Site Design & Landscape Planning SD-10

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- ☑ Minimize Impervious Land Coverage

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Description

Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, create new opportunities, and protect slopes and channels.

Applicability

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design considerations provided are applicable to new development and redevelopment as defined by various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.). These plans define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land distributing activities with structural or impervious surfaces.

Design Considerations

Design requirements for site design and landscape planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

Landscape plans should be developed with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.
- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Landscape/Outdoor Pesticide Use

- Design landscaping to minimize water use, runoff, and the use of fertilizers and pesticides.
- Specify plants that are tolerant of saturated soil conditions in areas where landscape is used to detain or retain stormwater.
- Design landscaping grounds to optimize surface infiltration where appropriate.
- Design grading and drainage systems so that drain inlets are located outside of lawn areas, or include non-turf buffers around inlets.
- Preserve existing native trees, shrubs, and ground cover and incorporate in the landscape plan to the maximum extent practicable.
- Select plants used for erosion control in steep hillside areas.
- Select pest resistant plants as much as possible (especially in landscaped areas adjacent to hardscape).
- Design for successful plant growth and maximum habitat by selecting plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions. Use native vegetation where possible.

Conserve Natural Areas During Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.
- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.

- Maximize the use of trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.
- Use natural vegetation in parking lot islands and other landscaped areas.
- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities within the Landscape

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.
- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.
- Improve and maintain the quality of soil through soil amendments and the creation of a microbial community.
- Evaluate infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Preserve or create stream setbacks – vegetated areas, including trees, shrubs, and herbaceous vegetation, that protect a stream system, lake reservoir, or coastal estuarine area.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.

- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are comparable and equally effective.

Minimizing and Disconnecting Impervious Areas

- Refer to Fact Sheet SD-10 – Minimizing and Disconnecting Impervious Areas for information on spill cleanup.

Figure 1. Swale at city hall in Brisbane, CA.

Figure 2. Railroad rails and rip rap to slow stormwater flows in a creek daylighting project in Paso Robles, CA.

Redeveloping Existing Installations

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas, and incorporate other applicable recommendations described above.

Figure 3. Energy dissipation, erosion control, and stream buffers at Strawberry Creek in Berkeley, CA.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Minimizing and Disconnecting Impervious Areas SD-11


Photo: Rob Dusenbury

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- ☑ Minimize Impervious Land Coverage

Description

Minimizing and disconnecting impervious areas are site design strategies used to reduce the total volume of runoff from project sites requiring treatment. The reduction in runoff volume results in smaller treatment controls, reduction of pollutants discharged from the site, and prevention of unnecessary treatment of runoff from pervious surfaces.

Approach

Impervious areas planned for new development and redevelopment should be minimized to reduce runoff generation through a variety of techniques. These techniques include replacing impervious surfaces with pervious ones, the use of alternative layout designs, minimizing parking surface area, and the use of self-treating areas. The objective of self-treating areas is to drain pervious area runoff, which does not require treatment, directly to the storm drain system. To the extent feasible, runoff from impervious areas can also be discharged to adjacent pervious areas rather than connecting directly to the storm drain system, which requires treatment BMPs.

Applicability

Appropriate applications include residential, commercial, and industrial areas planned for development or redevelopment.

Design considerations provided are applicable to new development and redevelopment as defined by various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.). These plans define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land distributing activities with structural or impervious surfaces.

Design Considerations

Minimize Impervious Area

A variety of design techniques can be implemented to reduce the impervious footprint at a site. These design techniques include:

- Replacing impervious area with a pervious material. Paved areas can be replaced pervious concrete, pervious asphalt, interlocking concrete pavers, grid pavement, etc. For more information on pervious pavements, see Fact Sheet TC-13. Green roofs can be implemented as a site design measure to reduce the amount of impervious roof area. For more information on green roofs see Fact Sheet TC-33. Both pervious pavements, if designed to store and infiltrate the design storm volume, and green roofs are considered Self-Treating Areas (see more information below).
- Alternative site layout techniques, subject to local jurisdiction policies and regulations, including:
  - Compact, multi-story structures to reduce building footprints, as allowed by the local jurisdiction.
  - Clustering buildings close together to minimize land disturbance, protect natural areas, and reduce the amount of connecting impervious area needed (i.e. streets, driveways, etc.).
  - Minimizing driveway and street width, as allowed by the local jurisdiction.
  - Use of sidewalks on only one side of the street in areas with minimal pedestrian traffic, as allowed by local jurisdictions.
- Minimizing surface parking areas by either reducing the demand for parking or implementing design techniques which reduce the amount of impervious surface area per parking space. Techniques for minimizing surface parking area include:
  - Structured parking.
  - Shared parking – parking that serves different land uses which have different peak demand times. For example, an office (peak parking demand during the day) could share a parking lot with a restaurant (peak demand time at night).
  - Separation of housing and parking costs – this will cause tenants to consider whether or not they want to pay the additional cost for parking.
  - Parking lifts – an effective strategy for increasing the parking capacity and decreasing the amount of impervious area per parking space.
  - Valet parking – valet parking decreases the amount of impervious area needed per parking stall.

Figure 1. Narrow street width, permeable pavers, and runoff to vegetation as part of this project in Santa Monica.

Figure 2. In this Los Altos project, curb cuts direct street runoff to vegetation. Downspouts are directed to cisterns and swales.

Self-Treating Areas

Self-treating areas consist of only landscaping and other pervious areas that drain directly to the storm drain system. They should not receive any runoff from impervious areas. Self-treating areas utilize infiltration and other organic processes to naturally remove pollutants from stormwater runoff. Typical self-treating areas include natural spaces, landscaped areas (such as parks and lawns), green roofs, and areas paved with turf block. Other types of pervious pavements may be considered self-treating if they store and infiltrate the design storm runoff volume. Self-treating areas reduce the runoff volume requiring treatment, and thus the size of treatment controls required. If runoff from self-treating areas is co-mingled with runoff from impervious surfaces, the combined runoff volume will require treatment.

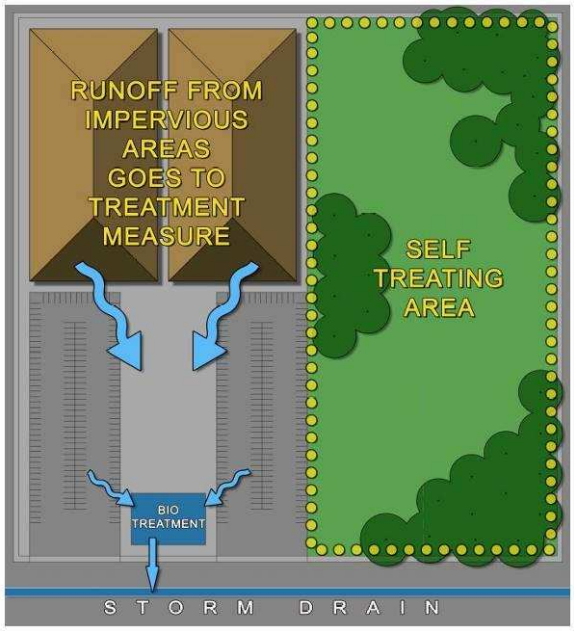


Image Credit: SCVURPPP

Design considerations for self-treating areas include:

- Design to not receive any impervious runoff.
- Design to drain to the storm drain system separately from impervious areas so that runoff from self-treating areas does not need to be treated using BMPs.
- Consider using pervious pavement such as porous concrete, porous asphalt, or unit block pavers that are designed to store and infiltrate the runoff volume required by local provisions and permits.

Disconnect Impervious Areas

Disconnecting impervious areas can be achieved by intercepting the runoff from a roof or pavement and draining it to a pervious area. Impervious runoff draining to a pervious area must either be contained onsite or undergo treatment before being discharged into the storm drain system.

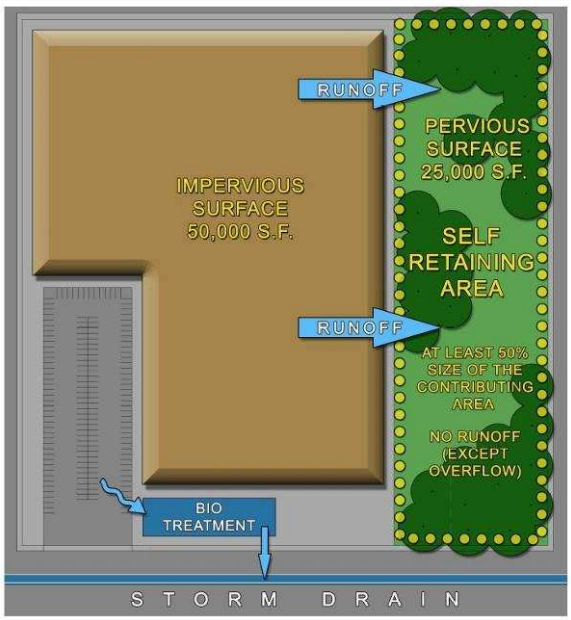


Image Credit: SCVURPPP

Note: Impervious-to-pervious ratio is for example purposes only

Minimizing and Disconnecting Impervious Areas SD-11

Self-Retaining Areas

Self-retaining areas are one design option for disconnecting impervious areas. Self-retaining areas occur in depressed areas, due either to the natural site topography or constructed depressions or berms. In self-retaining areas, the captured stormwater runoff that needs treatment will infiltrate into the ground. Drainage from roofs and paving can be directed to self-retaining areas, or self-retaining areas may be constructed by designing concave landscaped areas adjacent to walkways, driveways, sidewalks, etc.

Figure 3. Disconnecting downspouts, removing impervious surface, and installing native plants in San Francisco, CA.

Design considerations for self-retaining areas are listed below. Refer to local agency regulations or permits for specific requirements.

- Capture of specific rainfall depths without producing runoff may be required.
- A maximum allowable timeframe for full drainage of self-retaining areas may be required.
- There may be a maximum allowable ratio of impervious area to pervious receiving area.
- Self-retaining areas may require a minimum ponding depth/overflow inlet elevation, dependent on rainfall capture and run-on ratio requirements. They should also include sufficient elevation difference to allow for build-up of turf or mulch.
- Self-retaining areas should provide for drainage of rainfall depths greater than the required depth directly to offsite streets or storm drains.
- Runoff can either sheet flow or be piped into self-retaining areas.
- Soil amendment, vegetation, and irrigation considerations may be required for soil stability and permeability.

Other Resources

BASMAA Post Construction Manual, Bay Area Stormwater Management Agencies Association, July 2014.

C.3 Stormwater Handbook, Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP), April 2012.

C.3 Stormwater Technical Guidance, Alameda Countywide Clean Water Program, May 2016.

Encinitas Stormwater Manual, Appendix C-1 Self-Treating and Self-Retaining Areas.
Using Site Design Techniques to Meet Development Standards for Stormwater Quality, Bay Area Stormwater Management Agencies Association, May 2003.

Efficient Irrigation & Planting SD-12

Photo: SFPUC Urban Watershed Management Program

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water, plant selection, and landscape design that minimize runoff of excess irrigation water into the stormwater conveyance system.

Applicability

This fact sheet is applicable to planting and irrigation systems of residential, commercial, and industrial areas in new development and redevelopment projects as defined by various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.). These plans define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land distributing activities with structural or impervious surfaces.

Design Considerations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where applicable and feasible:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.

- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.
- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species).
- Consider design features such as:
  - Using mulches (such as wood chips or bark) in planter areas without ground cover to minimize sediment in runoff;
  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect;
  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible; and
  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth.
- Employ other comparable, equally effective methods to reduce irrigation water runoff.
- Note that Assembly Bill 1881, the Model Water Efficiency Landscape Ordinance, requires the use of efficient irrigation and compatible plantings for any project over 2055 square feet.

Figure 1. Swale at San Diego Airport with rock mulch, low-water plantings, and irrigation controls.

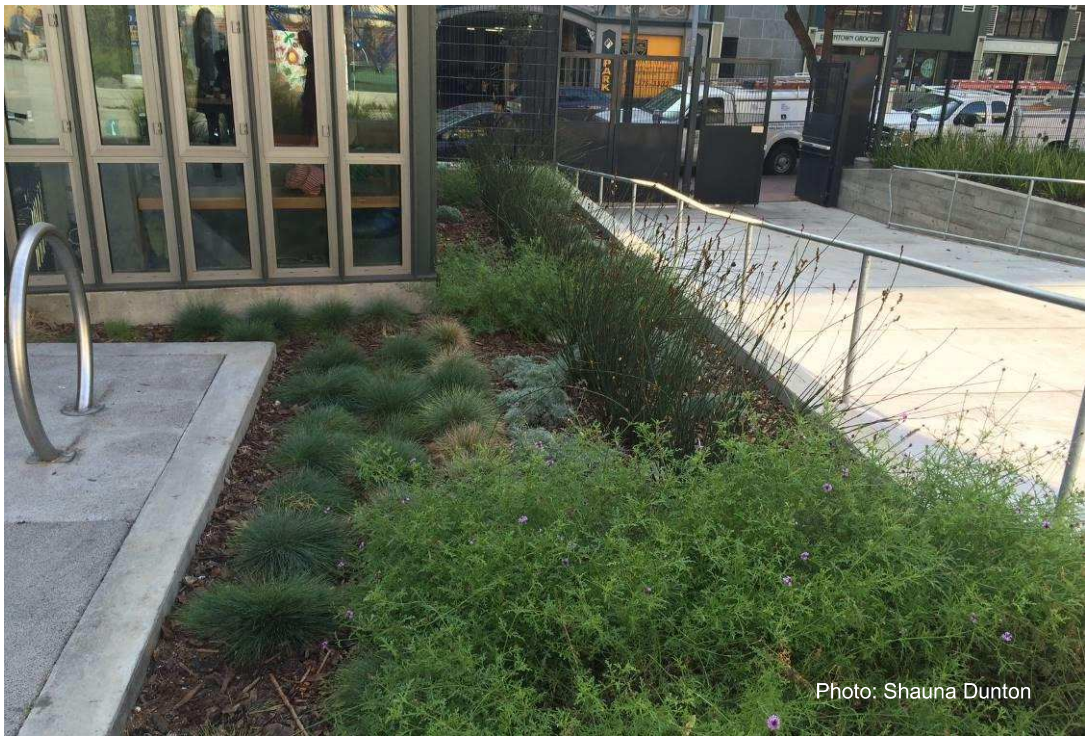


Figure 2. Mulched landscape area adjacent to permeable concrete at a public park in San Francisco.

Figure 3. Downspout to mulched flow-through planter bed in project courtyard.

Other Resources

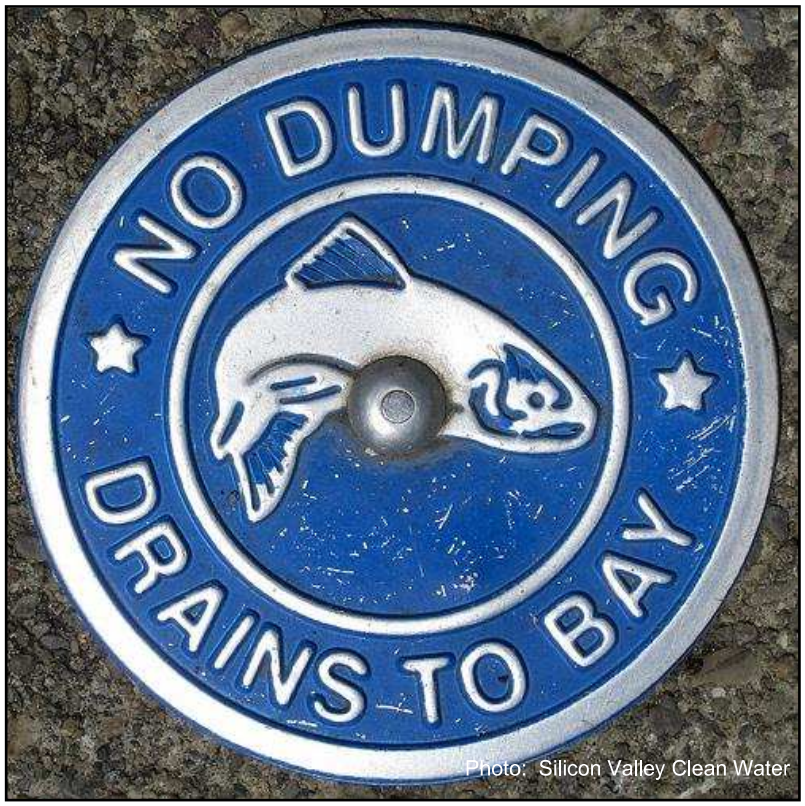
A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Storm Drain Signage SD-20



http://www.svcw.org/facilities/sitePages/discharge to sf bay.aspx

Design Objectives

- Cover
- Contain
- Reduce/Minimize
- ☑ Prohibit Dumping
- Collect & Convey

Targeted Constituents

- ☑ Sediment
- ☑ Nutrients
- ☑ Trash
- ☑ Metals
- ☑ Bacteria
- ☑ Oil & Grease
- ☑ Synthetic Organics
- ☑ Pesticides

Description

Waste materials dumped into storm drain inlets can have impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Applicability

Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas as well as any other area where contributions or dumping to storm drains is likely.

Design considerations provided are applicable to new development and redevelopment as defined by various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.). These plans define “redevelopment” in terms of amounts of additional impervious

area, increases in gross floor area and/or exterior construction, and land distributing activities with structural or impervious surfaces.

Design Considerations

Storm drain message markers or placards are recommended at all storm drain inlets. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include "NO DUMPING – DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.
- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note that some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

Additional Information

Maintenance Considerations

Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Examples

Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Spill Prevention, Control & Cleanup SD-22


Photo: City of El Cajon, CA

Design Objectives

- ☑ Cover
- ☑ Contain
- Reduce/Minimize
- ☑ Prohibit Dumping
- ☑ Collect & Convey

Targeted Constituents

- Sediment
- Nutrients
- Trash
- ☑ Metals
- Bacteria
- ☑ Oil & Grease
- ☑ Synthetic Organics
- ☑ Pesticides

Description

Spills and leaks are one of the largest contributors of stormwater pollutants. Many activities that occur at a new development or redevelopment site have the potential to cause accidental spills. Accidental releases of materials from aboveground liquid storage tanks present the potential for contaminating stormwater with many different pollutants. Materials spilled, leaked, or lost from the tanks may accumulate in soils or on impervious surfaces and be carried away by stormwater runoff.

The most common causes of unintentional releases are:

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

Preparation for accidental spills, with proper training and reporting systems implemented, can minimize the discharge of pollutants to the environment. Spill prevention and control plans are applicable to any site at which hazardous materials are stored or used. An effective plan should have spill prevention and response procedures

that identify hazardous material storage areas, specify material handling procedures, and provide locations of spill clean-up equipment and materials.

Approach

Structural measures such as covering, berming, and double containment should be used to prevent spills from reaching storm drains. A spill prevention plan should be developed in order to identify potential spills, characterize the potential pollutants, eliminate the potential for spills, train employees on spill prevention and cleanup, and respond to spills when they occur.

Applicability

Appropriate applications for spill prevention, control, and cleanup include residential, commercial, and industrial areas planned for development or redevelopment.

Design considerations provided are applicable to new development and redevelopment as defined by various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.). These plans define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land distributing activities with structural or impervious surfaces.

Design Considerations

- Post emergency hotline telephone numbers in appropriate locations to contact in case of accidental spills.
- Provide double containment facilities for hazardous chemicals.
- If possible, provide material handling areas indoors, under cover, or away from storm drains or sensitive water bodies.
- Berm storage areas so that if a spill or leak occurs the material is contained.
- Cover outside storage areas either with a permanent structure or with a seasonal one such as a tarp so that rain cannot come into contact with the materials.

Storage of reactive, ignitable, or flammable liquids should comply with the Uniform Fire Code and the National Electric Code. Practices listed below should be employed to enhance the code requirements:

- Provide designated area for tanks. Tanks located in areas where firearms are discharged should be encapsulated in concrete or the equivalent.
- Designated areas should be impervious and paved with Portland cement concrete, free of cracks and gaps, in order to contain leaks and spills.
- Liquid materials should be stored in UL approved double-walled tanks or surrounded by a curb or dike to provide the volume to contain 10% of the volume of all of the containers of 110% of the volume of the largest container, whichever is greater. The area inside the curb should slope to a drain.

- For used oil or dangerous waste, a dead-end sump should be installed in the drain.
- All other liquids should be drained to the sanitary sewer if available. The drain must have a positive control such as a lock, valve, or plug to prevent release of contaminated liquids.
- Accumulated stormwater in petroleum storage areas should be passed through an oil/water separator.
- If the liquid is oil, gas, or other material will be used onsite that separates from and floats on water, install a spill control device (such as a tee section) in the catch basins that collects runoff from the storage tank area.

Additional Information

Designing for Operation and Maintenance Considerations

Spill and Leak Prevention and Response

- Develop and post procedures to prevent/mitigate spills to storm drain systems. Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.
- If illegal dumping is observed at the facility:
  - Post "No Dumping" signs with phone number for reporting illegal dumping and disposal. Signs should also indicate fines and penalties applicable for illegal dumping.
  - Landscaping and beautification efforts may also discourage illegal dumping.
  - Bright lighting and/or entrance barriers may also be needed to discourage illegal dumping.
- Store and contain liquid materials in such a manner that if the container is ruptured, the contents will not discharge, flow, or be washed into the storm drainage system, surface waters, or groundwater.

Other Resources

California's Nonpoint Source Program Plan. http://www.swrcb.ca.gov/nps/index.html.

Clark County Storm Water Pollution Control Manual, http://www.co.clark.wa.us/pubworks/bmpman.pdf.

King County Storm Water Pollution Control Manual, http://dnr.metrokc.gov/wlr/dss/spcm.htm.

Orange County Stormwater Program, Best Management Practices for Industrial/Commercial Business Activities, http://ocwatersheds.com/documents/bmp/industrialcommericalbusinessesactivities

Santa Clara Valley Urban Runoff Pollution Prevention Program, http://www.scvurppp.org.

The Stormwater Managers Resource Center, http://www.stormwatercenter.net/.

Fueling Areas SD-30

Photo Credit: Geoff Brosseau

Design Objectives

- ☑ Cover
- ☑ Contain
- Reduce/Minimize
- Prohibit Dumping
- Collect & Convey

Targeted Constituents

- Sediment
- Nutrients
- ☑ Trash
- ☑ Metals
- Bacteria
- ☑ Oil & Grease
- Synthetic Organics
- Pesticides

Description

Fueling areas have the potential to contribute oil and grease, solvents, car battery acid, coolant, and gasoline to the stormwater conveyance system. Spills at vehicle and equipment fueling areas can be a significant source of pollution because fuels contain toxic materials and heavy metals that are not easily removed by stormwater treatment devices.

Approach

Project plans must be developed for cleaning near fuel dispensers, emergency spill cleanup, containment, and leak prevention.

Applicability

Appropriate applications include commercial, industrial, and any other areas planned to have fuel dispensing equipment, including retail gasoline outlets, automotive repair shops, and major non-retail dispensing areas.

Design considerations provided are applicable to new development and redevelopment as defined by various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.). These plans define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land distributing activities with structural or impervious surfaces.

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Design Considerations

Design requirements for fueling areas are governed by Building and Fire Codes and by current local agency ordinances and zoning requirements. Design requirements described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements.

Covering

Fuel dispensing areas should provide an overhanging roof structure or canopy. The cover's minimum dimensions must be equal to or greater than the dispensing area. The cover must not drain onto the fuel dispensing area and the downspouts must be routed to prevent drainage across the fueling area. The fueling area should drain to the project's treatment control BMP(s) prior to discharging to the stormwater conveyance system. Note that if fueling large equipment or vehicles that would prohibit the use of covers or roofs, the fueling island should be designed to sufficiently accommodate the larger vehicles and equipment and to prevent stormwater run-on and runoff. Grade to direct stormwater to a dead-end sump.

Surfacing

Fuel dispensing areas should be paved with Portland cement concrete (or equivalent smooth impervious surface). The use of asphalt concrete should be prohibited. Use asphalt sealant to protect asphalt paved areas surrounding the fueling area. This provision may be made to sites that have pre-existing asphalt surfaces.

The concrete fuel dispensing area should be extended a minimum of 6.5 ft from the corner of each fuel dispenser, or the length at which the hose and nozzle assembly may be operated plus 1 ft, whichever is less.

Grading/Contouring

As noted above, the canopy should completely overhang, or extend beyond, the dispensing area. Under this canopy, dispensing areas should have an appropriate slope to prevent ponding and be separated from the rest of the site by a grade break that prevents run-on of urban runoff. (Slope is required to be 2 to 4% in some jurisdictions' stormwater management and mitigation plans.)

Fueling areas should be graded to drain toward a dead-end sump, a tank without an outlet that requires regular inspection and pump out. Runoff from downspouts/roofs should be directed away from fueling areas. Do not locate storm drains in the immediate vicinity of the fueling area.

Additional Information

In the case of an emergency, provide storm drain seals, such as isolation valves, drain plugs, or drain covers, to prevent spills or contaminated stormwater from entering the stormwater conveyance system.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Maintenance Bays & Docks SD-31

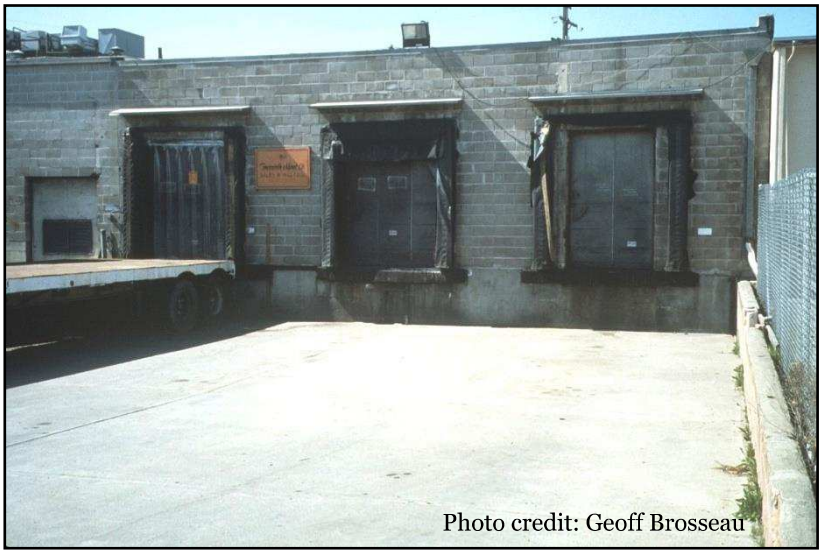
Photo credit: Geoff Brosseau

Design Objectives

- ☑ Cover
- ☑ Contain
- Reduce/Minimize
- ☑ Prohibit Dumping
- ☑ Collect & Convey

Targeted Constituents

- ☑ Sediment
- Nutrients
- ☑ Trash
- Metals
- Bacteria
- ☑ Oil & Grease
- Synthetic Organics
- Pesticides

Description

Several measures can be taken to prevent operations at maintenance bays and loading docks from contributing a variety of toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to the stormwater conveyance system.

Approach

In designs for maintenance bays and loading docks, containment is encouraged. Preventative measures include overflow containment structures and dead-end sumps. However, in the case of loading docks from grocery stores and warehouse/distribution centers, engineered infiltration systems may be considered.

Applicability

Appropriate applications include commercial and industrial areas planned for development or redevelopment.

Design considerations provided are applicable to new development and redevelopment as defined by various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.). These plans define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land distributing activities with structural or impervious surfaces.

Design Considerations

Design requirements for vehicle maintenance and repair are governed by Building and Fire Codes, and by current local agency ordinances, and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code requirements.

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Designs of maintenance bays should consider the following:

- Repair/maintenance bays and vehicle parts with fluids should be indoors; or designed to preclude urban run-on and runoff.
- Repair/maintenance floor areas should be paved with Portland cement concrete (or equivalent smooth impervious surface).
- Repair/maintenance bays should be designed to capture all wash water leaks and spills. Provide impermeable berms, drop inlets, trench catch basins, or overflow containment structures around repair bays to prevent spilled materials and wash-down waters form entering the storm drain system. Connect drains to a sump for collection and disposal. Direct connection of the repair/maintenance bays to the storm drain system is prohibited. If required by local jurisdiction, obtain an Industrial Waste Discharge Permit.
- Other features may be comparable and equally effective.

The following designs of loading/unloading dock areas should be considered:

- Loading dock areas should be covered, or drainage should be designed to preclude urban run-on and runoff.
- Direct connections into storm drains from depressed loading docks (truck wells) are prohibited.
- Below-grade loading docks from grocery stores and warehouse/distribution centers of fresh food items should drain through water quality inlets, or to an engineered infiltration system, or an equally effective alternative. Pre-treatment may also be required.
- Other features may be comparable and equally effective.

Additional Information

Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permit.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Trash Storage Areas SD-32

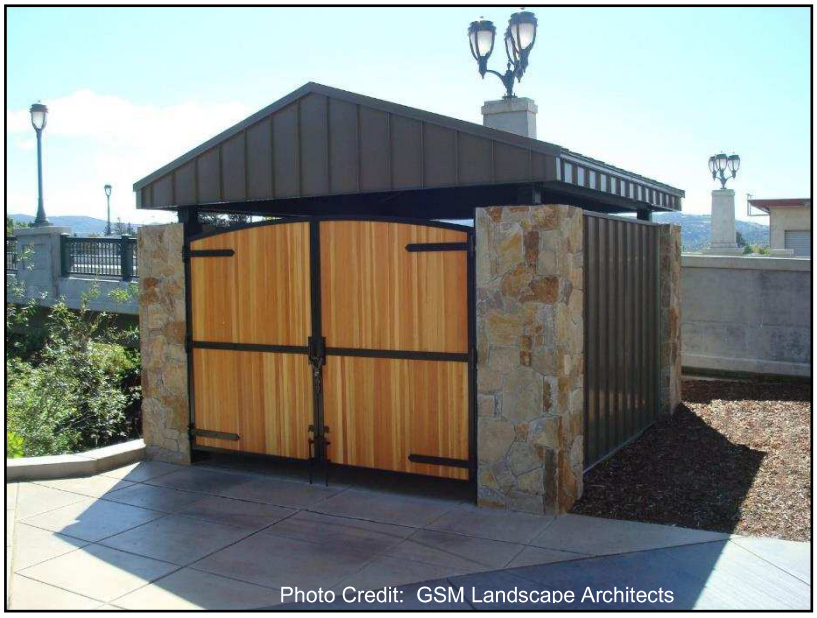
Photo Credit: GSM Landscape Architects

Design Objectives

- ☑ Cover
- ☑ Contain
- Reduce/Minimize
- ☑ Prohibit Dumping
- ☑ Collect & Convey

Targeted Constituents

- Sediment
- ☑ Nutrients
- ☑ Trash
- Metals
- ☑ Bacteria
- ☑ Oil & Grease
- ☑ Synthetic Organics
- ☑ Pesticides

Description

Trash storage areas are areas where a trash receptacle (s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

Approach

This fact sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling. Preventative measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design considerations provided are applicable to new development and redevelopment as defined by various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.). These plans define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land distributing activities with structural or impervious surfaces.

Design Considerations

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.
- Make sure trash container areas are screened or walled to prevent off-site transport of trash and minimize pest entry options.
- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

Additional Information

Maintenance Considerations

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Vehicle Washing Areas SD-33


Photo Credit: Geoff Brosseau

Design Objectives

- ☑ Cover
- ☑ Contain
- Reduce/Minimize
- ☑ Prohibit Dumping
- ☑ Collect & Convey

Targeted Constituents

- ☑ Sediment
- Nutrients
- ☑ Trash
- Metals
- Bacteria
- ☑ Oil & Grease
- ☑ Synthetic Organics
- Pesticides

Description

Vehicle washing, equipment washing, and steam cleaning may contribute high concentrations of metals, oil and grease, solvents, phosphates, and suspended solids to wash waters that drain to stormwater conveyance systems.

Approach

Project plans should include appropriately designed area(s) for washing-steam cleaning of vehicles and equipment. Depending on the size and other parameters of the wastewater facility, wash water may be conveyed to a sewer, an infiltration system, recycling system or other alternative. Pretreatment may be required for conveyance to a sanitary sewer.

Applicability

Appropriate applications include commercial developments, restaurants, retail gasoline outlets, automotive repair shops and others.

Design considerations provided are applicable to new development and redevelopment as defined by various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.). These plans define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land distributing activities with structural or impervious surfaces.

Design Considerations

Design requirements for vehicle maintenance are governed by Building and Fire Codes, and by current local agency ordinances, and zoning requirements. Design criteria described in this fact sheet

are meant to enhance and be consistent with these code requirements.

Areas for washing/steam cleaning should incorporate one of the following features:

- Be self-contained and/or covered with a roof or overhang.
- Be equipped with a clarifier or other pretreatment facility.
- Have a proper connection to a sanitary sewer.
- Include other features which are comparable and equally effective.

CAR WASH AREAS - Some jurisdictions' stormwater management plans include vehicle-cleaning area source control design requirements for community car wash racks in complexes with a large number of dwelling units. In these cases, wash water from the areas may be directed to the sanitary sewer, to an engineered infiltration system, or to an equally effective alternative. Pre-treatment may also be required.

Depending on the jurisdiction, developers may be directed to divert surface water runoff away from the exposed area around the wash pad (parking lot, storage areas), and wash pad itself to alternatives other than the sanitary sewer. Roofing may be required for exposed wash pads.

It is generally advisable to cover areas used for regular washing of vehicles, trucks, or equipment, surround them with a perimeter berm, and clearly mark them as a designated washing area. Sumps or drain lines can be installed to collect wash water, which may be treated for reuse or recycling, or for discharge to the sanitary sewer. Jurisdictions may require some form of pretreatment, such as a trap, for these areas.

Additional Information

Maintenance Considerations

Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permit.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Outdoor Material Storage Areas SD-34

Design Objectives

- ☑ Cover
- ☑ Contain
- Reduce/Minimize
- ☑ Prohibit Dumping
- ☑ Collect & Convey

Targeted Constituents

- ☑ Sediment
- Nutrients
- ☑ Trash
- ☑ Metals
- Bacteria
- Oil & Grease
- ☑ Synthetic Organics
- Pesticides

Description

Proper design of outdoor storage areas for materials reduces opportunity for toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to enter the stormwater conveyance system. Materials may be in the form of raw products, by-products, finished products, and waste products. The type of pollutants associated with the materials will vary depending on the type of commercial or industrial activity.

Approach

Outdoor storage areas require a drainage approach different from the typical infiltration/detention strategy. In outdoor storage areas, infiltration is discouraged. Containment is encouraged. Preventative measures include enclosures, secondary containment structures and impervious surfaces.

Applicability

Appropriate applications include residential, commercial, and industrial areas planned for development or redevelopment.

Design considerations provided are applicable to new development and redevelopment as defined by various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.). These plans define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land distributing activities with structural or impervious surfaces.

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Design Considerations

Some materials are more of a concern than others. Toxic and hazardous materials must be prevented from coming in contact with stormwater. Non-toxic or non-hazardous materials do not have to be prevented from stormwater contact. However, these materials may have toxic effects on receiving waters if allowed to be discharged with stormwater in significant quantities. Accumulated material on an impervious surface could result in significant impact on the rivers or streams that receive the runoff.

Material may be stored in a variety of ways including bulk piles, containers, shelving, stacking, and tanks. Stormwater contamination may be prevented by eliminating the possibility of stormwater contact with the material storage areas either through diversion, cover, or capture of the stormwater. Control measures may also include minimizing the storage area. Design requirements for material storage areas are governed by Building and Fire Codes, and by current City or County ordinances and zoning requirements. Control measures are site specific and must meet local agency requirements.

Where proposed project plans include outdoor areas for storage of materials that may contribute pollutants to the stormwater conveyance system, the following structural or treatment BMPS should be considered:

- Materials with the potential to contaminate stormwater should be: (1) placed in an enclosure such as, but not limited to, a cabinet, shed, or similar structure that prevents contact with runoff or spillage to the stormwater conveyance system, or (2) protected by secondary containment structures such as berms, dikes, or curbs.
- The storage area should be paved and sufficiently impervious to contain leaks and spills.
- The storage area should slope towards a dead-end sump to contain spills and direct runoff from downspouts/roofs should be directed away from storage areas.
- The storage area should have a roof or awning that extends beyond the storage area to minimize collection of stormwater within the secondary containment area. A manufactured storage shed may be used for small containers.

Note that the location(s) of installations of where these preventative measures will be employed must be included on the map or plans identifying BMPs.

Additional Information

Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permits.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Outdoor Work Areas SD-35


Photo Credit: Geoff Brosseau

Design Objectives

- ☑ Cover
- ☑ Contain
- Reduce/Minimize
- ☑ Prohibit Dumping
- ☑ Collect & Convey

Targeted Constituents

- ☑ Sediment
- ☑ Nutrients
- ☑ Trash
- ☑ Metals
- Bacteria
- ☑ Oil & Grease
- ☑ Synthetic Organics
- Pesticides

Description

Proper design of outdoor work areas for materials reduces opportunity for toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to enter the stormwater conveyance system.

Approach

Outdoor work areas require a drainage approach different from the typical infiltration/detention strategy. In outdoor work areas, infiltration is discouraged; collection and conveyance are encouraged. In outdoor work areas, infiltration is discouraged and runoff is often routed directly to the sanitary sewer, not the storm drain. Because this runoff is being added to the loads normally received by the wastewater treatment plants, municipal stormwater programs and/or private developers must work with the local plant to develop solutions that minimize effects on the treatment facility. These concerns are best addressed in the planning and design stage of the outdoor work area.

Applicability

Appropriate applications include residential, commercial, and industrial areas planned for development or redevelopment.

Design considerations provided are applicable to new development and redevelopment as defined by various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.). These plans define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land distributing activities with structural or impervious surfaces.

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Design Considerations

Design requirements for outdoor work areas are governed by Building and Fire Codes, current local agency ordinances, and zoning requirements.

Outdoor work areas can be designed in particular ways to reduce impacts on both stormwater quality and sewage treatment plants.

- Create an impermeable surface such as concrete or asphalt, or a prefabricated metal drip pan, depending on the use.
- Cover the area with a roof. This prevents rain from falling on the work area and becoming polluted runoff.
- Berm or perform mounding around the perimeter of the area to prevent water from adjacent areas from flowing on to the surface of the work area.
- Directly connect runoff. Unlike other areas, runoff from work areas is directly connected to the sanitary sewer or other specialized containment systems. This allows the more highly concentrated pollutants from these areas to receive special treatment that removes particular constituents. Approval for this connection must be obtained from the appropriate sanitary sewer agency.
- Locate the work area away from storm drains or catch basins.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Outdoor Processing Areas SD-36


Photo Credit: Eric Zickler

Design Objectives

- ☑ Cover
- ☑ Contain
- Reduce/Minimize
- ☑ Prohibit Dumping
- ☑ Collect & Convey

Targeted Constituents

- ☑ Sediment
- ☑ Nutrients
- ☑ Trash
- ☑ Metals
- ☑ Bacteria
- ☑ Oil & Grease
- ☑ Synthetic Organics
- ☑ Pesticides

Description

Outdoor process equipment operations such as rock grinding or crushing, painting or coating, grinding or sanding, degreasing or parts cleaning, landfills, waste piles, wastewater and solid waste treatment and disposal, and other operations may contribute a variety of toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to the storm conveyance system.

Approach

Outdoor processing areas require a drainage approach different from the typical infiltration/detention strategy. In outdoor process equipment areas, infiltration is discouraged. Containment is encouraged, accompanied by collection and conveyance. Preventative measures include enclosures, secondary containment structures, dead-end sumps, and conveyance to treatment facilities in accordance with conditions established by the applicable sewer agency.

Suitable Applications

Appropriate applications include commercial and industrial areas planned for development or redevelopment.

Design considerations provided are applicable to new development and redevelopment as defined by various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.). These plans define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land distributing activities with structural or impervious surfaces.

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Design Considerations

Design requirements for outdoor processing areas are governed by Building and Fire codes, current local agency ordinances, and zoning requirements.

Operations determined to be a potential threat to water quality should consider to the following recommendations:

- Cover or enclose areas that would be the most significant source of pollutants, slope the area toward a dead-end sump, or discharge to the sanitary sewer system following appropriate treatment in accordance with conditions established by the applicable sewer agency.
- Grade or berm area to prevent run-on from surrounding areas.
- Do not install storm drains in areas of equipment repair.
- Consider other features that are comparable or equally effective.
- Provide secondary containment structures (not double wall containers) where wet material processing occurs (e.g., electroplating), to hold spills resulting from accidents, leaking tanks, or equipment, or any other unplanned releases. (Note that if these are plumbed to the sanitary sewer, they must be with the prior approval of the sewering agency.)

Additional Information

Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permit.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Food Service Facilities SD-37

Photo Credit: City of San Juan Capistrano, CA

Design Objectives

- ☑ Cover
- ☑ Contain
- ☑ Reduce/Minimize
- ☑ Prohibit Dumping
- ☑ Collect & Convey

Targeted Constituents

- ☑ Sediment
- ☑ Nutrients
- ☑ Trash
- Metals
- ☑ Bacteria
- ☑ Oil & Grease
- ☑ Synthetic Organics
- ☑ Pesticides

Description

Food service facilities for new development and redevelopment can include restaurants, food truck commissaries, grocery stores, bakeries, delicatessens, and any facility requiring a Health Department permit for food preparation. Pollutant-generating sources and activities include: equipment cleaning, grease handling and disposals, spills, surface cleaning, cooling and refrigeration equipment maintenance, landscaping and grounds maintenance, dumpster and loading dock areas, parking lots, and illicit connections to the storm drain system. Pollutants include organic materials (food wastes), oil and grease, and toxic chemicals in cleaning products, disinfectants, and pesticides.

Approach

Minimize exposure of rain and runoff to outdoor cleaning and storage areas by using cover and containment. In and around these areas use good housekeeping to minimize the generation of pollutants. Make stormwater pollution prevention BMPs a part of standard operating procedures and the employee training program. Provide employee education materials in the first language of employees.

Applicability

The Food Service Facility fact sheet is applicable to new development and re-development of restaurants, food truck commissaries, grocery stores, bakeries, delicatessens, and any facility requiring a health department permit for food preparation.

Design considerations provided are applicable to new development and redevelopment as defined by various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.). These plans define “redevelopment” in terms of amounts of additional

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impervious area, increases in gross floor area and/or exterior construction, and land distributing activities with structural or impervious surfaces.

Design Considerations

- Connect sinks and cleaning areas to a grease interceptor prior to discharge to the sanitary sewer system.
- Size sinks and other cleaning facilities appropriately to accommodate the largest possible items to be cleaned and allow for controlled drainage to a grease interceptor.
- Provide trash receptacles around loading docks to keep litter from accumulating.
- Install a spill cleanup kit near the dumpster and loading dock areas.
- Consider enclosing the dumpster in a roofed and bermed area to prevent exposure to rainwater, and draining the area to the sanitary sewer. Contact the local wastewater treatment plant or the county environmental health department for guidance.
- Design all other site components so that the discharge of fats, oils, and grease is controlled and minimized. Ensure that all discharges from cooling equipment go to the sanitary sewer and not the street, gutter, or storm drain.

Additional Information

Designing for Operation and Maintenance Considerations

Equipment and Outdoor Cleaning

If any cleaning will be done outside, provide an outside cleaning area that is connected to the sanitary sewer.

Grease Handling and Disposal

Provide tallow bins or sealed containers with tamper-proof lids.

Landscaping and Grounds Maintenance

Refer to fact sheet SD-40: Building and Grounds Maintenance for information on landscaping and grounds maintenance.

Dumpster and Loading Dock Areas

For information on cleaning dumpster areas see the 2018 CASQA Industrial and Commercial Handbook business guide sheet BG-61: Mobile Cleaning – Food Service Related.

Pest Control

Refer to 2018 CASQA Industrial and Commercial Handbook business guide sheet BG-30: Food Service Facilities for information on pest control.

Education and Training

Post information about or labels for BMPs where employees and customers can see them.

Spill Response and Prevention Procedures

Refer to Fact Sheet SD-22: Spill Prevention, Control, and Cleanup for information on spill cleanup.

Other Resources

Bay Area Stormwater Management Agencies Association, 2014. *BASMAA Post Construction Manual.*

Bay Area Pollution Prevention Group, 2010. *Gravity Grease Interceptor (GGI) Fact Sheet.* Available on-line at http://bacwa.org/Portals/0/GGI%20Fact%20Sheet-Final.pdf

Bay Area Pollution Prevention Group, 2010. *Hydromechanical Grease Interceptor (HGI) Fact Sheet.*

Bay Area Pollution Prevention Group, 2010. *Grease Removal Device (GRD) Fact Sheet.*

Bay Area Pollution Prevention Group, 2007. *Avoid Fines and Health Risks from Grease Overflows.*

City of Pleasanton. *BMPs for Restaurants.*

Contra Costa County Public Works Department. Municipal Stormwater NPDES Compliance. *Food Service Facilities.*

Food and Beverage Association of San Diego. *What's Cookin', Eating and Drinking Establishments Stormwater Best Management Practices.*

Orange County Public Works, OC Watersheds. Industrial/Commercial Business Activities Best Management Practices.

Sacramento Stormwater Management Program. *Waste Disposal Guidelines for Food-Handling Facilities.*

San Francisco Public Utilities Commission, 2016. *Technical Report Templates - Section 7: Source Control Checklist.*

San Mateo Countywide Stormwater Pollution Prevention Program. *Stormwater Best Management Practices for Restaurants and Food Facilities.*

Santa Cruz County Department of Public Works, Environmental Compliance Unit. Best Environmental Management Practices. *Restaurant Wastewater.*

Pools, Spas, & Decorative Water Features SD-38


Photo Credit: Frederic Larson, The Chronicle

Design Objectives

- ☑ Cover
- ☑ Contain
- ☑ Reduce/Minimize
- ☑ Prohibit Dumping
- ☑ Collect & Convey

Targeted Constituents

- Sediment
- ☑ Nutrients
- Trash
- Metals
- Bacteria
- Oil & Grease
- ☑ Synthetic Organics
- ☑ Pesticides

Description

The primary pollutants of concern in water from pools, spas, and decorative water features are disinfectant chemicals, such as chlorine, chloramine, or bromine (pools and spas) and algaecides (fountains and other water features). These chemicals, if discharged to the storm drain system, can be toxic to aquatic life. Following the procedures noted in this fact sheet will reduce exposure of waterways to the pollutants in discharge from pools, spas, and other water features.

Approach

Never discharge water or wastewater from these activities to the driveway, street, gutter, or near a storm drain or where water might flow to a creek or seasonal stream. Follow local regulations for draining swimming pools.

Applicability

This fact sheet is applicable to residential and commercial pools, spas, and decorative water features. Pools and spas located in sensitive areas or adjacent to shorelines should inquire with the appropriate authorities to determine if special code requirements apply.

Design considerations provided are applicable to new development and redevelopment as defined by various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.). These plans define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land distributing activities with structural or impervious surfaces.

Design Considerations

- Design the layout of the pool area or water feature so that the cleanout is in a readily accessible area.
- If the municipality requires pools to be plumbed to sanitary sewer, design the connection according to local requirements and include a note on the plans referring to agency requirements.

Design Considerations based on Permitting Information

Many of the regional and state permitting requirements state that swimming pool water, if identified as a source of pollution, is effectively prohibited from discharging into an MS4. Some permits allow discharge of pool water to an MS4 after chlorine, bromine, and algaecides, and other pollutants have been eliminated. See permits for full description of requirements.

Additional Information

Designing for Operation and Maintenance Considerations

Draining Pools

- Design so that discharge flows are kept at low levels typically possible through a garden hose. Higher flow rates may be prohibited by local ordinance.
- Design should prevent discharge to the street, storm drain, or where water might flow to a creek or seasonal stream.
- If a sanitary sewer cleanout is available, design so that facility can be discharged through that cleanout. If assistance is needed in locating the cleanout, call the local sanitary sewer agency.
- If discharge connects to the sewer line, design so that an "air gap" is maintained between the discharge line and the sewer line (do not seal the connection between the hose and sewer line).

Spill Response and Prevention Procedures

Refer to Fact Sheet SD-22 Spill Prevention, Control, & Cleanup for information on spill response and prevention.

Other Resources

CASQA Stormwater Best Management Practice Handbook Portal: Industrial and Commercial, 2014.

CASQA Stormwater Best Management Practice Handbook: Municipal, 2003.

Orange County Stormwater Program. Industrial/Commercial Business Activities Best Management Practices. Fact Sheet IC24 Disposal of Wastewater Generated by Mobile Businesses & Outdoor Activities. Available online at: http://ocwatersheds.com/civicax/filebank/blobload.aspx?BlobID=10201.

Sacramento Stormwater Management Program. *Pool Water Brochure*. Available on-line at: http://www.sacstormwater.org/StormwaterDocuments/Stormwater Brochures/PoolwaterBrochure.pdf.

San Diego County Watershed Protection Program, 2009. *Pool and Fountain Maintenance Stormwater Best Management Practices (BMPs)*. Available on-line at: http://www.sdcounty.ca.gov/dpw/watershedpdf/bmp_2009_pool+fountain_cleaning.pdf.

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Building & Grounds Maintenance SD-40


Photo Credit: City of Vancouver, WA

Design Objectives

- ☑ Cover
- ☑ Contain
- ☑ Reduce/Minimize
- ☑ Prohibit Dumping
- ☑ Collect & Convey

Targeted Constituents

- Sediment
- ☑ Nutrients
- ☑ Trash
- Metals
- Bacteria
- Oil & Grease
- ☑ Synthetic Organics
- ☑ Pesticides

Description

Stormwater runoff from building and grounds maintenance activities can be contaminated with toxic hydrocarbons in solvents, fertilizers and pesticides, suspended solids, heavy metals, abnormal pH, and oils and greases. Utilizing the protocols in this fact sheet will prevent or reduce the potential for exposure of stormwater to pollutants from building and grounds maintenance activities by washing and cleaning up with as little water as possible, following good landscape management practices, preventing and cleaning up spills immediately, and keeping debris from entering the storm drains.

Approach

Proper design of building and grounds maintenance facilities reduces the opportunity for pollutants to enter the stormwater conveyance system. Preventative measures including containment, source control pollution prevention, and effective employee training should be used to reduce the likelihood of contaminated discharge.

Applicability

Appropriate applications include building and grounds maintenance areas for new development and redevelopment of residential, commercial, and industrial areas.

Design considerations provided are applicable to new development and redevelopment as defined by various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.). These plans define “redevelopment” in terms of amounts of additional

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impervious area, increases in gross floor area and/or exterior construction, and land distributing activities with structural or impervious surfaces.

Figure 1. Maintenance of bioretention facility.

Design Considerations

Waste Management

- Provide pet waste collection dispensers, where applicable.
- Provide trash receptacles in areas of high pedestrian traffic.

Landscape/Outdoor Pesticide Use

See SD-10 Site Design and Landscaping.

Additional Information

Designing for Operation and Maintenance Considerations

Landscaping Activities

Provide an area for stockpiling materials temporarily that is located away from watercourses and drain inlets. Ideally, a permanently covered area would be provided although temporary covers can be used during operation.

Building Repair, Remodeling, and Construction

Provide containment devices for work areas to prevent dust, grit, wash water, or other pollutants entering catch basins which may include a storm drain cover, filter fabric, or similarly effective runoff control mechanism.

Material Handling and Waste Management

- Follow all federal, state, and local laws and regulations governing the design for use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.
- Implement storage requirements for pesticide products with guidance from the local fire department and County Agricultural Commissioner. Provide secondary containment for pesticides.

Spill Response and Prevention Procedures

Refer to Fact Sheet SD-22 – Spill Prevention, Control, and Cleanup for information on spill cleanup.

Fire Sprinkler Line Flushing

Site fire sprinkler line flushing may be a source of non-stormwater runoff pollution. The water entering the system is usually potable water, though in some areas it may be non-potable reclaimed wastewater. There are subsequent factors that may drastically reduce the quality of the water in such systems. Black iron pipe is usually used since it is cheaper than potable piping,

but it is subject to rusting and results in lower quality water. Initially, the black iron pipe has an oil coating to protect it from the rusting between manufacturer and installation; this will contaminate the water from the first flush but not from subsequent flushes. Nitrates, polyphosphates, and other corrosion inhibitors, as well as fire suppressants and antifreeze may be added to the sprinkler water system. Water generally remains in the sprinkler system a long time (typically a year) and between flushes may accumulate iron, manganese, lead, copper, nickel, and zinc. The water generally becomes anoxic and contains living and dead bacteria and breakdown products from chlorination. This may result in a significant BOD problem and the water often smells. Consequently, dispose fire sprinkler line flush water into the sanitary sewer. Do not allow discharge to storm drain or infiltration due to potential high levels of pollutants in the fire sprinkler line water.

Other Resources

Bay Area Stormwater Management Agencies Association, 2014. *BASMAA Post Construction Manual.*

CASQA Stormwater Best Management Practice Handbook Portal: Industrial and Commercial, 2014.

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City of Seattle, Seattle Public Utilities Department of Planning and Development, 2009. *Stormwater Manual Vol. 1 Source Control Technical Requirements Manual.*

Kennedy/Jenks Consultants, 2007. *The Truckee Meadows Industrial and Commercial Storm Water Best Management Practices Handbook.*

Orange County Stormwater Program, Best Management Practices for Industrial/Commercial Business Activities.

Sacramento Stormwater Management Program. *Best Management Practices for Industrial Storm Water Pollution Control.*

San Francisco Public Utilities Commission, 2016. *Technical Report Templates - Section 7: Source Control Checklist.*

US EPA, 1997. *Best Management Practices Handbook for Hazardous Waste Containers.*

Ventura Countywide Stormwater Management Program Clean Business Fact Sheets.