriatic acid, sodium hydroxide, bleach, etc.) and can turn wastewater into hazardous waste ○ the use of specific cleaning products incompatible with any pre-treatment device (check with local permitting agency) ○ dumping of vehicle fluids in wash areas ○ engine/car repair in the wash area ○ dumping in storm drains

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Waste Management Areas

Purpose

This fact sheet specifies how to design waste and recycling storage areas so that they aren't sources of pollutants to the storm drainage system and receiving waters. A properly designed waste/recycling storage area keeps rain, runoff, and other site water from leaching away pollutants; minimizes the chance of spills and leaks; and prevents any spilled or leaked wastes from entering the storm drainage system. Potential pollutants from waste include fats/oils/greases (from food), particulates, organic matter, toxic chemicals, and more.



*Trash enclosure with covered dumpster.
Photo: City of Folsom*

Applicability

Refer to Table 3-3 regarding the project land use types that need to comply with this fact sheet. The design requirements provided in this fact sheet are primarily intended for new development. If applied to significant redevelopment, the requirements would only apply in the case of complete redesign of the portion of the facility involving the waste management/trash enclosure area(s).

Design Requirements

To protect water quality, design waste and recycling storage areas as explained in Table WM-1. Design requirements in this fact sheet are intended to supplement (not supersede) those in other codes (such as the Building, Fire, and Zoning Codes and the hazardous waste requirements in Title 22, California Code of Regulations, as applicable). Discuss any potential conflicts with the local permitting agency early in the planning process before proceeding with design. In addition, check with the appropriate waste management agency regarding design or access requirements.



*Covered Storage for Waste and Recycling
Bins and Compactor, Pleasanton,
California
Photo: CKB Environmental*

Operation and Maintenance

The design features required by this fact sheet need to be maintained and properly operated. This includes regular maintenance of the grease interceptor and handling and disposal of materials which

Waste Management Areas

accumulate in the interceptor, and maintenance of covers and sanitary sewer connections, if applicable.

Table WM-1. Design Requirements for Waste Management Areas to Protect Water Quality

Design Feature	Requirement
Location and Enclosure – General	<ul style="list-style-type: none"> Design an enclosed area for waste and recycling storage and collection on the site so that containers cannot be knocked over and where unauthorized use or vandalism is unlikely. This will help keep debris from being blown off site and pollutants from entering the storm drain system.
Location/Access – Enclosure Area	<ul style="list-style-type: none"> Provide adequate room for waste collection trucks to pick up and empty dumpsters to minimize chance of accidents and spillage. Check with the local solid waste agency for access standards. In the absence of local standards, design the enclosure to have direct access for collection trucks, meaning the truck can drive directly at the bin and insert the forks into the sides of the bin. A minimum straight approach of 50-65 feet is recommended to line up directly with the bin.
Paving	<ul style="list-style-type: none"> Pave the waste/recycling storage area with Portland Cement Concrete.
Space and Waste Segregation	<ul style="list-style-type: none"> Provide ample space inside the waste management area for bins to contain the maximum amount of expected waste and recycling matter to be generated at the facility, considering the typical waste collection schedule. Check with the local solid waste agency for detail drawings if available. For areas designated to contain tallow bin(s), provide a separate enclosed area for storage of the tallow bin, segregated from the area used to store solid and recycling wastes, and covered if acceptable to permitting agency (some agencies may not want solid waste enclosures covered [see discussion below], but will allow tallow bin enclosures to be covered due to different loading practices).
Cover	<ul style="list-style-type: none"> Provide a cover for the entire waste area if acceptable to permitting agency. Some local waste haulers may not allow a cover, due to vertical clearance/accessibility needs for front loading trucks. If a cover will be installed, check with local fire department about possible sprinkling requirements.
Grading/Drainage	<ul style="list-style-type: none"> Direct runoff from roof downspouts away from the waste/recycling storage area. Locate the waste management area at least 35 feet from the nearest storm drain inlet. The intention is to deter employees/tenants/contractors from directing wash water to the storm drain system with a hose or pressure washer. Hydraulically isolate the area; this can be achieved by reverse grading at the perimeter, perimeter curbing or berming, or the use of perimeter or area drains to collect and divert runoff.
Sanitary Sewer Connection	<ul style="list-style-type: none"> If acceptable to the permitting agency, connect the hydraulically isolated area to the sanitary sewer via a trench drain at the back of the enclosure or similar, to facilitate proper disposal of polluted wash water. Check with the local waste management agency for detail drawings if available. Provide pretreatment with an approved grease interceptor prior to discharge to the sanitary sewer. Check with the local sanitary sewer permitting agency for specifics and approval. Note that the Plumbing Code limits the number of connections to a single grease interceptor at a facility.

Design Feature	Requirement
	<ul style="list-style-type: none"> ▪ See Appendix C for sanitary sewer connection and contact information.
Signage	<ul style="list-style-type: none"> ▪ Post signs inside the enclosure and/or on the bins prohibiting the disposal of liquids and hazardous materials therein. ▪ Consider posting signs on the inside of the enclosure walls to educate employees and tenants about proper wash down procedures (procedures will vary depending on whether or not the area is connected to the sanitary sewer system).
<p><i>These requirements are intended to supplement, not supersede, those found in other codes (e.g., building, plumbing, fire, hazardous waste). If conflicts are identified, consult with the local permitting agency and other agencies as needed (e.g., fire, sanitation district) for resolution.</i></p>	

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