REFERENCE GUIDE FOR STORMWATER BEST MANAGEMENT PRACTICES

Stormwater Management Division
Bureau of Sanitation, Department of Public Works
City of Los Angeles

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EXECUTIVE SUMMARY

Over the past two decades, local, regional, and national research programs have identified the principal causes of water pollution in most urban areas. Urban runoff, discharged from municipal and separate storm drain systems, has been one of the principal causes identified. Urban runoff discharged through storm drain system is further described as “non-point source pollution”, that is, a diffuse pollution that cannot be traced to a specific source. Because the pollution is discharged from the storm drain system, it is also referred to as “stormwater pollution.” Over time, stormwater pollution can deposit hundreds of tons of trash and debris at beaches and can also lead to public health and safety concerns. Urban runoff and stormwater pollution are not only a concern during the rainy season, but also year-round. This is due to the various ways in which urban water is used and discharged to the storm drain system, throughout the year. While the effect of stormwater pollution is not easily observed at the source, the impact upon receiving waters is apparent. One noticeable example is the presence of trash and debris along the beaches after a rainstorm event.

A less observable effect occurs when urban runoff and associated stormwater pollution impact aquatic plant and animal life in receiving waters. An example of this effect is the presence of potentially harmful viruses and bacteria now found in our coastal receiving waters along with soil particles, other solids, and litter. The City of Los Angeles storm drain system does not filter or treat contaminants or debris in the urban runoff, thus making urban runoff one of the most significant sources of surface water pollution in the region.

The City of Los Angeles is committed to implementing corrective measures to mitigate urban runoff and stormwater pollution problems. The City’s Stormwater Program has been directed to identify and implement mitigation and control measures via the application of Best Management Practices (BMPs). This manual has been prepared to assist departments and divisions of the City of Los Angeles in finding related information regarding BMPs for stormwater and urban runoff.

When implemented, BMPs best manage, prevent, control, remove, reduce, or treat urban runoff and stormwater pollution, before the pollution reaches receiving waters. BMPs include programs, operational measures or methods, engineered systems, technologies, processes, or siting criteria. This manual summarizes and details information on applicable BMPs for construction, source control, and treatment control as defined below:

- Construction BMPs are structural devices, measures, and operational methods or procedures used at construction sites to prevent, control, and treat pollution emanating from the site.
- Source control BMPs are schedules of activities, prohibitions of practices, maintenance procedures, management and operational procedures, and other methods employed at municipal, industrial, residential, and commercial sites, that help prevent stormwater pollution by reducing the potential for contamination at the source of pollution.
- Treatment control BMPs are engineered systems, technology, and structural devices that use physical, chemical, or biological processes to treat, control, remove, or reduce pollutants from stormwater and urban runoff.

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ACRONYMS AND ABBREVIATIONS

BMP	best management practice
BOD	biochemical oxygen demand
CDS	continuous deflective separation
cf	cubic feet
cfs	cubic feet per second
City	City of Los Angeles
COD	chemical oxygen demand
CWA	Federal Clean Water Act of 1987
gal	gallon
H	high
k	thousand
L	low
m	million
M	moderate
NPDES	National Pollutant Discharge Elimination System
O&M	operation and maintenance
RWQCB	Regional Water Quality Control Board (Los Angeles)
sf	square feet
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board (California)
TSS	total suspended solids
UV	ultra-violet

INTRODUCTION

Purpose and Scope

This *Reference Guide for Stormwater Best Management Practices* has been prepared to provide general guidance and information on stormwater and urban runoff best management practices (BMPs). General guidance is provided to help locate related information on BMPs and to further identify, assess, and select appropriate BMPs. To help with the location and selection, the guide provides BMP listings, selection matrices, reference information, BMP cost information, and BMP target pollutant information. Background information is also provided and includes a general overview of associated pollutant and regulatory issues.

Designated manual users include engineers, planners, managers, and field operations personnel in the Stormwater Management Division, as well as other City of Los Angeles departments and divisions. This manual serves as a reference guide and a planning tool for designated users. The use of this manual however, does not supersede requirements of a National Pollutant Discharge Elimination System (NPDES) permit or other regulatory permits. Although this manual is currently not available to other users, it may in the future, be made available to developers, industries, commercial entities, and the general public, as appropriate. The current and primary purpose of this manual is to assist city engineers and managers in planning, developing, and selecting the optimum BMP(s) for various applications.

Manual Organization and Use

This manual consists of three major sections that correspond to different BMP categories, as listed below:

I. Construction BMPs
II. Source Control BMPs
III. Treatment Control BMPs

Section I describes BMPs for the construction category, Section II describes BMPs for the source control category, and Section III describes BMPs for the treatment control category. BMP definitions are provided for the described categories at the end of the Executive Summary and at the beginning of each section. Each section contains BMP guidance information for the specific category.

The guidance information presented in each section includes relevant background information, a listing of applicable stormwater BMPs, and associated tables to help with the BMP selection process. One of the tables included in each section is a BMP selection matrix. The other tables include a BMP reference table, a BMP cost table,

and a BMP target pollutant table. If needed, directions for manual use, including table use, are provided in Appendix C. Table organization is described below.

Table Organization

The tables are organized in a series format as described below.

Series A includes Tables IA, IIA, and IIIA. All Series A tables are BMP Selection Matrices and are specific to one BMP category as follows:

Table IA Construction BMP Selection Matrix
Table IIA Source Control BMP Selection Matrix
Table IIIA Treatment Control BMP Selection Matrix

Each table listed above identifies BMPs that would be applicable to a certain activity, area of concern, or target pollutant associated with the category. The purpose of this table series is to identify and help select a BMP that would not only be applicable to the category, but also the activity or area of concern within the category.

Series B includes Tables IB, IIB, and IIIB. All Series B tables are BMP Reference Tables and are specific to one BMP category as follows:

Table IB Construction BMP References
Table IIB Source Control BMP References
Table IIIB Treatment Control BMP References

Each table listed above identifies BMPs that are applicable to the category along with a corresponding published reference for each BMP. Abbreviated number citations are included in the table. Full citations are in numerical order, in the Reference section at the end of the manual. The purpose of this table series is to provide reference information for BMPs that are being considered for selection within a category. Each BMP was identified from the latest available and applicable references, pilot study materials, and application results published by various federal, state, and local agencies, as well as those published by private companies.

Series C includes Tables IC, IIC and IIIC. All Series C tables are BMP Cost Tables and are specific to one BMP category as follows:

Table IC Construction BMP Costs
Table IIC Source Control BMP Costs
Table IIIC Treatment Control BMP Costs

Each table listed above identifies relative or estimated costs for BMPs applicable to that category. The purpose of this table series is to list applicable BMPs and corresponding qualitative and quantitative cost information. Costs vary depending

on a number of factors including site conditions, site location, and size and type of the project. Because of the unavailability of individual costs at this time, cost information on capital, training, and operation and maintenance are expressed in general qualitative costs (high, moderate, and low) only. The relative cost information was primarily obtained from the California Stormwater BMP Handbooks (References 2, 3, and 4). Information on quantitative costs for treatment control BMPs was also obtained from available data summary materials and pilot study technical reports (e.g. References 30, 39, and 42).

Series D includes Tables ID, IID, and IIID. All Series D Tables are BMP Target Pollutant Tables and are specific to one BMP category as follows:

Table ID Construction BMP Target Pollutants
Table IID Source Control BMP Target Pollutants
Table IIID Treatment Control BMP Target Pollutants

Each table listed above consists of BMP listings and corresponding pollutants targeted. The purpose of this table series is to identify the pollutants removed, treated, or reduced by the specific BMP. It should be noted that pollutants could be site-specific depending on the type of project or activity. The information included in the Series D tables was obtained primarily from the California Stormwater BMP Handbooks (References 2, 3, and 4) and pilot study reports (e.g. Reference 39). The degree of effectiveness in the pollutant removal process vary for each BMP due to site-specific conditions and other factors such as application, topography, weather conditions, and implementation methodology. Thus, information on pollutant removal efficiency for construction, source control, and treatment control BMP categories are not documented in this manual. Instead, a qualitative table of target pollutants for each BMP category is provided. It should be noted, however, that limited removal efficiency data for treatment control systems can be found in some reference materials cited in this manual (e.g. Reference 24). Also, information included on specific pollutants for treatment control systems are based on currently available data.

Target Pollutants

Target pollutants referred to in this manual and specifically listed in Series D tables, as described above, are grouped in eight general categories as follows:

1. Sediments – Sediments are soils or other surficial materials transported or deposited by the action of wind, water, ice, or gravity, as a product of erosion. For example, sediments can erode from land when disturbed by a construction activity or heavy rainfall. Sediments can increase turbidity, clog the gills of fish, reduce spawning, lower the ability of young aquatic organisms to survive, smother bottom dwelling organisms, and suppress the growth of aquatic vegetation.
2. Nutrients – Nutrients are inorganic substances, such as nitrogen and phosphorous. They commonly exist in the form of mineral salts that are either dissolved or

suspended in water. The primary source of nutrients in urban runoff has been identified as fertilizer products. Excessive use of fertilizer can result in the discharge of nutrients to water bodies and streams, resulting in excessive aquatic algae and plant growth. Overgrowth of aquatic algae and plants can lead to a state of eutrophication in the water body. Eutrophication occurs when overgrowth leads to excessive decay of organic matter in the water body, loss of oxygen in the water, and the eventual death of water body organisms. For non-point sources of pollution, phosphorous is the primary nutrient of concern.

3. Heavy Metals – Metals are inorganic substances that sometimes occur naturally in soil at small concentrations. Metals such as lead, copper, chromium, mercury, cadmium, and zinc, characterized by higher molecular weight, are called heavy metals. At small concentrations naturally-occurring in soil, heavy metals are not considered toxic. However, at higher concentrations, certain heavy metals can be toxic. Metals are also commercially available. Commercially available metals can be found in formed or manufactured metals, as well as metal products. Metals are also used as raw material components in non-metal products such as fuels, adhesives, paints, and other coatings. For example, certain heavy metals such as lead and chromium, have been used as corrosion inhibitors in primer coatings or cooling tower systems. A primary source of heavy metal pollution in stormwater however, is the use of commercially available metals and metal products. At certain conditions, these products can react or degrade such that their metal components are released to the environment and transported via leaching or erosion to local water bodies. Environmental concerns, regarding the potential for release to the environment, have restricted selected heavy metal usage in certain applications.

4. Toxic Chemicals – Toxic chemicals are either organic or inorganic substances, which at certain concentrations can indirectly or directly constitute a hazard to life or health. Chemicals exhibiting human and/or aquatic toxicity characteristics are considered toxic. Some commercially available or naturally occurring substances that may exhibit these characteristics include pesticides, cyanides, solvents, organic compounds, and hydrocarbons. For example, the excessive application of pesticides may result in runoff containing toxic levels of the pesticide's active component. Also, when rinsing off objects, toxic levels of solvents and cleaning compounds can be discharged to the storm drain. Dirt, grease, and grime retained in the cleaning fluid or rinse water may also be present at levels that are harmful or hazardous to the environment. Other sources of potentially toxic or hazardous substances include the following: automotive fluids that drip and leak from vehicles; illegally discharged motor fluids (such as motor oil and radiator fluid); cleanup wastes (such as concrete mixers, paints, adhesives, etc.); industrial, sanitary, and animal wastes; and certain types of litter.

5. Floatable Materials - Trash (e.g., paper, plastic, polystyrene packing foam, aluminum materials, etc.) and biodegradable organic matter (e.g., leaves, grass cuttings, food waste, etc.) are considered floatable materials. The presence of floatable materials has a significant impact on the recreational value of a water body and can potentially impact aquatic species habitat. Excess organic matter can create a high biochemical oxygen demand in a stream and thereby, lower the water quality of the

stream. Also, in areas where stagnant water exists, the presence of excess organic matter can promote septic conditions resulting in the growth of undesirable organisms and the release of odorous and hazardous compounds such as hydrogen sulfide.

6. Oxygen-Demanding Substances – Oxygen-demanding substances are those substances that require oxygen as part of their natural, biological, or chemical processes. The oxygen demand of a substance can lead to depletion of natural oxygen resources in a water body and possibly the development of septic conditions. Proteins, carbohydrates, and fats are examples of oxygen-demanding substances. They can also be referred to as "biodegradable organics." The presence of oxygen-demanding substances in water is measured as biochemical oxygen demand (BOD) and chemical oxygen demand (COD).
7. Oil and Grease – Oil and grease are characterized as high-molecular weight organic compounds. Primary sources of oil and grease are petroleum hydrocarbon products, motor products, esters, oils, fats, waxes, and high molecular-weight fatty acids. Migration of these pollutants to the water bodies are very possible due to the wide uses and applications of some of these products in either municipal, residential, commercial, industrial, or construction areas. Elevated oil and grease content can decrease the aesthetic value of the water body, as well as the water quality.
8. Bacteria and Viruses – Bacteria and viruses are micro-organisms that thrive under certain environmental conditions. Water, containing excessive bacterial and viral levels, can alter the aquatic habitat and create a harmful environment for humans and aquatic life. This type of water pollution is characterized by high coliform bacterial counts. It is typically caused by excess animal or human fecal wastes in the water. Also, the decomposition of excess organic waste causes increased growth of undesirable organisms in the water.

I. Construction Best Management Practices (BMPs)

This section lists and describes those BMPs most commonly used for construction activities. Construction BMPs include structural devices, measures, and operational methods or procedures used at construction sites to prevent, control, and treat stormwater pollution emanating from the site. This section presents the following information: background information, providing an overview of related pollutant and regulatory issues; a BMP listing, summarizing the applicable practices; and BMP guidance information, to assist in the BMP selection process. Guidance information is presented in a tabular format and includes: a BMP selection matrix, a BMP reference table, a BMP cost table, and a BMP target pollutant table.

A. Background Information

1. Pollutant Issues - Most construction activities disturb large areas and amount of earth and therefore result in significant erosion and transportation of related particulates such as sediments and dust to nearby waterways. In excess amounts, these particulates can increase water turbidity and consequently impair aquatic life and beneficial uses of the water.

   Pollutants such as hydrocarbons, metals, nutrients, toxic substances, trash, and other debris can be generated from a variety of construction activities and can travel with eroded sediments. Potential pollutants traveling with the sediments may include the organic components in the top soil, plant residues, nutrient elements, organic material, deposited atmospheric pollutants, and other liquid and solid wastes.

   Toxic substances have been found to adsorb or concentrate in sediments. When excessive loading occurs in an aquatic system, the toxic substances can interfere with the reproductive cycle of many plants and animals and cause tumors and lesions in fish. Toxic pollutants in sediments can also be re-mobilized under certain environmental conditions. When a pollutant is re-mobilized, it has the potential to further interfere with the natural cycle of aquatic life.

   Miscellaneous wastes that can be generated at a construction site include wash water from concrete mixers, paints and associated equipment cleaning wastes, solid wastes resulting from trees and shrubs removed during land clearing, wood and paper materials derived from building product packaging, food containers (such as paper, aluminum, and metal cans), and sanitary wastes. Discharge of these wastes into the drain system can lead to unsightly and polluted waterways.

2. Regulatory Issues - Based on the aforementioned pollutant issues, the amended federal Clean Water Act of 1987 (CWA) added a requirement to address construction site stormwater pollution. In California, construction activities

consisting of five acres or more are subject to the Construction National Pollutant Discharge Elimination System (NPDES) Permit requirements of the State Water Resources Control Board (SWRCB). These requirements include the preparation and implementation of a formal Storm Water Pollution Prevention Plan (SWPPP).

The CWA also requires that each municipality throughout the nation be issued an NPDES Permit (Permit). The goal of the Permit is to stop polluted discharges from entering the storm drain system and local coastal waters. The associated municipal stormwater NPDES Permit was granted by the Los Angeles Regional Water Quality Control Board (RWQCB) on July 15, 1996. It was issued to Los Angeles County and 85 co-permittee cities including the City of Los Angeles. The Permit contains a requirement for Los Angeles County and co-permittees to develop and implement a "Development Construction Model Program."

In 1999, the local "Development Construction Model Program" was adopted. This program requires construction sites of less than 5 acres of disturbed soil size, to incorporate stormwater pollution control measures. As described previously, the SWRCB's Construction NPDES Permit requires that construction sites of 5 acres or more prepare and implement an official SWPPP and also follow specific NPDES Permit requirements.

B. BMP Listing

Listed below are the specific BMPs for construction activities. The list includes erosion and sedimentation control measures, site management practices, materials and waste management, and general preventive maintenance and inspection.

A-1. Construction Scheduling
A-2. Preservation of Existing Vegetation
A-3. Employee/Subcontractor Training
A-4. Site Maintenance and Inspection
A-5. Vehicle and Equipment Cleaning
A-6. Vehicle and Equipment Fueling
A-7. Vehicle and Equipment Maintenance
A-8. Material Delivery and Storage
A-9. Material Use
A-10. Material Handling
A-11. Spill Prevention and Control
A-12. Solid Waste Management
A-13. Hazardous Waste Management
A-14. Contaminated Soil Management
A-15. Concrete Waste Management
A-16. Sanitary/Septic Waste Management

A-17. Dust Controls
A-18. Dewatering Operations
A-19. Paving Operations
A-20. Structure Construction and Painting
A-21. Seeding and Planting
A-22. Mulching
A-23. Geotextiles and Mats
A-24. Temporary Stream Crossing
A-25. Reinforced Soil Retaining System
A-26. Stabilized Construction Entrance
A-27. Construction Road Stabilization
A-28. Earthen Dike
A-29. Temporary Drains and Swales
A-30. Temporary Slope Drain
A-31. Storm Drain Outlet Protection
A-32. Check Dams
A-33. Slope Roughening/Terracing
A-34. Silt Fence
A-35. Straw Bale Barriers
A-36. Sandbag Barrier
A-37. Brush or Rock Filter
A-38. Storm Drain Inlet Protection
A-39. Temporary Sediment Trap
A-40. Temporary Sediment Basin

C. BMP Selection Matrix and Tables

The BMP selection matrix and tables are provided to help select construction BMPs that best meet the NPDES Permit requirements or other stormwater mitigation plan and most suitable for a subject construction site. The construction BMP selection matrix and tables can be found in the subsequent pages and are listed as follows:

Table IA - Construction BMP Selection Matrix
Table IB - Construction BMP References
Table IC - Construction BMP Costs
Table ID - Construction BMP Target Pollutants

Table IA
CONSTRUCTION BMP SELECTION MATRIX

Stormwater Best Management Practices (BMPs)		Category of Construction Activities																						
		Site Prep./ Earth		Underground Structures				Aboveground Structures				Roadways/ Walkways/ Parking Lots			Waterways					Planting/ Landscaping			
BMP Name	BMP Code	Clearing & Grubbing	Earthwork	Foundations	Conduits (Open Cut)	Drilling	Tunnels	Wood Frame	Structural Steel	Masonry & Concrete	Roofing & Coating	Concrete	Asphalt	Base & Subgrade	Channel Improvements	Water/Sediment Impoundment	Over Crossing	Under Crossing	Waterfront Construction	Irrigation Facilities	Seeding & Sodding	Mulching	Planting
Sediment Control																								
Scheduling	A-1	X	X		X							X	X	X	X	X	X	X	X	X	X	X	X	X
Preservation of Existing Vegetation	A-2	X	X		X		X					X	X	X	X	X	X	X	X	X		X	
Dust Control	A-3	X	X		X							X	X	X	X	X	X	X	X	X	X	X	X	X
Stabilized Construction Entrance	A-26	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
General Site Management																								
Construction Practices																								
Dewatering Operations	A-18														X	X	X	X	X					
Paving Operations	A-19			X	X	X	X					X	X	X			X	X						
Structure Construction & Paint	A-20			X			X	X	X	X	X						X	X	X					

Stormwater Best Management Practices (BMPs)		Category of Construction Activities																				
		Site Prep./ Earth		Underground Structures				Aboveground Structures				Roadways/ Walkways/ Parking Lots			Waterways					Planting/ Landscaping			
BMP Name	BMP Code	Clearing & Grubbing	Earthwork	Foundations	Conduits (Open Cut)	Drilling	Tunnels	Wood Frame	Structural Steel	Masonry & Concrete	Roofing & Coating	Concrete	Asphalt	Base & Subgrade	Channel Improvements	Water/Sediment Impoundment	Over Crossing	Under Crossing	Waterfront Construction	Irrigation Facilities	Seeding & Sodding	Mulching	Planting
Vehicle & Equipment Management																							
Vehicle & Equipment Cleaning	A-6	X	X	X	X	X	X					X	X	X					X				

Table IA (Cont.)
CONSTRUCTION BMP SELECTION MATRIX

Stormwater Best Management Practices (BMPs)		Category of Construction Activities																				
		Site Prep./ Earth		Underground Structures				Aboveground Structures				Roadways/ Walkways/ Parking Lots			Waterways					Planting/ Landscaping			
BMP Name	BMP Code	Clearing & Grubbing	Earthwork	Foundations	Conduits (Open Cut)	Drilling	Tunnels	Wood Frame	Structural Steel	Masonry & Concrete	Roofing & Coating	Concrete	Asphalt	Base & Subgrade	Channel Improvements	Water/Sediment Impoundment	Over Crossing	Under Crossing	Waterfront Construction	Irrigation Facilities	Seeding & Sodding	Mulching	Planting
Vehicle & Equipment Fueling	A-7	X	X	X	X	X	X					X	X	X					X				
Vehicle & Equipment Maintenance	A-8	X	X	X	X	X	X					X	X	X					X				
Tracking Control																							
Stabilized Construction Entrance	A-26	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Contractor Training																							
Employee/Subcontractor Training	A-4	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Construction Materials & Waste Management																							
Materials Management																							
Material Delivery & Storage	A-9			X	X			X	X	X	X	X	X	X	X		X	X	X		X	X	X
Material Use	A-10			X	X			X	X	X	X	X	X	X	X		X	X	X		X		
Spill Prevention & Control	A-12									X	X		X									X	X

Stormwater Best Management Practices (BMPs)		Category of Construction Activities																				
		Site Prep./ Earth		Underground Structures				Aboveground Structures				Roadways/ Walkways/ Parking Lots			Waterways					Planting/ Landscaping			
BMP Name	BMP Code	Clearing & Grubbing	Earthwork	Foundations	Conduits (Open Cut)	Drilling	Tunnels	Wood Frame	Structural Steel	Masonry & Concrete	Roofing & Coating	Concrete	Asphalt	Base & Subgrade	Channel Improvements	Water/Sediment Impoundment	Over Crossing	Under Crossing	Waterfront Construction	Irrigation Facilities	Seeding & Sodding	Mulching	Planting
Waste Management																							
Solid Waste Management	A-13	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Hazardous Waste Management	A-14									X	X												

Table IA (Cont.)
CONSTRUCTION BMP SELECTION MATRIX

Stormwater Best Management Practices (BMPs)		Category of Construction Activities																						
		Site Prep./ Earth		Underground Structures				Aboveground Structures				Roadways/ Walkways/ Parking Lots			Waterways					Planting/ Landscaping			
BMP Name	BMP Code	Clearing & Grubbing	Earthwork	Foundations	Conduits (Open Cut)	Drilling	Tunnels	Wood Frame	Structural Steel	Masonry & Concrete	Roofing & Coating	Concrete	Asphalt	Base & Subgrade	Channel Improvements	Water/Sediment Impoundment	Over Crossing	Under Crossing	Waterfront Construction	Irrigation Facilities	Seeding & Sodding	Mulching	Planting
Contaminated Soil Management	A-15	X	X	X	X	X	X																
Concrete Waste Management	A-16			X	X		X			X		X			X		X	X	X	X			
Sanitary/Septic Waste Mgmt.	A-17	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Table IB
CONSTRUCTION BMP REFERENCES

Stormwater Best Management Practices	BMP Code	Sources of Information (See References)
Construction Scheduling	A-1	2, 9, 17, 19, 29
Preservation of Existing Vegetation	A-2	2, 6, 9, 15, 19, 29, 32
Employee/Subcontractor Training	A-3	2, 9, 24
Site Maintenance and Inspection	A-4	24
Vehicle and Equipment Cleaning	A-5	2, 9, 15, 19, 23, 41
Vehicle and Equipment Fueling	A-6	2, 9, 19, 23, 41
Vehicle and Equipment Maintenance	A-7	2, 9, 15, 19, 23, 41
Material Delivery and Storage	A-8	2, 9, 15, 19, 23, 27
Material Use	A-9	2, 9, 19, 24
Material Handling	A-10	25, 27
Spill Prevention and Control	A-11	2, 9, 17, 19, 23, 24, 41
Solid Waste Management	A-12	2, 9, 15, 16, 17, 19, 24, 27, 28, 41
Hazardous Waste Management	A-13	2, 9, 19, 24, 27, 28, 41
Contaminated Soil Management	A-14	2, 9, 15, 19, 24, 27, 28
Concrete Waste Management	A-15	2, 9, 15, 19, 24, 27, 28, 41
Sanitary/Septic Waste Management	A-16	2, 9, 19, 24, 41
Dust Controls	A-17	2, 9, 23, 24, 32
Dewatering Operations	A-18	2, 9, 19, 24, 35
Paving Operations	A-19	2, 6, 9, 19, 32
Structure Construction & Painting	A-20	2, 6, 9, 19
Seeding and Planting	A-21	2, 6, 9, 13, 15, 18, 19, 23, 24, 27, 29, 32
Mulching	A-22	2, 9, 13, 15, 18, 19, 23, 27, 29, 32
Geo-textiles and Mats	A-23	2, 9, 15, 19, 23, 24, 27, 29, 32
Temporary Stream Crossing	A-24	2, 9, 15, 19, 24, 29
Reinforced Soil Retaining System	A-25	15, 24, 29
Stabilized Construction Entrance	A-26	2, 6, 9, 15, 19, 24, 27, 29, 32
Construction Road Stabilization	A-27	2, 6, 9, 15, 19, 24, 32
Earth Dike	A-28	2, 9, 15, 19, 23, 24, 32
Temporary Drains and Swales	A-29	2, 6, 9, 18, 19, 23, 24, 32
Temporary Slope Drain	A-30	2, 9, 15, 19, 23, 24, 27, 29, 32
Storm Drain Outlet Protection	A-31	2, 9, 19, 23, 24, 32

Table IB (Cont.)
CONSTRUCTION BMP REFERENCES

Stormwater Best Management Practices	BMP Code	Sources of Information (See References)
Check Dams	A-32	2, 9, 15, 19, 23, 24, 29, 32, 35
Slope Roughening/Terracing	A-33	2, 9, 19, 23, 24, 27, 29, 32
Silt Fence	A-34	2, 9, 15, 18, 19, 23, 24, 27, 29, 32
Straw Bale Barriers	A-35	2, 9, 15, 18, 19, 23, 27, 29, 32
Sandbag Barrier	A-36	2, 9, 19
Brush or Rock Filter	A-37	2, 9, 19, 23, 24, 32
Storm Drain Inlet Protection	A-38	2, 9, 15, 18, 19, 23, 24, 29, 32
Temporary Sediment Trap	A-39	2, 9, 15, 18, 19, 20, 23, 24, 27, 29, 32
Temporary Sediment Basin	A-40	2, 9, 15, 18, 19, 23, 24, 27, 29, 32

Table IC
CONSTRUCTION BMP COSTS

([1] Individual quantitative cost information on capital, O&M, and training are not available for the specified BMP. The California Stormwater BMP Handbooks were used for relative cost [expressed as H – high, L – low, and M – moderate] information)

Stormwater Best Management Practices	BMP Code	Implementation Requirements			
		Capital Cost[1]	O&M Cost[1]	Training Cost[1]	Comments
Construction Scheduling	A-1	L	L	L	May increase other const. costs
Preservation of Existing Vegetation	A-2	L	L	L	May yield aesthetic benefits
Employee/Subcontractor Training	A-3	L	L	M	
Site Maintenance and Inspection	A-4	L	L	L	
Vehicle and Equipment Cleaning	A-5	L	L	L	
Vehicle and Equipment Fueling	A-6	M	L	M	
Vehicle and Equipment Maintenance	A-7	L	L	M	
Material Delivery and Storage	A-8	L	L	M	
Material Use	A-9	L	L	M	
Material Handling	A-10	L	L	L	
Spill Prevention and Control	A-11	L	M	M	
Solid Waste Management	A-12	L	L	M	
Hazardous Waste Management	A-13	L	L	M	Treatment/ disposal of contaminated soil can be costly
Contaminated Soil Management	A-14	L	M	M	
Concrete Waste Management	A-15	L	L	M	
Sanitary/Septic Waste Management	A-16	L	L	L	
Dust Controls	A-17	L	M	L	

Table IC (Cont.)
CONSTRUCTION BMP COSTS

([1] Individual quantitative cost information on capital, O&M, and training are not available for the specified BMP. The California Stormwater BMP Handbooks were used for relative cost [expressed as H – high, L – low, and M – moderate] information)

Stormwater Best Management Practices	BMP Code	Implementation Requirements			
		Capital Cost[1]	O&M Cost[1]	Training Cost[1]	Comments
Dewatering Operations	A-18	M	M	M	High disposal costs for contaminated groundwater
Paving Operations	A-19	L	L	M	
Structure Construction & Painting	A-20	L to M	L	M	
Seeding and Planting	A-21	M	M	M	
Mulching	A-22	M	M	L	
Geotextiles and Mats	A-23	H	M	L	
Temporary Stream Crossing	A-24	M	L	L	Bridge: $45-$95 per sq. ft.
Reinforced Soil Retaining System	A-25	M	L	L	
Stabilized Construction Entrance	A-26	M	L	L	
Construction Road Stabilization	A-27	M	M	L	
Earth Dike	A-28	M	L	L	$15-$55 per linear ft.
Temporary Drains and Swales	A-29	M	L	L	
Temporary Slope Drain	A-30	M	L	L	
Outlet Protection	A-31	M	L	L	
Check Dams	A-32	M	L	L	
Slope Roughening/Terracing	A-33	L	L	L	Terracing: $4 per linear ft.

Table IC (Cont.)
CONSTRUCTION BMP COSTS

([1] Individual quantitative cost information on capital, O&M, and training are not available for the specified BMP. The California Stormwater BMP Handbooks were used for relative cost [expressed as H – high, L – low, and M – moderate] information)

Stormwater Best Management Practices	BMP Code	Implementation Requirements			
		Capital Cost[1]	O&M Cost[1]	Training Cost[1]	Comments
Silt Fence	A-34	M	M	L	$7 per linear ft.
Straw Bale Barriers	A-35	H	H	L	Annual cost: $17 per linear ft.
Sandbag Barrier	A-36	H	L	L	Costly, longer life
Brush or Rock Filter	A-37	M	M	L	Rock filter can be more expensive
Storm Drain Inlet Protection	A-38	M	L	L	Annual cost: $150 per inlet
Temporary Sediment Trap	A-39	L	M	L	$1.3k per drainage acre
Temporary Sediment Basin	A-40	L	M	L	$350 - $700 per drainage acre

ft - feet
k - thousand
O&M – operation and maintenance

Table ID
CONSTRUCTION BMP TARGET POLLUTANTS

Stormwater Best Management Practices	BMP Code	Target Pollutants
Construction Scheduling	A-1	Sediment, Nutrients, Metals, Pesticides, Oil/Grease/Fuels, Toxic Chemicals, Miscellaneous Wastes
Preservation Existing Vegetation	A-2	Sediment, Miscellaneous Wastes
Employee/Subcontractor Training	A-3	Sediment, Nutrients, Metals, Pesticides, Oil/Grease/Fuels, Toxic Chemicals, Miscellaneous Wastes
Site Maintenance and Inspection	A-4	Sediments, Nutrients, Metals, Pesticides, Oil/Grease/Fuels, Toxic Chemicals, Miscellaneous Wastes
Vehicle and Equipment Cleaning	A-5	Oil/Grease/Fuels, Toxic Chemicals
Vehicle and Equipment Fueling	A-6	Oil/Grease/Fuels, Toxic Chemicals
Vehicle and Equipment Maintenance	A-7	Oil/Grease/Fuels, Toxic Chemicals
Material Delivery and Storage	A-8	Sediment, Nutrients, Metals, Pesticides, Oil/Grease/Fuels, Toxic Chemicals
Material Use	A-9	Sediment, Nutrients, Metals, Pesticides, Oil/Grease/Fuels, Toxic Chemicals
Material Handling	A-10	Sediment, Nutrients, Metals, Pesticides, Oil/Grease/Fuels, Toxic Chemicals
Spill Prevention and Control	A-11	Pesticides, Oil/Grease/Fuels, Toxic Chemicals, Miscellaneous Wastes
Solid Waste Management	A-12	Sediment, Metals, Miscellaneous Wastes
Hazardous Waste Management	A-13	Toxic Chemicals
Contaminated Soil Management	A-14	Sediment, Nutrients, Metals, Pesticides, Oil/Grease/Fuels, Toxic Chemicals, Miscellaneous Wastes
Concrete Waste Management	A-15	Sediment, Miscellaneous Wastes
Sanitary/Septic Waste Management	A-16	Miscellaneous Wastes
Dust Controls	A-17	Sediment, Metals, Toxic Chemicals
Dewatering Operations	A-18	Sediment, Nutrients, Metals, Pesticides, Oil/Grease/Fuels, Toxic Chemicals, Miscellaneous Wastes
Paving Operations	A-19	Sediment, Pesticides, Oil/Grease/Fuels, Miscellaneous Wastes
Structure Construction & Painting	A-20	Metals, Toxic Chemicals, Miscellaneous Wastes
Seeding and Planting	A-21	Sediment, Nutrients, Pesticides, Miscellaneous Wastes
Mulching	A-22	Sediment, Nutrients, Pesticides, Miscellaneous Wastes

Table ID (Cont.)
CONSTRUCTION BMP TARGET POLLUTANTS

Stormwater Best Management Practices	BMP Code	Target Pollutants
Geo-textiles and Mats	A-23	Sediment, Toxic Chemicals, Miscellaneous Wastes
Temporary Stream Crossing	A-24	Sediment
Reinforced Soil Retaining System	A-25	Sediment
Stabilized Construction Entrance	A-26	Sediment
Construction Road Stabilization	A-27	Sediment
Earth Dike	A-28	Sediment
Temporary Drains and Swales	A-29	Sediment, Nutrients, Metals, Pesticides, Oil/Grease/Fuels, Toxic Chemicals, Miscellaneous Wastes
Temporary Slope Drain	A-30	Sediment, Miscellaneous Wastes
Storm Drain Outlet Protection	A-31	Sediment
Check Dams	A-32	Sediment
Slope Roughening/Terracing	A-33	Sediment
Silt Fence	A-34	Sediment
Straw Bale Barriers	A-35	Sediment
Sandbag Barrier	A-36	Sediment
Brush or Rock Filter	A-37	Sediment
Storm Drain Inlet Protection	A-38	Sediment
Temporary Sediment Trap	A-39	Sediment
Temporary Sediment Basin	A-40	Sediment

II. Source Control Best Management Practices (BMPs)

This section lists and describes those BMPs most commonly used for source control at municipal, residential, industrial, and commercial sites. Source control BMPs help to prevent stormwater pollution by reducing the potential for contamination at the source of the pollution. Source control BMPs include schedules of activities, prohibitions of practices, maintenance procedures, management and operational procedures; and other methods employed at municipal, industrial, residential, and commercial sites to control pollution at the source. This section presents the following information: background information, providing an overview of related pollutant and regulatory issues; a BMP listing, summarizing the applicable source control practices by area or activity, and guidance information to assist in BMP selection. Guidance information is presented in a tabular format and includes a BMP selection matrix, a BMP reference table, a BMP cost table, and BMP target pollutant table.

A. Background Information

1. Pollutant Issues - Urban stormwater primary pollutant sources include the following areas and operations: industrial and commercial areas; high activity parking lots; material (including wastes) storage and handling areas; vehicle and equipment fueling, washing maintenance, repair areas; erodible soil; street and highways; and handling and application of landscape maintenance products.

   Reduction or the elimination of stormwater pollutants can be achieved by implementing operational source control BMPs including good housekeeping, employee training, spill prevention and cleanup, preventative maintenance, regular inspections, and record-keeping. These BMPs can be combined with engineering, structural, and physical controls (such as impervious containments and covers). If operational and structural source control BMPs are not feasible or adequate, then stormwater treatment BMPs may be necessary, as described in Section III. Selecting cost-effective BMPs should be based on an assessment of potential pollutants and their sources.

2. Regulatory Issues - Source controls can be used to assist industrial entities in complying with requirements of their individual NPDES permits and their industrial sector permits issued by the United States Environmental Protection Agency. Source controls may also be used in complying with requirements of the General Industrial NPDES permit issued by SWRCB. In the event that the identified BMPs become infeasible or inadequate to reduce the source of contamination, treatment controls may need to be utilized.

   City facilities, operations and departments may also utilize source controls to help meet the requirements of the Municipal Stormwater NPDES permit. This includes city vehicle maintenance yards and field operations.

Those in charge of private or city development can use source controls to help comply with the requirements of the newly adopted stormwater mitigation measures, issued by the RWQCB. Source controls may also be used to assist in reducing stormwater pollution from the entire City of Los Angeles drainage area including areas not covered by the described regulatory requirements.

B. BMP Listing

Listed below are the source control BMPs for municipal, residential, industrial, and commercial activities. The list includes vehicle management; material handling and storage; structure and facility maintenance; vegetation management; illicit discharge control; and general practices, preventive maintenance, and inspection. Specific industrial and commercial BMPs are individually listed in the references identified.

General

B-1. Public Education/Participation
B-2. Land Use Planning/Management
B-3. Employee Training
B-4. Housekeeping Practices
B-5. Safer Alternative Products
B-6. Above-Water Activities

Vehicle Fleet Management

B-7. Vehicle and Equipment Fueling
B-8. Vehicle and Equipment Washing and Steam Cleaning
B-9. Vehicle and Equipment Maintenance and Repair
B-10. Vehicle and Equipment Parking and Storage
B-11. Vehicle Leak and Spill Control

Raw Material, Products and By-Products

B-12. Aboveground Tank Leak and Spill Control
B-13. Outdoor Loading/Unloading of Material
B-14. Outdoor Container Storage of Liquids
B-15. Outdoor Equipment O&M
B-16. Outdoor Storage & Storage of Materials
B-17. Outdoor Manufacturing Activities
B-18. Waste Handling and Disposal
B-19. Household Hazardous Waste Collection
B-20. Used Oil Recycling
B-21. Material Handling
B-22. Material Use

Building Maintenance

B-23. Building and Grounds Maintenance
B-24. Building Repair and Remodeling
B-25. Roof/Building Drains

Illicit Connections/Illicit Discharges

B-26. Storm Drain System Signs
B-27. Illicit Connection-Prevention
B-28. Illicit Connection-Detection and Removal
B-29. Leaking Sanitary Sewer Control
B-30. Illegal Dumping Control
B-31. Non-Stormwater Discharges
B-32. Industrial/Commercial Discharger Control Program

Street/Storm Drain Maintenance

B-33. Street Cleaning
B-34. Catch Basin Cleaning
B-35. Storm Drain Flushing
B-36. Roadway/Bridge Maintenance
B-37. Detention/Infiltration Device Maintenance
B-38. Storm Channel/Creek Maintenance

Vegetation

B-39. Vegetation Controls
B-40. Pest Management & Lawn/Vegetation Management
B-41. Landscaping
B-42. Buffer (Vegetation) System Protection
B-43. Pesticide/Fertilizer Use

Others

B-44. Specific Industrial BMPs
B-45. Specific Commercial BMPs
B-46. General Preventive Maintenance
B-47. General Inspection and Maintenance

C. Selection Matrix and Tables

The BMP selection matrix and associated tables are provided to help select source control BMPs that best meet the requirements and suitable for a subject municipal, industrial, and commercial site. The source control BMP selection matrix and tables can be found in the subsequent pages and are listed as follows:

Table IIA - Source Control BMP Selection Matrix
Table IIB - Source Control BMPs References
Table IIC - Source Control BMP Costs
Table IID - Source Control BMP Target Pollutants

Table IIA
SOURCE CONTROL BMP SELECTION MATRIX

Stormwater Best Management Practices (BMPs)		Category of Pollution Source Areas																
		Municipal								Residential					Industrial		Commercial	
BMP Name	BMP Code	Structures/Yards/ Facilities	Green Spaces	Parking Lots	Road/Bridge/Street	Storage Facility	Equipment/Vehicle Facilities	Loading/Unloading Areas	Other Areas	Garden/Yard Maintenance	Vehicle Storage/Maintenance	Animals/Household Pets	Septic Tanks	Other Areas	Existing/Old Development	New Development	Existing/Old Development	New Development
General																		
Public Education/Participation	B-1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Land Use Planning/Management	B-2		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X
Employee Training	B-3	X	X	X	X	X	X	X	X						X	X	X	X
Housekeeping Practices	B-4	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
Safer Alternative Products	B-5					X	X	X	X	X	X			X	X	X	X	X
Above-Water Activities	B-6								X					X	X	X	X	X
Vehicle Fleet																		
Vehicle and Equipment Fueling	B-7						X				X				X	X	X	X
Vehicle and Equipment Washing and Steam Cleaning	B-8						X				X				X	X	X	X

Table IIA (Cont.)
SOURCE CONTROL BMP SELECTION MATRIX

Stormwater Best Management Practices (BMPs)		Category of Pollution Source Areas																
		Municipal								Residential					Industrial		Commercial	
BMP Name	BMP Code	Structures/Yards/ Facilities	Green Spaces	Parking Lots	Road/Bridge/Street	Storage Facility	Equipment/Vehicle Facilities	Loading/Unloading Areas	Other Areas	Garden/Yard Maintenance	Vehicle Storage/Maintenance	Animals/Household Pets	Septic Tanks	Other Areas	Existing/Old Development	New Development	Existing/Old Development	New Development
Vehicle and Equipment Maintenance and Repair	B-9						X				X				X	X	X	X
Vehicle and Equipment Parking and Storage	B-10			X			X				X				X	X	X	X
Vehicle Leak and Spill Control	B-11			X			X				X				X	X	X	X
Raw Materials, Products, and By-Products																		
Aboveground Tank Leak and Spill Control	B-12	X			X	X	X	X	X		X				X	X	X	X
Outdoor Loading/Unloading of Material	B-13	X			X	X	X	X	X						X	X	X	X
Outdoor Container Storage of Liquids	B-14	X				X	X	X	X		X			X	X	X	X	X
Outdoor Process Equipment O&M	B-15					X			X						X	X	X	X
Outdoor Storage of Materials	B-16	X				X	X	X	X		X			X	X	X	X	X
Outdoor Manufacturing Activities	B-17														X			

Table IIA (Cont.)
SOURCE CONTROL BMP SELECTION MATRIX

Stormwater Best Management Practices (BMPs)		Category of Pollution Source Areas																
		Municipal								Residential					Industrial		Commercial	
BMP Name	BMP Code	Structures/Yards/ Facilities	Green Spaces	Parking Lots	Road/Bridge/Street	Storage Facility	Equipment/Vehicle Facilities	Loading/Unloading Areas	Other Areas	Garden/Yard Maintenance	Vehicle Storage/Maintenance	Animals/Household Pets	Septic Tanks	Other Areas	Existing/Old Development	New Development	Existing/Old Development	New Development
Waste Handling and Disposal	B-18	X				X	X		X	X		X	X	X	X	X	X	X
Household Hazardous Waste Collection	B-19									X	X			X				
Used Oil Recycling	B-20					X	X		X		X				X	X	X	X
Material Handling	B-21	X				X	X	X	X	X	X			X	X	X	X	X
Material Use	B-22	X				X	X	X	X	X	X			X	X	X	X	X
Building/Facility Maintenance																		
Building and Grounds Maintenance	B-23	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X
Building Repair and Remodeling	B-24	X				X	X		X					X	X		X	
Roof/building Drains	B-25	X				X	X		X					X	X	X	X	X
Illicit Connections/Illicit Discharges																		
Storm Drain System Signs	B-26	X		X	X	X	X		X					X	X	X	X	X

Table IIA (Cont.)
SOURCE CONTROL BMP SELECTION MATRIX

Stormwater Best Management Practices (BMPs)		Category of Pollution Source Areas																
		Municipal								Residential					Industrial		Commercial	
BMP Name	BMP Code	Structures/Yards/ Facilities	Green Spaces	Parking Lots	Road/Bridge/Street	Storage Facility	Equipment/Vehicle Facilities	Loading/Unloading Areas	Other Areas	Garden/Yard Maintenance	Vehicle Storage/Maintenance	Animals/Household Pets	Septic Tanks	Other Areas	Existing/Old Development	New Development	Existing/Old Development	New Development
Illicit Connection-Prevention	B-27	X							X						X	X	X	X
Illicit Connection-Detection and Removal	B-28	X							X						X		X	
Leaking Sanitary Sewer Control	B-29	X				X	X		X				X	X	X	X	X	X
Illegal Dumping Control	B-30	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X
Non-Stormwater Discharges	B-31	X				X	X		X						X	X	X	X
Industrial/Commercial Discharger Control Program	B-32														X	X	X	X
Street/Storm Drain Maintenance																		
Street Cleaning	B-33			X	X			X	X	X				X	X	X	X	X
Catch Basin Cleaning	B-34			X	X				X					X	X		X	
Storm Drain Flushing	B-35			X	X				X					X	X	X	X	X
Roadway/Bridge Maintenance	B-36				X										X		X	
Detention/Infiltration Device Maintenance	B-37	X		X	X				X					X	X		X	

Table IIA (Cont.)
SOURCE CONTROL BMP SELECTION MATRIX

Stormwater Best Management Practices (BMPs)		Category of Pollution Source Areas																
		Municipal								Residential					Industrial		Commercial	
BMP Name	BMP Code	Structures/Yards/ Facilities	Green Spaces	Parking Lots	Road/Bridge/Street	Storage Facility	Equipment/Vehicle Facilities	Loading/Unloading Areas	Other Areas	Garden/Yard Maintenance	Vehicle Storage/Maintenance	Animals/Household Pets	Septic Tanks	Other Areas	Existing/Old Development	New Development	Existing/Old Development	New Development
Storm Channel/Creek Maintenance	B-38	X	X	X	X				X	X				X	X	X	X	X
Vegetation																		
Vegetation Controls	B-39	X	X	X	X	X	X	X	X	X				X	X	X	X	X
Pest Management & Lawn/Vegetation Management	B-40		X	X	X				X	X		X		X	X	X	X	X
Landscaping	B-41	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X
Buffer (Vegetation) System Protection	B-42		X	X	X				X	X				X	X	X	X	X
Pesticide/Fertilizer Use	B-43	X	X			X			X	X				X	X	X	X	X
Other BMPs																		
Specific Industrial BMPs	B-44														X	X		
Specific Commercial BMPs	B-45																X	X
General Preventive Maintenance	B-46	X			X	X	X	X	X	X	X		X	X	X	X	X	X
General Inspection and Maintenance	B-47	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Table IIB
SOURCE CONTROL BMP REFERENCES

Stormwater Best Management Practices	BMP Code	Sources of Information (See References)
General		
Public Education/Participation	B-1	3, 8, 10, 16, 17, 25, 27, 30, 36, 41
Land Use Planning/Management	B-2	3, 6, 8, 10, 15, 17, 27, 28, 36
Employee Training	B-3	4, 23, 25, 27
Housekeeping Practices	B-4	3, 10, 15, 23, 24, 26, 27, 30, 36
Safer Alternative Products	B-5	3, 10, 36
Above-Water Activities	B-6	4
Vehicle Fleet		
Vehicle and Equipment Fueling	B-7	4, 23, 33, 41
Vehicle and Equipment Washing and Steam Cleaning	B-8	4, 15, 23, 33, 41
Vehicle and Equipment Maintenance and Repair	B-9	4, 15, 23, 33, 41
Vehicle and Equipment Parking and Storage	B-10	3, 6, 33, 41
Vehicle Leak and Spill Control	B-11	3, 10, 27, 33, 36
Raw Materials, Products, and By-Products		
Aboveground Tank Leak and Spill Control	B-12	3, 10, 24, 33, 36
Outdoor Loading/Unloading of Material	B-13	4, 23, 25, 33
Outdoor Container Storage of Liquids	B-14	4, 23, 25, 33
Outdoor Process Equipment O&M	B-15	4, 23, 25, 33
Outdoor Storage of Materials	B-16	3, 4, 10, 15, 23, 25, 27, 33, 36
Outdoor Manufacturing Activities	B-17	23, 33
Waste Handling and Disposal	B-18	4, 17, 19, 25, 28
Household Hazardous Waste Collection	B-19	3, 10, 28, 30, 36, 41
Used Oil Recycling	B-20	3, 10, 36

Table IIB (Cont.)
SOURCE CONTROL BMP REFERENCES

Stormwater Best Management Practices	BMP Code	Sources of Information (See References)
Material Handling	B-21	25, 27
Material Use	B-22	2, 9, 19, 24
Building and Facility Maintenance		
Building and Grounds Maintenance	B-23	4, 17
Building Repair and Remodeling	B-24	4, 17, 41
Roof/building Drains	B-25	2, 6, 8, 21, 29, 33
Illicit Connections/Illicit Discharges		
Storm Drain System Signs	B-26	3, 10, 36
Illicit Connection-Prevention	B-27	3, 10, 17, 33, 36
Illicit Connection-Detection and Removal	B-28	3, 10, 17, 27, 28, 30, 36
Leaking Sanitary Sewer Control	B-29	3, 10, 36
Illegal Dumping Control	B-30	3, 10, 17, 19, 36
Non-Stormwater Discharges	B-31	4, 8, 22, 23, 24, 27
Industrial/Commercial Discharger Control Program	B-32	17, 27
Street/Storm Drain Maintenance		
Street Cleaning	B-33	3, 10, 17, 18, 28, 30, 32, 33, 36
Catch Basin Cleaning	B-34	3, 10, 15, 18, 20, 27, 28, 30, 36
Storm Drain Flushing	B-35	3, 10, 17, 36
Roadway/Bridge Maintenance	B-36	3, 10, 17, 27, 30, 36
Detention/Infiltration Device Maintenance	B-37	3, 10, 23, 36
Storm Channel/Creek Maintenance	B-38	3, 10, 15, 20, 23, 32, 36
Vegetation		
Vegetation Controls	B-39	3, 6, 8, 10, 11, 15, 19, 21, 23, 24, 29, 30, 32, 36
Pest Management & Lawn/Vegetation Management	B-40	26, 30, 33, 41

Table IIB (Cont.)
SOURCE CONTROL BMP REFERENCES

Stormwater Best Management Practices	BMP Code	Sources of Information (See References)
Landscaping	B-41	12, 15, 21, 27, 33, 40, 41
Buffer (Vegetation) System Protection	B-42	6, 8,11, 15, 19, 21, 23, 24, 27, 29, 32
Pesticide/Fertilizer Use	B-43	10, 15, 16, 24, 26, 28, 29, 30, 41
Others		
Specific Industrial BMPs	B-44	23, 24, 26, 27, 29, 33, 41
Specific Commercial BMPs	B-45	23, 24, 26, 27, 29, 33, 41
General Preventive Maintenance	B-46	23, 25, 27, 30
General Inspection and Maintenance	B-47	24

Table IIC
SOURCE CONTROL BMP COSTS

([1] Individual quantitative cost information on capital, O&M, and training are not available for the specified BMP. The California Stormwater BMP Handbooks were used for relative cost [expressed as H – high, L – low, and M – moderate] information)

Stormwater Best Management Practices	BMP Code	Implementation Requirements			
		Capital Cost[1]	O&M Cost[1]	Training Cost[1]	Comments
General					
Public Education/Participation	B-1	M	M	M	
Land Use Planning/Management	B-2	L	M	H	
Employee Training	B-3	M	M	M	
Housekeeping Practices	B-4	L	M	H	
Safer Alternative Products	B-5	L	M	H	
Above-Water Activities	B-6	L	M	M	
Vehicle Fleet					
Vehicle and Equipment Fueling	B-7	M	L	M	
Vehicle and Equipment Washing and Steam Cleaning	B-8	M	L	M	
Vehicle and Equipment Maintenance and Repair	B-9	L	M	M	
Vehicle and Equipment Parking and Storage	B-10	L	L	M	
Vehicle Leak and Spill Control	B-11	L	M	H	
Raw Material, Products and By-Products					
Aboveground Tank Leak and Spill Control	B-12	L	M	H	
Outdoor Loading/Unloading of Material	B-13	M	L	M	
Outdoor Container Storage of Liquids	B-14	M	M	H	
Outdoor Equipment O&M	B-15	L	L	M	
Outdoor Storage of Materials	B-16	M	L	H	
Outdoor Manufacturing Activities	B-17	L	L	M	
Waste Handling and Disposal	B-18	L	M	M	
Household Hazardous Waste Collection	B-19	M	M	M	

Table IIC (Cont.)
SOURCE CONTROL BMP COSTS

([1] Individual quantitative cost information on capital, O&M, and training are not available for the specified BMP. The California Stormwater BMP Handbooks were used for relative cost [expressed as H – high, L – low, and M – moderate] information)

Stormwater Best Management Practices	BMP Code	Implementation Requirements			
		Capital Cost[1]	O&M Cost[1]	Training Cost[1]	Comments
Used Oil Recycling	B-20	L	M	M	
Material Handling	B-21	M	L	M	
Material Use	B-22	L	L	M	
Building Maintenance					
Building and Grounds Maintenance	B-23	L	M	M	
Building Repair and Remodeling	B-24	L	M	M	
Roof/Building Drains	B-25	M	L	L	
Illicit Connection/Illicit Discharges					
Storm Drain System Signs	B-26	L	M	M	
Illicit Connection-Prevention	B-27	L	M	M	
Illicit Connection-Detection and Removal	B-28	L	H	L	
Leaking Sanitary Sewer Control	B-29	L	H	H	
Illegal Dumping Control	B-30	L	M	H	
Non-Stormwater Discharges	B-31	M	L	M	
Industrial/Commercial Discharger Control Program	B-32	L	M	H	
Street/Storm Drain Maintenance					
Street Cleaning	B-33	H	H	H	
Catch Basin Cleaning	B-34	H	H	M	
Storm Drain Flushing	B-35	M	H	M	
Roadway/Bridge Maintenance	B-36	L	L	M	
Detention/Infiltration Device Maintenance	B-37	M	M	L	
Storm Channel/Creek Maintenance	B-38	L	M	H	

Table IIC (Cont.)
SOURCE CONTROL BMP COSTS

([1] Individual quantitative cost information on capital, O&M, and training are not available for the specified BMP. The California Stormwater BMP Handbooks were used for relative cost [expressed as H – high, L – low, and M – moderate] information)

Stormwater Best Management Practices	BMP Code	Implementation Requirements			
		Capital Cost[1]	O&M Cost[1]	Training Cost[1]	Comments
Vegetation					
Vegetation Control	B-39	L	L	M	
Pest Management & Lawn/ Vegetation Management	B-40	M	M	L	
Landscaping	B-41	M	L	L	
Buffer (Vegetation) System Protection	B-42	H	L	M	
Pesticide/Fertilizer Use	B-43	L	M	H	
Other					
Specific Industrial BMPs	B-44	L	M	L	
Specific Commercial BMPs	B-45	L	M	L	
General Preventive Maintenance	B-46	L	M	M	
General Inspection and Maintenance	B-47	L	M	M	

O&M – operation and maintenance

Table IID
SOURCE CONTROL BMP TARGET POLLUTANTS

Stormwater Best Management Practices	BMP Code	Target Pollutants
General		
Public Education/Participation	B-1	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Land Use Planning/ Management	B-2	Sediment, Nutrients, Metals, Toxic Chemicals
Employee Training	B-3	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Housekeeping Practices	B-4	Sediment, Nutrients, Toxic Chemicals, Oil/Grease, Oxygen-Demanding Substances
Safer Alternative Products	B-5	Sediment, Nutrients, Toxic Chemicals, Oil/Grease, Oxygen-Demanding Substances
Above-Water Activities	B-6	Metals, Toxic Chemicals, Oil/Grease, Oxygen-Demanding Substances, Floatable Materials, Bacteria/Viruses
Vehicle Fleet		
Vehicle and Equipment Fueling	B-7	Metals, Oil/Grease, Toxic Chemicals
Vehicle and Equipment Washing and Steam Cleaning	B-8	Sediment, Nutrients, Metals, Oil/Grease, Toxic Chemicals, Oxygen-Demanding Substances
Vehicle and Equipment Maintenance and Repair	B-9	Metals, Oil/Grease, Toxic Chemicals
Vehicle and Equipment Parking and Storage	B-10	Metals, Oil/Grease, Toxic Chemicals
Vehicle Leak and Spill Control	B-11	Metals, Oil/Grease, Toxic Chemicals
Raw Material, Products, and By-Products		
Aboveground Tank Leak and Spill Control	B-12	Toxic Chemicals, Oil/Grease
Outdoor Loading/Unloading of Material	B-13	Nutrients, Metals, Toxic Chemicals, Oil/Grease, Oxygen-Demanding Substances, Floatable Materials
Outdoor Container Storage of Liquids	B-14	Metals, Toxic Chemicals, Oxygen-Demanding Substances
Outdoor Process Equipment O&M	B-15	Sediment, Metals, Toxic Chemicals, Oil/Grease
Outdoor Storage of Materials	B-16	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oil/Grease
Outdoor Manufacturing Activities	B-17	Sediments, Nutrients, Metals, Toxic Chemicals, Oil/Grease, Oxygen-Demanding Substances, Floatable Materials
Waste Handling and Disposal	B-18	Metals, Toxic Chemicals, Oil/Grease
Household Hazardous Waste Collection	B-19	Metals, Toxic Chemicals, Oil/Grease

Used Oil Recycling	B-20	Metals, Oil/Grease

Table IID (Cont.)
SOURCE CONTROL BMP TARGET POLLUTANTS

Stormwater Best Management Practices	BMP Code	Target Pollutants
Material Handling	B-21	Sediment, Nutrients, Metals, Oil/Grease, Toxic Chemicals
Material Use	B-22	Sediment, Nutrients, Metals, Oil/Grease, Toxic Chemicals
Building and Facility Maintenance		
Building and Grounds Maintenance	B-23	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease
Building Repair and Remodeling	B-24	Sediment, Metals, Toxic Chemicals, Floatable Materials, Oil/Grease
Roof/Building Drains	B-25	Sediment, Metals, Floatable Materials
Illicit Connection/Illicit Discharges		
Storm Drain System Signs	B-26	Sediment, Nutrients, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease
Illicit Connection-Prevention	B-27	Nutrients, Oxygen-Demanding Substances, Bacteria/Viruses
Illicit Connection-Detection and Removal	B-28	Nutrients, Oxygen-Demanding Substances, Bacteria/Viruses
Leaking Sanitary Sewer Control	B-29	Nutrients, Oxygen-Demanding Substances, Bacteria/Viruses
Illegal Dumping Control	B-30	Sediment, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Non-Stormwater Discharges	B-31	Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Industrial/Commercial Discharger Control Program	B-32	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Street/Storm Drain Maintenance		
Street Cleaning	B-33	Sediment, Nutrients, Metals, Floatable Materials, Oxygen-Demanding Substances
Catch Basin Cleaning	B-34	Sediment, Metals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease
Storm Drain Flushing	B-35	Sediment, Nutrients, Metals, Oxygen-Demanding Substances, Bacteria/Viruses
Roadway/Bridge Maintenance	B-36	Sediment, Nutrients, Metals, Oxygen-Demanding Substances, Bacteria/Viruses
Detention/Infiltration Device Maintenance	B-37	Sediment, Metals, Oxygen-Demanding Substances, Bacteria/Viruses
Storm Channel/Creek Maintenance	B-38	Sediment, Metals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease
Vegetation		
Vegetation Controls	B-39	Sediment, Nutrients, Floatable Materials, Oxygen-Demanding Substances

Table IID (Cont.)
SOURCE CONTROL BMP TARGET POLLUTANTS

Stormwater Best Management Practices	BMP Code	Target Pollutants
Pest Management & Lawn/Vegetation Management	B-40	Sediment, Nutrients, Floatable Materials, Oxygen-Demanding Substances, Bacteria/Viruses
Landscaping	B-41	Sediment, Nutrients, Floatable Materials, Oxygen-Demanding Substances
Buffer (Vegetation) System Protection	B-42	Sediment, Nutrients, Floatable Materials, Oxygen-Demanding Substances
Pesticide/Fertilizer Use	B-43	Nutrients, Pesticide, Toxic Chemicals, Oxygen-Demanding Materials
Other		
Specific Industrial BMPs	B-44	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Specific Commercial BMPs	B-45	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
General Preventive Maintenance	B-46	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
General Inspection and Maintenance	B-47	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses

N/A – not applicable

III. Treatment Control Best Management Practices (BMPs)

This section lists and describes those BMPs most commonly used for treatment control. Treatment control BMPs include engineered systems, technology, and structural devices that use physical, chemical, or biological processes to treat, control, remove, or reduce pollutants from stormwater and urban runoff. This section presents the following: background information, providing an overview of related pollutant and regulatory issues; a BMP listing, summarizing the applicable practices; and guidance information to assist in the BMP selection process. Guidance information is presented in a tabular format and includes a BMP selection matrix, a BMP reference table, a BMP cost table, and a BMP target pollutant table.

A. Background Information

1. Pollutant Issues - Treatment control BMPs are designed to treat, reduce, or remove pollutants contained in urban runoff. The pollutants of concern may include suspended solids, sand, silt, heavy metals (e.g. copper, lead, zinc), nutrients (e.g. nitrogen, phosphorus), bacteria and viruses, and organics (e.g. petroleum hydrocarbons, pesticides). Floatable pollutants including oil, debris, and scum can also be removed by certain treatment control devices (e.g. separator structures). Treatment control BMPs include settling basins or vaults, oil/water separators, biofilters, wet ponds, constructed wetlands, infiltration, media filters, and others.

2. Regulatory Issues - Treatment control systems can fulfill the regulatory requirements of either construction or source control BMPs (see Sections I.B and II.B). Treatment control measures should be considered as part of the BMP selection process in the event that construction or source control BMPs are not sufficient to reduce stormwater pollution to met regulatory requirements. Treatment controls should also be considered if they are economically feasible and a preferrable measure. Also, in certain instances, regulatory requirements may require the implementation of treatment control instead of other control alternatives.

B. BMP Listing

Listed below are the treatment control BMPs. The list includes vegetative, infiltration, pavement, catch basin, hydrodynamic, clarifier, media filtration, and end-of-pipe systems.

Vegetative Systems

C-1. Biofiltration Swales (Vegetated Buffer System)

C-2. Vegetative Filter Strips

C-3. Bioretention

C-4. Existing Vegetation
C-5. Constructed Wetlands
C-6. Shallow Marsh

Infiltration/Retention/Detention

C-7. Infiltration Trench
C-8. Infiltration Basin
C-9. Cisterns
C-10. Wet (Retention) Pond
C-11. Dry (Extended Detention) Pond
C-12. Dry Well

Pavements

C-13. Asphalt Porous Pavements
C-14. Modular Concrete Block Porous Pavements
C-15. Poured Concrete Porous Pavements
C-16. Structural Soil

Catch Basin Systems

C-17. Boarding/Coarse Screens
C-18. Generic Catch Basin Filters
C-19. Fossil Filter™
C-20. Aqua-Guard™
C-21. StormFilter™
C-22. Ultra-Urban Filter™
C-23. Enviro-Drainâ
C-24. HydroKleen™

Vortex/Hydrodynamic Systems

C-25. Generic Hydrodynamic Systems
C-26. Downstream Defender
C-27. Vortechnics™
C-28. V2B1™
C-29. Continuous Deflective Separation (CDS™)
C-30. StormTreat™
C-31. Stormceptorâ
C-32. Aqua-Filter™

Clarifiers

C-33. Generic Clarifiers

C-34. Clarifiers with Rain Diversion
C-35. Oil/Water Separator
C-36. Jensenâ Interceptor
C-37. Teichert Interceptor™
C-38. BaySaverâ
C-39. Isoilater™

Media Filtration

C-40. Sand/Organic Beds
C-41. Organic Filters
C-42. StormFilter™

End-of-Pipe Systems

C-43. Diversion to Sewer
C-44. Disinfection
C-45. Water Reclamation

C. Selection Matrix and Tables

The BMP selection matrix and associated tables are provided to help select a treatment control BMP that best meets the requirements and suitable for a subject site. The treatment control BMP selection matrix and tables can be found in the subsequent pages and are listed as follows:

Table IIIA - Treatment Control BMP Selection Matrix
Table IIIB - Treatment Control BMP References
Table IIIC - Treatment Control BMP Costs
Table IIID - Treatment Control BMP Target Pollutants

Table IIIA
TREATMENT CONTROL BMP SELECTION MATRIX

Stormwater Best Management Practices (BMPs)		Category of Pollutants Treated																							
		Solids						Nutrients				Metals		Oxygen Demanding Substances		Organics				Toxic Chemicals		Bacteria/Viruses			
BMP Name	BMP Code	Trash/Debris	Floatable Materials	Suspended Solids	Dissolved Solids	Settleable Solids	Sediments (General)	Total Nitrogen	Total Phosphorous	Org. Phosphorous	Nutrients (General)	Heavy	Metals(General)	General	COD/BOD	Oil & Grease	Fuels	Solvents	Other Organics	General	Organics/Inorganics	Total Coliform	Fecal Coliform	Bacteria	Viruses
Vegetative Systems																									
Biofiltration Swales/Vegetated Buffer System	C-1		X			X	X				X		X	X		X				X					
Vegetative Filter Strips	C-2		X			X	X				X		X	X		X				X					
Bioretention	C-3		X			X	X				X		X	X		X				X				X	X
Existing Vegetation	C-4		X			X	X				X		X	X		X				X					
Constructed Wetlands	C-5		X			X	X				X		X	X		X				X				X	X
Shallow Marsh	C-6		X			X	X				X		X	X		X				X					
Infiltration/Retention																									
Infiltration Trench	C-7		X	X	X	X	X				X		X	X		X				X				X	X

Table IIIA (Cont.)
TREATMENT CONTROL BMP SELECTION MATRIX

Stormwater Best Management Practices (BMPs)		Category of Pollutants Treated																							
		Solids						Nutrients				Metals		Oxygen Demanding Substances		Organics				Toxic Chemicals		Bacteria/Viruses			
BMP Name	BMP Code	Trash/Debris	Floatable Materials	Suspended Solids	Dissolved Solids	Settleable Solids	Sediments (General)	Total Nitrogen	Total Phosphorous	Org. Phosphorous	Nutrients (General)	Heavy	Metals(General)	General	COD/BOD	Oil & Grease	Fuels	Solvents	Other Organics	General	Organics/Inorganics	Total Coliform	Fecal Coliform	Bacteria	Viruses
Infiltration Basin	C-8		X				X				X		X	X		X				X				X	X
Cisterns	C-9		X				X				X		X	X		X				X				X	X
Wet (Retention) Pond	C-10		X				X				X		X	X		X				X				X	X
Dry (Extended Detention) Pond	C-11		X				X				X		X	X		X				X					
Dry Well	C-12		X				X				X		X	X		X				X					
Pavements																									
Asphalt Porous Pavements	C-13		X			X	X				X		X	X		X				X					
Modular Concrete Block Porous Pavements	C-14		X			X	X				X		X	X		X				X					
Poured Concrete Porous Pavements	C-15		X			X	X				X		X	X		X				X					
Structural Soil	C-16					X	X				X		X	X		X				X					
Boarding/Coarse Screens	C-17		X																						

Table IIIA (Cont.)
TREATMENT CONTROL BMP SELECTION MATRIX

Stormwater Best Management Practices (BMPs)		Category of Pollutants Treated																								
		Solids						Nutrients				Metals		Oxygen Demanding Substances		Organics				Toxic Chemicals		Bacteria/Viruses			
BMP Name	BMP Code	Trash/Debris	Floatable Materials	Suspended Solids	Dissolved Solids	Settleable Solids	Sediments (General)	Total Nitrogen	Total Phosphorous	Org. Phosphorous	Nutrients (General)	Heavy	Metals(General)	General	COD/BOD	Oil & Grease	Fuels	Solvents	Other Organics	General	Organics/Inorganics	Total Coliform	Fecal Coliform	Bacteria	Viruses
Catch Basins Systems																									
Generic Catch Basin Filters	C-18	X	X										X			X									
Fossil Filter™	C-19	X					X									X	X								
Aqua-Guard™	C-20	X	X				X					X				X	X								
StormFilter™	C-21			X	X	X	X	X	X		X	X	X		X	X									
Ultra-Urban Filter™	C-22	X	X	X	X	X	X									X									
Enviro-Drainâ	C-23						X									X	X								
HydroKleen™	C-24											X	X				X		X						
Vortex/Hydrodynamic Systems																									
Generic Hydrodynamic Systems	C-25		X	X	X	X	X									X									
Downstream Defender	C-26		X	X	X	X	X																		
Vortechnics™	C-27		X	X	X	X	X					X				X									
V2B1™	C-28		X	X	X	X	X									X									

Table IIIA (Cont.)
TREATMENT CONTROL BMP SELECTION MATRIX

Stormwater Best Management Practices (BMPs)		Category of Pollutants Treated																							
		Solids						Nutrients				Metals		Oxygen Demanding Substances		Organics				Toxic Chemicals		Bacteria/Viruses			
BMP Name	BMP Code	Trash/Debris	Floatable Materials	Suspended Solids	Dissolved Solids	Settleable Solids	Sediments (General)	Total Nitrogen	Total Phosphorous	Org. Phosphorous	Nutrients (General)	Heavy	Metals(General)	General	COD/BOD	Oil & Grease	Fuels	Solvents	Other Organics	General	Organics/Inorganics	Total Coliform	Fecal Coliform	Bacteria	Viruses
Cont. Deflective Separation™	C-29	X	X	X	X	X	X	X	X		X			X	X										
StormTreat™	C-30			X				X	X	X	X	X			X	X						X	X	X	X
Stormceptorâ	C-31		X	X	X	X	X		X		X	X	X			X									
Aqua-Filter™	C-32	X		X			X	X		X	X		X		X	X	X								
Clarifiers																									
Generic Clarifiers	C-33		X	X	X	X	X									X									
Clarifiers with Rain Diversion	C-34						X									X	X								
Oil/Water Separator	C-35		X	X	X	X	X				X		X	X		X				X					
Jensenâ Interceptor	C-36		X	X	X	X	X									X									
Teichert Interceptor™	C-37		X	X	X	X	X																		
BaySaverâ	C-38	X	X	X	X	X	X									X									
Isoilater™	C-39		X	X							X				X	X									

Table IIIA (Cont.)
TREATMENT CONTROL BMP SELECTION MATRIX

Stormwater Best Management Practices (BMPs)		Category of Pollutants Treated																							
		Solids						Nutrients				Metals		Oxygen Demanding Substances		Organics				Toxic Chemicals		Bacteria/Viruses			
BMP Name	BMP Code	Trash/Debris	Floatable Materials	Suspended Solids	Dissolved Solids	Settleable Solids	Sediments (General)	Total Nitrogen	Total Phosphorous	Org. Phosphorous	Nutrients (General)	Heavy	Metals(General)	General	COD/BOD	Oil & Grease	Fuels	Solvents	Other Organics	General	Organics/Inorganics	Total Coliform	Fecal Coliform	Bacteria	Viruses
Media Filtration																									
Sand/Organic Beds	C-40		X				X	X	X		X	X	X	X		X								X	X
Organic Filters	C-41		X				X				X		X	X		X								X	X
StormFilter™	C-42			X	X	X	X	X	X		X	X	X		X	X									
End-of-Pipe Systems																									
Diversion to Sewer	C-43	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Disinfection	C-44																					X	X	X	X
Water Reclamation	C-45		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Table IIIB
TREATMENT CONTROL BMP REFERENCES

Stormwater Best Management Practices	BMP Code	Sources of Information (See References)
Vegetative Systems		
Biofiltration Swales/ Vegetated Buffer System	C-1	1, 3, 4, 5, 6, 7, 8, 11, 12, 13, 14, 15, 18, 20, 21, 23, 24, 27, 28, 29, 30, 31, 32, 34, 35, 36, 40, 42
Vegetative Filter Strips	C-2	1, 3, 4, 5, 6, 7, 11, 12, 13, 14, 18, 21, 23, 27, 28, 29, 30, 32, 34, 35, 36
Bioretention	C-3	5, 6, 7, 8, 12, 13, 21, 30
Existing Vegetation	C-4	1, 6, 10, 21, 23, 27, 32, 34
Constructed Wetlands	C-5	1, 3, 4, 7, 11, 20, 21, 27, 28, 29, 30, 34, 36
Shallow Marsh	C-6	1, 7, 11, 13, 14, 15, 18, 29, 30
Infiltration/Retention		
Infiltration Trench	C-7	1, 3, 4, 6, 7, 8, 11, 12, 13, 14, 15, 16, 18, 20, 21, 23, 27, 28, 30, 34, 35, 36
Infiltration Basin	C-8	1, 3, 4, 7, 11, 12, 13, 14, 15, 18, 20, 21, 27, 28, 30, 34, 35, 36
Cisterns	C-9	1, 3, 4, 40
Wet (Retention) Pond	C-10	1, 3, 4, 7, 8, 11, 12, 14, 15, 18, 20, 21, 27, 28, 29, 30, 31, 34, 35, 36
Dry (Extended Detention) Pond	C-11	1, 3, 4, 7, 11, 14, 15, 20, 21, 27, 28, 29, 30, 34, 35, 36
Dry Well	C-12	28, 30, 40
Pavements		
Asphalt Porous Pavements	C-13	1, 3, 4, 6, 11, 14, 15, 18, 21, 23, 27, 28, 30, 34, 35, 40
Modular Concrete Block Porous Pavements	C-14	1, 3, 4, 6, 14, 15, 18, 21, 23, 27, 28, 30, 34, 35, 40
Poured Concrete Porous Pavements	C-15	1, 3, 4, 6, 14, 15, 18, 21, 23, 27, 28, 30, 34, 35, 40
Structural Soil	C-16	3, 14, 40, 43
Catch Basin Systems		
Boarding/Coarse Screens	C-17	6, 38, 43
Generic Catch Basin Filters	C-18	34, 38
Fossil Filter™	C-19	37, 38, 42
Aqua-Guard™	C-20	37

Table IIIB (Cont.)
TREATMENT CONTROL BMP REFERENCES

Stormwater Best Management Practices	BMP Code	Sources of Information (See References)
StormFilter™	C-21	6, 37, 38, 39, 42
Ultra-Urban Filter™	C-22	37, 38
Enviro-Drainâ	C-23	37, 42
HydroKleen™	C-24	42
Vortex/Hydrodynamic Systems		
Generic Hydrodynamic Systems	C-25	34, 42
Downstream Defender	C-26	37, 42
Vortechnics™	C-27	37, 39, 42
V2B1™	C-28	37, 39, 42
Continuous Deflective Separation™	C-29	37, 38, 42
StormTreat™	C-30	37, 39, 42
Stormceptorâ	C-31	1, 37, 38, 39, 42
Aqua-Filter™	C-32	42
Clarifiers		
Generic Clarifiers	C-33	4, 34
Clarifiers with Rain Diversion	C-34	43
Oil/Water Separator	C-35	3, 4, 14, 27, 34, 36
Jensenâ Interceptor	C-36	37, 42
Teichert Interceptor™	C-37	37, 42
BaySaverâ	C-38	37, 39
Isoilater™	C-39	39
Media Filtration		
Sand/Organic Beds	C-40	1, 3, 4, 5, 6, 7 12, 13, 14, 15, 20, 21, 27, 28, 30, 34, 36
Organic Filters	C-41	1, 5, 6, 7, 20, 21, 27, 34, 36
StormFilter™	C-42	37, 38, 39, 42

Table IIIB (Cont.)
TREATMENT CONTROL BMP REFERENCES

Stormwater Best Management Practices	BMP Code	Sources of Information (See References)
End-of-Pipe Systems		
Diversion to Sewer	C-43	27, 43
Disinfection	C-44	43
Water Reclamation	C-45	11

Table IIIC
TREATMENT CONTROL BMP COSTS

([1] Individual quantitative cost information on capital, O&M, and training are not available for the specified BMP. The California Stormwater BMP Handbooks were used for relative cost [expressed as H – high, L – low, and M – moderate] information)
([2] Numerical cost data was obtained from available technical and data summary reports [References 30, 39, 42, and 43])

Stormwater Best Management Practices	BMP Code	Implementation Requirements			
		Capital Cost[1]	O&M Cost[1]	Training Cost[1]	Comments[2]
Vegetative Systems					
Biofiltration Swales (Vegetated Buffer System)	C-1	L	M	L	$0.5/cf
Vegetative Filter Strips	C-2	L	M	L	$1.3/cf
Bioretention	C-3	M	M	L	$5.3/cf
Existing Vegetation	C-4	L	L	L	
Constructed Wetlands	C-5	H	M	L	$0.6-$1.25/cf
Shallow Marsh	C-6	M	M	L	
StormTreat™	C-30	M to H	M	L	$12k/cfs treated
Infiltration/Retention					
Infiltration Trench	C-7	M	M	L	$4/cf
Infiltration Basin	C-8	M	M	L	$1.30/cf
Cisterns	C-9	M	L	L	$7k/ 1,800-gal
Wet (Retention) Pond	C-10	H	M	L	$0.5-$1/cf
Dry (Extended Detention) Pond	C-11	H	M	L	$0.5-$1/cf
Dry Well	C-12	M	L	L	
Pavements					
Asphalt Porous Pavements	C-13	M	L	L	$10-$15/sf
Modular Concrete Block Porous Pavements	C-14	H	L	L	$10-$15/sf
Poured Concrete Porous Pavements	C-15	H	L	L	$10-$15/sf
Structural Soil	C-16	M	L	L	$10-$15/sf
Catch Basin Systems					
Boarding/Coarse Screens	C-17	L	M	L	$300/opening

Table IIIC (Cont.)
TREATMENT CONTROL BMP COSTS

([1] Individual quantitative cost information on capital, O&M, and training are not available for the specified BMP. The California Stormwater BMP Handbooks were used for relative cost [expressed as H – high, L – low, and M – moderate] information)
([2] Numerical cost data was obtained from available technical and data summary reports [References 30, 39, 42, and 43])

Stormwater Best Management Practices	BMP Code	Implementation Requirements			
		Capital Cost[1]	O&M Cost[1]	Training Cost[1]	Comments[2]
Generic Catch Basin Filters	C-18	L	M	L	$1k- 5k/ catch basin
Fossil Filter™	C-19	L	M	L	$3.1k/cfs
Aqua-Guard™	C-20	L to M	M	L	$3k/catch basin
StormFilter™	C-21	M to H	M	M	$39.6k-$74k/cfs
Ultra-Urban Filter™	C-22	L	M	L	$4.5k/cfs $3k/catch basin
Enviro-Drain®	C-23	L	L	L	$3k-$4k/cfs
HydroKleen™	C-24	L to M	L	L	$3.9k-$11.4k/cfs
Vortex/Hydrodynamic Systems					
Generic Hydrodynamic Systems	C-25	M to H	M	L	
Downstream Defender	C-26	M to H	M	L	$5.2k-$16.1k/cfs
Vortechnics™	C-27	M to H	M	L	$9k-$36.8k/cfs
V2B1™	C-28	M to H	M	L	$7k-$17k/cfs
Continuous Deflective Separation™	C-29	M to H	M	L	$7.5k-$12k/cfs
Stormceptor®	C-31	M to H	M	L	$16.7k-$33.1k/cfs $40k/7,200-gal
Aqua-Filter™	C-32	M to H	M	L	
Clarifiers					
Generic Clarifiers	C-33	M	M	L	$10k/5,000-gal tank
Clarifiers with Rain Diversion	C-34	M	M	L	$10k/5,000-gal tank
Oil/Water Separator	C-35	M	M	L	$10k/5,000-gal tank
Jensen® Interceptor	C-36	L to M	L	L	$11.8k-$12.4k/cfs
Teichert Interceptor™	C-37	L	L	L	$8.7k/cfs

Table IIIC (Cont.)
TREATMENT CONTROL BMP COSTS

([1] Individual quantitative cost information on capital, O&M, and training are not available for the specified BMP. The California Stormwater BMP Handbooks were used for relative cost [expressed as H – high, L – low, and M – moderate] information)
([2] Numerical cost data was obtained from available technical and data summary reports [References 30, 39, 42, and 43])

Stormwater Best Management Practices	BMP Code	Implementation Requirements			
		Capital Cost[1]	O&M Cost[1]	Training Cost[1]	Comments[2]
BaySaver®	C-38	L to M	L	L	$2.4k/cfs treated
Isoilater™	C-39	M	M	L	$4.7k/cfs treated
Media Filtration					
Sand/Organic Beds	C-40	H	M	L	$3-$6/cf
Organic Filters	C-41	H	M	L	
StormFilter™	C-42	H	M	M	$18.6k/cfs treated
End-of-Pipe Systems					
Diversion to Sewer	C-43	H	H	L	$1.5m/ 5 cfs $0.5m/ 0.5 cfs
Disinfection	C-44	H	H	M	$2.5m/ 5 cfs for UV
Water Reclamation	C-45	H	H	H	$5m for 5 cfs

cf – cubic feet
cfs – cubic feet per second
k - thousand
m – million
O&M – operation and maintenance

Table IIID
TREATMENT CONTROL BMP TARGET POLLUTANTS

Stormwater Best Management Practices	BMP Code	Target Pollutants
Vegetative Systems		
Biofiltration Swales (Vegetated Buffer System)	C-1	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease
Vegetative Filter Strips	C-2	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease
Bioretention	C-3	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Existing Vegetation	C-4	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease
Constructed Wetlands	C-5	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Shallow Marsh	C-6	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease
Infiltration/Retention		
Infiltration Trench	C-7	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Infiltration Basin	C-8	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Cisterns	C-9	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Wet (Retention) Pond	C-10	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Dry (Extended Detention) Pond	C-11	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease
Dry Well	C-12	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease

Table IIID (Cont.)
TREATMENT CONTROL BMP TARGET POLLUTANTS

Stormwater Best Management Practices	BMP Code	Target Pollutants
Pavements		
Asphalt Porous Pavements	C-13	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease
Modular Concrete Block Porous Pavements	C-14	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease
Poured Concrete Porous Pavements	C-15	Sediment, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease
Structural Soil	C-16	Sediment, Nutrients, Metals, Floatable Materials, Oil/Grease
Catch Basin Systems		
Boarding/Coarse Screens	C-17	Floatable Materials
Generic Catch Basin Filters	C-18	Floatable Materials, Trash & Debris, Oil/Grease, Metals
Fossil Filter™	C-19	Trash & Debris, Sediments, Oil & Grease, Fuels
Aqua-Guard™	C-20	Sediments, Floatable Materials, Trash & Debris, Oil/Grease, Metals, Fuels
StormFilter™	C-21	TSS, COD, Nutrients, Oil/Grease, Metals, Sediments
Ultra-Urban Filter™	C-22	Sediment, Floatable Materials, Trash & Debris, TSS, Oil & Grease
Enviro-Drainâ	C-23	Sediments, Fuels, Oil & Grease
HydroKleen™	C-24	Fuels, Other Organics, Metals
Vortex/Hydrodynamic Systems		
Generic Hydrodynamic Systems	C-25	Floatable Materials, Sediments, Oil/Grease, TSS
Downstream Defender	C-26	Sediments, Floatable Materials, TSS
Vortechnics™	C-27	TSS, Sediments, Floatable Materials, Metals, Oil & Grease
V2B1™	C-28	Sediments, Floatable Materials, TSS, Oil & Grease
Continuous Deflective Separation™	C-29	Sediments, Floatable Materials, Trash & Debris, TSS, Nutrients, COD, BOD
StormTreat	C-30	TSS, COD, Nutrients, Oil/Grease, Metals, Bacteria/Viruses
Stormceptorâ	C-31	TSS, Nutrients, Oil/Grease, Metals, Sediments, Floatable Materials
Aqua-Filter™	C-32	Trash & Debris, Sediments, TSS, COD, Nutrients, Oil/Grease, Metals, Fuels

Table IIID (Cont.)
TREATMENT CONTROL BMP TARGET POLLUTANTS

Stormwater Best Management Practices	BMP Code	Target Pollutants
Clarifiers		
Generic Clarifiers	C-33	Sediments, Floatable Materials, Oil/Grease, TSS,
Clarifiers with Rain Diversion	C-34	Sediment, Floatable Materials, Oil & Grease, Fuels
Oil/Water Separator	C-35	Sediments, Nutrients, Metals, Toxic Chemicals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, TSS
Jensenâ Interceptor	C-36	Sediments, Floatable Materials, TSS, Oil & Grease
Teichert Interceptor™	C-37	Sediments, Floatable Materials
BaySaverâ	C-38	TSS, Sediments, Floatable Materials, Oil & Grease
Isoilater™	C-39	TSS, COD, Nutrients, Oil/Grease, Floatable Materials, COD/BOD
Media Filtration		
Sand/Organic Beds	C-40	Sediments, Nutrients, Metals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Organic Filters	C-41	Sediments, Nutrients, Metals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
StormFilter™	C-42	TSS, COD, Nutrients, Oil/Grease, Metals, Sediments
End-of-Pipe Systems		
Diversion to Sewer	C-43	Sediments, Nutrients, Metals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses
Disinfection	C-44	Bacteria/Viruses
Water Reclamation	C-45	Sediments, Nutrients, Metals, Floatable Materials, Oxygen-Demanding Substances, Oil/Grease, Bacteria/Viruses

COD – chemical oxygen demand
TSS – total suspended solids

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APPENDIX A
ASSISTANCE DIRECTORY

Spill Response Agencies

City of Los Angeles, Stormwater Management Division ..... (800) 974-9794
City of Los Angeles Police Department, Hazardous Materials Program ..... (213) 485-4011
City of Los Angeles Fire Department, Hazardous Materials Program..... (213) 485-6185
County of Los Angeles Fire Department, Hazardous Materials Program ..... (323) 890-4045

Recycling & Hazardous Waste Disposal

City of Los Angeles, Household & Small Business Hazardous Waste Hotline..... (800) 988-6942
City of Los Angeles, Hazardous & Toxic Materials Program ..... (213) 580-1023
City of Los Angeles, Solid Resources Citywide Recycling Division..... (213) 473-8228
County of Los Angeles, Recycling & Household Hazardous Waste Hotline ..... (800) 522-5218

To Report Illegal Dumping

City of Los Angeles, Stormwater Program Hotline..... (800) 974-9794
County of Los Angeles, Illegal Dumping Hotline..... (800) 303-0003
Calif. Environmental Protection Agency, Dept. of Toxic Substances Control ..... (818) 551-2800

To Report Clogged Catch Basins

City of Los Angeles, Stormwater Program Hotline..... (800) 974-9794
County of Los Angeles, Department of Public Works ..... (888) 253-2652

For Assistance on BMP Requirements

City of Los Angeles, Stormwater Management Division..... (213) 847-6350

To Request a Copy of the Reference Guide

City of Los Angeles, Stormwater Management Division..... (800) 974-9794

APPENDIX B
VENDOR INFORMATION

The following is the list of vendors, proprietary treatment control systems, and web site addresses or phone numbers, as available:

1. Aqua-Guard™, Remedial Solutions, Inc./AquaShield™. Web Page: http://www.aquashieldinc.com
2. Aqua-Filter™, Remedial Solutions, Inc./AquaShield™. Web Page: http://www.aquashieldinc.com
3. BaySaverâ , BaySaver, Inc. Web Page: http://www.BaySaver.com
4. CDS™, Continuous Deflective Separation Technologies, Inc. Web Page: http://www.cdstech.com.au/usa/index.html
5. DrainPac™ Storm Drain Filter Insert, United Storm Water, Inc. Telephone: (877) 71-STORM • Web site: http://www.unitedstormwater.com
6. Enviro-Drainâ , Enviro-Drain, Inc. Web Page: http://www.members.aa.net/~filters
7. Ero-Con Filter, Ero-Con. Telephone: (800)891-0473
8. Fossil Filter™, KriStar Enterprises, Inc.. Web Page: http://www.fossilfilter.com
9. HydroKleen™, ALTECH Technology Systems, Inc. Web Page: http://www.altech-group.com
10. Isoilater™, Americast, Inc. Telephone: (800)999-2278
11. Jensenâ Interceptors, Jensenâ Precast. Telephone: (909)355-1819
12. V2B1™, Environment 21™, Kistner Concrete Products, Inc., http://www.kistner.com/env21-2.html
13. RDI Drain Inceptor™, Roberts Design, Inc. Web Page: http://www.auto-wise.com/related.htm
14. Storm*ceptor* â , Storm*ceptor* Corporation. Web Page: http://www.stormceptor.com
15. StormFilter™, Stormwater Management, Inc. Web Page: http://www.stormwatermgt.com

16. StormTreat™, StormTreat Systems, Inc. Telephone: (508)362-4449

17. Ultra-Urban Filter™, Abtech Industries, Inc. Web Page: http://www.abtechindustries.com

18. Vortechnics™, Vortechnics, Inc.. Web Page: http://www.vortechnics.com

APPENDIX C
HOW TO USE THE GUIDE

A. Input Data:

BMP Category: Source Control

Site/Area: Industrial

B. Find Applicable BMP(s):

1) Look under Section II – Source Control Best Management Practices.
2) Note BMP codes and listing in Subsection B - BMP Listing.
3) Locate Table IIA – Source Control BMP Selection Matrix (Please note that the BMPs are numbered sequentially from the top of the table).
4) Read columns under "Industrial" category (under "Category of Pollution Source Areas") and list corresponding BMP(s) marked with an "X". The "X" marks indicate suggested BMPs for that category.

   Example:

BMP Code	BMP Name
B-16	Outdoor Storage of Materials

5) Using the specific example in number 4) above, locate Table IIB – Source Control BMP References. List the specified reference numbers listed under "Sources of Information" column.
6) Find the reference names corresponding to the numbers in Table IIB from "References" section at the end of the manual. These references discuss partially or in detail the subject BMP (Outdoor Storage of Materials) and related topics.
7) From Table IIC – Source Control BMP Costs, locate BMP code B-16 and note the relative costs based on capital, O&M, and training as M (moderate), L (low), and H (high), respectively. These costs are site-specific and exact figures vary. Some references also indicate cost information.
8) From Table IID – Source Control BMP Target Pollutants, locate BMP code B-16 and note the target pollutants. Target pollutants are sometimes site-specific and also vary depending on the type of industrial activity.

APPENDIX D
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