7/18/2013

MANAGING WET WEATHER AND URBAN RUNOFF

CITY OF COMMERCE LID GUIDELINES

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Section 1 – Introduction

What IS LID?

Low Impact Development (LID) consists of design strategies using softscape and hardscape surfaces to retain or filter stormwater and urban runoff. Key to the success of LID is to put in practice the use of small-scale, natural drainage features and to maximize infiltration and capture on site in lieu of conventional end-of-line treatment facilities. This approach also improves a property's aesthetic appearance that achieve multiple goals and benefits.

Purpose & Intent

- Control stormwater and urban runoff to capture pollutants.
- Reuse water and prevent water waste through landscape design elements.

The intent of a LID is to curb the transport of pollutants to downstream receiving waters caused by impervious surfaces like roadways, parking lots and buildings. Urban areas have less green space that can capture water resulting in increased water runoff. The City needs to take an LID approach to managing runoff while mitigating the impacts of development and urbanization. LID is widely recognized as a sensible approach to managing the quantity and quality of rainwater and urban runoff by setting standards and practices to maintain or restore the natural hydrologic character of a development site, reduce off-site runoff, improve water quality, and provide groundwater recharge.

LID can incorporate a wide variety of design elements including landscaping, permeable pavements, bioretention, infiltration and swales. Although the design and appearance of LIDs will vary, the goals remain the same; provide source control of runoff, limit its transport and pollutant conveyance to the collection system, restore pre-development hydrology to the maximum extent practicable, and provide environmentally enhanced communities.

WHY IS LID REQUIRED?

Los Angeles River Flood Control Channel

The City of Commerce adopted an LID Ordinance to comply with requirements of Clean Water Act and the MS4 Stormwater and Urban Runoff Permit (Order Number R4-2012-0175) effective December 28, 2012.

Commercial and Industrial land use represent a significant percentage of the impervious area within the City. Altered flow from development increases runoff from storm events, are damaging to the environment and increase the risk to property downstream.

Over time, water runoff has become more regulated to minimize negative impacts on the environment caused by transferring runoff to storm drains, channels, and water bodies. Stormwater runoff can contain pollutants such as trash, metals, nutrients, and bacteria and are regulated by governmental agencies. LID will help to transform the design of properties to a method of storing and treating water on-site for a cleaner discharge into waters of the United States.

Section 2 – Application

The MS4 Permit requires implementation of LID strategies in the following "Planning Priority Projects":

1. All development projects equal to 1 acre or greater of disturbed area that adds more than 10,000 square feet of impervious surface area.

2. Industrial parks 10,000 square feet or more of surface area.

3. Commercial malls 10,000 square feet or more of surface area.

4. Retail gasoline outlets with 5,000 square feet or more of surface area.

5. Restaurants (Standard Industrial Classification (SIC) of 5812) with 5,000 square feet or more of surface area.

6. Parking lots with 5,000 square feet or more of impervious surface area or with 25 or more parking spaces.

7. Streets and road construction of 10,000 square feet or more of impervious surface area.

8. Automotive service facilities (SIC of 5013, 5014, 5511, 5541, 7532-7534 and 7536-7539) with 5,000 square feet or more of surface area.

9. Projects in, near or discharging to Environmentally Sensitive Areas.

10. Single-family hillside homes.

11. Redevelopment projects:

    - Land disturbing activity that results in the creation or addition or replacement of 5,000 square feet or more of impervious surface area on an already developed site on Planning Priority Project categories.

    - Where Redevelopment results in an alteration to more than fifty percent of impervious surfaces of a previously existing development, and the existing development was not subject to post-construction stormwater quality control requirements, the entire project must be mitigated.

    - Where Redevelopment results in an alteration of less than fifty percent of impervious surfaces of a previously existing development, and the existing development was not subject to post-construction stormwater quality control requirements, only the alteration must be mitigated, and not the entire development.

- Redevelopment does not include routine maintenance activities that are conducted to maintain original line and grade, hydraulic capacity, original purpose of facility or emergency redevelopment activity required to protect public health and safety. Impervious surface replacement, such as the reconstruction of parking lots and roadways which does not disturb additional area and maintains the original grade and alignment, is considered a routine maintenance activity. Redevelopment does not include the repaving of existing roads to maintain original line and grade.

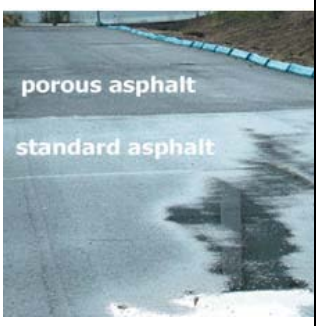
- Existing single-family dwelling and accessory structures are exempt from the Redevelopment requirements unless such projects create, add, or replace 10,000 square feet of impervious surface area.

12. Any other project as deemed appropriate by the Director.

Section 3 – Planning and Development

For every Planning Priority Project the site shall be designed to control pollutants, pollutant loads, and runoff volume to the maximum extent feasible by minimizing impervious surface area and controlling runoff from impervious surfaces through infiltration, evapotranspiration, capture and use, and/or biotreatment. This LID Guidelines is designed to provide guidance with Best Management Practices (BMP) selection based on site conditions. The initial step in selecting a stormwater tool is determining the available space and opportunities for LID.

Examples of Common LID Best Management Practices

			
Vegetated Swales/Bioswales	Rain Gardens	Rain Cisterns	Green Roofs
			
Permeable Pavers	Porous Pavement	Curb Bump-Outs	Curb Cuts

Site Considerations

Specific elements which should be given special consideration in the site assessment process for applicable LID include:

- Ownership of land.
- Location of existing utilities.
- Grade differential between road surface and storm drain system.
- Longitudinal slope.
- Soil suitability.
- Potential access for operations and maintenance.

Design Considerations

The drainage patterns of the project shall be developed to route drainage to areas with BMP opportunities before entering storm drains. For example, if a median strip is present, a reverse crown should be considered, where allowed, so that stormwater can drain to a median swale. Likewise, standard peak-flow curb inlets should be located downstream of areas with potential for stormwater planters so that water can first flow into the planter and then overflow to the downstream inlet if capacity of the planter is exceeded.

Infiltration planter

BMP Sizing for Applicable LID Projects

The Stormwater Quality Design Volume (SWQDv) standard should be used to determine the appropriate size, slope, and materials of each facility. The SWQDv is defined as:

1. The 85th percentile 24-hour runoff event as determined from the LA County 85th percentile precipitation isohyetal map; or
2. The volume of runoff produced from a 0.75 inch, 24-hour rain event, whichever is greater.

After identifying the appropriate stormwater facilities for a site, an integrated approach using several BMPs is encouraged. To increase water quality and functional hydrologic benefits, several stormwater management BMPs can be used in succession, namely a treatment train approach. The control measures should be designed using available topography to take advantage of gravity for conveyance to and through each facility. All LID designs must be based off of a published design standard.

The following steps should be used to size BMPs for applicable LID projects:

1. Delineate drainage areas tributary to BMP locations and compute imperviousness.
2. Design BMPs per a published design standard.
3. Use the recommended sizing method for the BMP selected in each drainage area.
4. Provide the calculated target sizing criteria for the selected BMPs.

Alternative Compliance Options for Applicable LID Projects

When, as determined by the Approving Agency, 100 percent onsite retention of the SWQDv is technically infeasible, partially or fully, the infeasibility shall be demonstrated in a submitted LID Plan. The technical infeasibility may result from conditions that include, but are not limited to:

1. The infiltration rate of saturated in-situ soils is less than 0.3 inch per hour and it is not technically feasible to amend the in-situ soils to attain an infiltration rate necessary to achieve reliable performance of infiltration or bioretention BMPs in retaining the SWQDv onsite.

2. Locations where seasonal high groundwater is within five to ten feet of surface grade;

3. Locations within 100 feet of a groundwater well used for drinking water;

4. Brownfield development sites or other locations where pollutant mobilization is a documented concern;

5. Locations with potential geotechnical hazards;

6. Smart growth and infill or redevelopment locations where the density and/ or nature of the project would create significant difficulty for compliance with the onsite volume retention requirement.

If partial or complete onsite retention is technically infeasible, the project site may biofiltrate 1.5 times the portion of the remaining SWQDv that is not reliably retained onsite. If hazardous waste contamination results in technical infeasibility, the Project Site may biofiltrate the remaining SWQDv portion that is not reliably retained onsite. Biofiltration BMPs must adhere to the design specifications provided in the MS4 Permit.

Additional alternative compliance options such as offsite infiltration may be available to the project Site. The project site should contact the Approving Agency to determine eligibility. Alternative compliance options are further specified in CASQA's Post-Construction BMP Handbook.

The remaining SWQDv that cannot be retained or biofiltered onsite must be treated onsite to reduce pollutant loading. BMPs must be selected and designed to meet pollutant-specific benchmarks as required per the MS4 Permit. Flow-through BMPs may be used to treat the remaining SWQDv and must be sized based on a rainfall intensity of:

1. 0.2 inches per hour, or

2. The one year, one-hour rainfall intensity as determined from the most recent Los Angeles County isohyetal map, whichever is greater.

A Multi-Phased Project may comply with the standards and requirements of this section for all of its phases by: (a) designing a system acceptable to the Approving Agency to satisfy these standards and requirements for the entire Site during the first phase, and (b) implementing these standards and requirements for each phase of Development or Redevelopment of the Site during the first phase or prior to commencement of construction of a later phase, to the extent necessary to treat the stormwater from such later phase. For purposes of this section, "Multi-Phased Project" shall mean any Planning Priority Project implemented over more than one phase and the Site of a Multi-Phased Project shall include any land and water area designed and used to store, treat or manage stormwater runoff in connection with the Development or Redevelopment, including any tracts, lots, or parcels of real property, whether Developed or not, associated with, functionally connected to, or under common ownership or control with such Development or Redevelopment.

Infiltration Considerations

Appropriate soils, infiltration media, and infiltration rates should be used for infiltration BMPs. If infiltration is proposed, a complete geotechnical or soils report should be undertaken to determine infiltration rates, groundwater depth, soil toxicity and stability, and other factors that will affect the ability and the desirability of infiltration. At a minimum, the infiltration capacity of the underlying soils shall be deemed suitable for infiltration (0.3 inches per hour or greater), appropriate media should be used in the BMP itself, the groundwater shall be located at a depth of ten feet or greater.

Operations and Maintenance

Regular inspections of BMPs installed must occur to ensure proper functioning of the BMP as designed and in accordance with manufacturer's specifications as applicable. Specifically, to ensure that surface ponding infiltrates into the subsurface completely within the design drawdown time following storms. This will minimize vector breeding and potential fines for violations from the Greater Los Angeles County Vector Control District.

Regular inspections of pretreatment sediment removal BMP/forebay must occur also to ensure sediment buildup does not exceed 50% of the forebay sediment storage capacity. Remove any excess sediment from the BMP.

Infiltration BMPs should be maintained to prevent blockage. Maintenance activities shall include checking for and removal of debris/sediment.

BMP soil applications must be maintained. Flow entrances, ponding areas, and surface overflow areas shall be inspected for erosion periodically and replaced as needed to maintain the long-term design infiltration rate.

Site vegetation shall be maintained for aesthetic appearance and filtration as designed and approved. This includes the removal of fallen, dead, and/or invasive plants, watering as necessary, and the replanting and/or reseeding of vegetation for reestablishment as necessary.

Maintenance of *permeable pavement systems* is essential to their continued functionality. Regular vacuuming and street sweeping should be performed to remove sediment from the pavement surface. The bedding and base material should be selected for long life and sufficient infiltration rates.

Permeable pavement, City of Los Angeles Airport parking lot

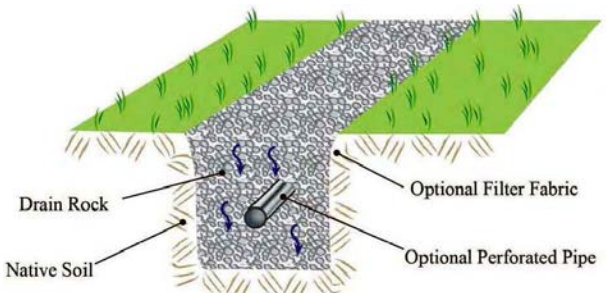
Section 4 - Infiltration

Infiltration systems utilize rock, gravel, and other highly permeable materials for on-site infiltration. Stormwater runoff is directed to these systems and allowed to infiltrate into the soils for on-site retention and groundwater recharge. During small storm events, infiltration systems can result in significant or even complete volume reduction of stormwater runoff. Infiltration should be used to the maximum extent practicable. Biotreatment BMPs should be considered if infiltration is found to be infeasible due to low infiltration rates, soil instability, high groundwater, or soil contamination.

Infiltration BMPs may become damaged by stormwater carrying high levels of sediment, therefore pre-treatment features should be designed to treat street runoff prior to discharging to infiltration features. Media filters, filter inserts, vortex-type units, bioretention devices, sumps, and sedimentation basins are several pre-treatment tools effective at removing sediment.

INFILTRATION TRENCHES AND DRY WELLS

Description



Infiltration trench (Model for Living Street Design Manual, 2011)

Infiltration trenches are linear, rock-filled features that promote infiltration by providing a high ratio of sub-surface void space in permeable soils. They provide on-site stormwater retention and may contribute to groundwater recharge. Infiltration trenches may accept stormwater from sheet flow, concentrated flow from a swale or other surface feature, or piped flow from a catch basin. Because they are not flow-through BMPs, infiltration trenches do not have outlets but may have overflow outlets for large storm events. Dry wells are typically distinguished from infiltration trenches by being deeper than they are wide. They are usually circular, resembling a well, and are backfilled with the same materials as infiltration trenches. Dry wells typically accept concentrated flow from surface features or from pipes and do not have outlets.

Infiltration trenches and dry wells are typically designed to infiltrate all flow they receive. In large storm events, partial infiltration of runoff can be achieved by providing an overflow outlet. In these systems, significant or even complete volume reduction is possible in smaller storm events. During large storm events, these systems may function as detention facilities and provide a limited amount of retention and infiltration.

Location and placement guidelines

Infiltration trenches and dry wells typically have small surface footprints so they are potentially some of the most flexible elements of landscape design. However, because they involve sub-surface excavation, these features may interfere with surrounding structures. Care needs to be taken to ensure that surrounding building foundations,

pavement bases, and utilities are not damaged by infiltration features. Once structural soundness is ensured, infiltration features may be located under sidewalks and in sidewalk planting strips, curb extensions, roundabouts, and medians. When located in medians, they are most effective when the street is graded to drain to the median. Dry wells require less surface area than trenches and may be more feasible in densely developed areas. Infiltration features should be sited on uncompacted soils with acceptable infiltration capacity. They are best used where soil and topography allow for moderate to good infiltration rates (0.3 inches per hour or better) and the depth to groundwater is at least 10 feet.

Prior to design of any retention or infiltration system, proper soil investigation and percolation testing shall be conducted to determine appropriate infiltration design rates, depth to groundwater, and if soil will exhibit instability as a result of infiltration. Any site with potential for previous underground contamination shall be investigated. Infiltration trenches and dry wells can be designed as stand-alone systems when water quality is not a concern or may be combined in series with other stormwater tools.

Perforated pipes and piped inlets and outlets may be included in the design of infiltration trenches. Cleanouts should be installed at both ends of any piping and at regular intervals in long sections of piping, to allow access to the system. Access ports are recommended for both trenches and wells and can be combined with clean-outs. If included, the overflow inlet from the infiltration trench should be properly designed for anticipated flows.

RAIN GARDENS

Description

Rain gardens are vegetated depressions in the landscape. They have flat bottoms and gently sloping sides. Rain gardens can be similar in appearance to swales, but their footprints may be any shape. Rain gardens hold water on the surface, like a pond, and have overflow outlets. The detained water is infiltrated through the topsoil and subsurface drain rock unless the volume of water is so large that some must overflow. Rain gardens can reduce or eliminate off-site stormwater discharge while increasing on-site recharge.

Rain garden (Model for Living Streets Design Manual, 2011)

Location and Placement Guidelines

Rain gardens may be placed where there is sufficient area in the landscape and where soils are suitable for infiltration. Rain gardens can be integrated with traffic calming measures installed along streets, such as medians, islands, circles, street ends, chicanes,

and curb extensions. Rain gardens are often used at the terminus of swales in the landscape.

PERMEABLE PAVEMENT

Description

Permeable pavement – parking stalls

Permeable pavement slows or eliminates direct runoff by absorbing rainfall and allowing it to infiltrate into the soil. Permeable pavement also filters and cleans pollutants such as petroleum deposits on streets and parking lots, reduces water volumes for existing overtaxed pipe systems, and decreases the cost of offsite or onsite downstream infrastructure. This BMP is impaired by sediment-laden run-on which diminishes its porosity. Care should be taken to avoid flows from landscaped areas reaching permeable pavement. Permeable pavement is, in certain situations, an alternative to standard pavement. Conventional pavement is designed to move stormwater off-site quickly. Permeable pavement, alternatively, accepts the water where it falls, minimizing the need for management facilities downstream.

Location and Placement Guidelines

Conditions where permeable pavement should be encouraged include:

- Sites where there is limited space in the right-of-way for other BMPs;
- Parking or emergency access lanes; and
- Furniture zones of sidewalks or walkways especially adjacent to tree wells

Conditions where permeable pavement should be avoided include:

- Large traffic volume or heavy load lanes;
- Where runoff is already being harvested from an impervious surface for direct use, such as irrigation of bioretention landscape areas;
- Steep sloped areas;
- Gas stations, car washes, auto repair, and other sites/sources of possible chemical contamination;
- Areas with shallow groundwater;
- Within 20 feet of sub-sidewalk basements; and
- Within 50 feet of domestic water wells.

Material and Design Guidelines

A soil or geotechnical report should be conducted to provide information about the permeability rate of the soil, load-bearing capacity of the soil, the depth to groundwater (10 feet or more required), and if soil will exhibit instability as a result of implementation. Infiltration rate and load capacity are key factors in the functionality of this BMP. Permeable pavement generally does not have the same load-bearing capacity as conventional pavement, so this BMP may have limited applications depending on the underlying soil strength and pavement use. Permeable pavement should not be used in general traffic lanes due to the possible variety of vehicles weights and heavy volumes of traffic.

Determining use of permeable pavement

- Conduct a soil or geotechnical study to determine infiltration rate and load capacity.

When used as a road paving, permeable pavement that carries light traffic loads typically has a thick drain rock base material. Pavers should be concrete as opposed to brick or other light-duty materials. Other possible permeable paving materials include porous concrete and porous asphalt. These surfaces also have specific base materials that detain infiltrated water and provide structure for the road surface. Base material depths should be specified based on design load and the soils report.

Plazas, emergency roads, and other areas of limited vehicular access can also be paved with permeable pavement. Paving materials for these areas may include open cell paver blocks filled with stones or grass and plastic cell systems. Base material specifications may vary depending on the product used, design load, and underlying soils.

When used for pedestrian paths, sidewalks, and shared-use paths, appropriate materials include those listed above as well as rubber pavers and decomposed granite or something similar (washed or pore-clogging fine material). Pedestrian paths may also use broken concrete pavers as long as ADA requirements are met. Paths should drain into adjoining landscapes and should be higher than adjoining landscapes to prevent run-on. Pavement used for sidewalks and pedestrian paths should be ADA compliant, especially smooth, and not exceed a 2 percent slope or have gaps wider than 0.25 inches. In general, tripping hazards should be avoided.

Design considerations for permeable pavement include:

- The location, slope and load-bearing capacity of the street, and the infiltration rate of the soil;
- The amount of storage capacity of the base course;
- The traffic volume and load from heavy vehicles;
- The design storm volume calculations and the quality of water; and
- Drain rock, filter fabrics, and other subsurface materials.

Section 5 - Biotreatment

Biotreatment BMPs are landscaped, shallow depressions that capture and filter stormwater runoff. These types of BMPs are an increasingly common type of stormwater treatment device that are installed at curb level and filled with a bioretention type soil. They are designed as soil and plant-based filtration devices that remove pollutants through a variety of physical, biological, and chemical treatment processes. They typically consist of a ponding area, mulch layer, planting soils, and plants. Stormwater is directed to the system and pollutants are treated as the stormwater drains through the planting soil and either infiltrated or collected by an underdrain and directed to a collection system. Biotreatment should only be used in cases where infiltration has been proven infeasible due to low infiltration rates, soil instability, high groundwater, or soil contamination.

BIORETENTION

Description

Bioretention is a stormwater management process that cleans stormwater by mimicking natural soil filtration processes as water flows through a bioretention BMP. It incorporates mulch, soil pores, microbes, and vegetation to reduce and remove sediment and pollutants from stormwater. Bioretention is designed to slow, spread, and, to some extent, infiltrate water. Each component of the bioretention BMP is designed to assist in retaining water, evapotranspiration, and adsorption of pollutants into the soil matrix. As runoff passes through the vegetation and soil, the combined effects of filtration, absorption, adsorption, and biological uptake of plants remove pollutants.

Bioretention system (Planter Boxes, City of Los Angeles)

Biorentention in a parking lot (GeoSyntec)

For areas with low permeability or other soil constraints, bioretention can be designed as a flow-through system with a barrier protecting stormwater from native soils. Bioretention areas can be designed with an underdrain system that directs the treated runoff to infiltration areas, cisterns or the storm drain system, or may treat the water exclusively through surface flow. Examples of bioretention BMPs include swales, planters, and vegetated buffer strips.

Location and Placement Guidelines

Bioretention facilities can be included in the design of all street components, adjacent to the traveled way and in the frontage or furniture sidewalk zones. They can be designed into curb extensions, medians, traffic circles, roundabouts, and any other landscaped area. Depending on the feature, maintenance and access should always be considered in locating the device. Bioretention systems are also appropriate in constrained locations where other stormwater facilities requiring more extensive subsurface materials are not feasible.

If bioretention devices are designed to include infiltration, native soil should have a minimum permeability rate of 0.3 inches per hour and at least 10 feet to the groundwater table. Sites that have more than a 5 percent slope may require other stormwater management approaches or special engineering.

FLOW-THROUGH PLANTERS

Description

Flow-through planter (Model for Living Streets Design Manual, 2011)

Flow-through planters are typically above-grade or at-grade with solid walls and a flow-through bottom. They are contained within an impermeable liner and use an underdrain to direct treated runoff back to the collection system. Where space permits, buildings can direct roof drains first to building-adjacent planters. Both underdrains and surface overflow drains are typically installed with building-adjacent planters.
At-grade street-adjacent planter boxes are systems designed to take street runoff and/or sidewalk runoff and incorporate bioretention processes to treat stormwater. These systems may or may not include underdrains.

Location and Placement Guidelines

Above-grade planters should be structurally separate from adjacent sidewalks to allow for future maintenance and structural stability per local department of public works' standards. At-grade planter systems can be installed adjacent to curbs within the frontage and/or furniture zones.

All planters should be designed to pond water for less than 48 hours after each storm. Flow-through planters designed to detain roof runoff can be integrated into a building's foundation walls, and may be either raised or at grade.

For at-grade planters, small localized depressions may be included in the curb opening to encourage flow into the planter. Following the inlet, a sump (depression) to capture sediment and debris may be integrated into the design to reduce sediment loadings.

VEGETATED SWALES

Description

Swales are linear, vegetated depressions that capture rainfall and runoff from adjacent surfaces. The swale bottom should have a gradual slope to convey water along its length. Swales can reduce off-site stormwater discharge and remove pollutants along the way. In a swale, water is slowed by traveling through vegetation on a relatively flat grade. This gives particulates time to settle out of the water while contaminants are removed by the vegetation.

Vegetated infiltration swale for a supermarket parking lot (Downey, CA)

Location and Placement Guidelines

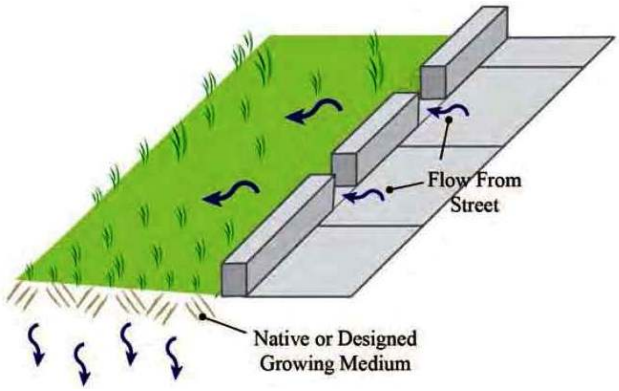
Swales can be located adjacent to roadways, sidewalks, or parking areas. Roadway runoff can be directed into swales via flush curbs or small evenly-spaced curb cuts into a raised curb. Swale systems can be integrated into traffic calming devices such as curb extensions.

Swales can be placed in medians where the street drains to the median. Placed alongside streets and pathways, vegetated swales can be landscaped with native plants which filter sediment and pollutants and provide habitat for wildlife. Swales should be designed to work in conjunction with the street slope to maximize filtration and slowing of stormwater. Swales are designed to allow water to slowly flow through the system. Depending on the landscape and design storm, an overflow or bypass for larger storm events may be needed. Curb openings should be designed to direct flow into the swale. Following the inlet, a sump may be built to capture sediment and debris.

VEGETATED BUFFER STRIPS

Description

Vegetated buffer strips are sloping planted areas designed to treat and absorb sheet flow from adjacent impervious surfaces. These strips are not intended to detain or retain water, only to treat it as a flow-



Vegetated buffer strip detail (Model for Living Streets Design Manual, 2011)

through feature. They should not receive concentrated flow from swales or other surface features, or concentrated flow from pipes.

Location and Placement Guidelines

Vegetated buffer strips are well-suited to treating runoff from roads and highways, small parking lots, and pervious surfaces. They may be commonly used on multi-way boulevards, park edge streets, or sidewalk furniture zones with sufficient space. When selecting potential placement the need for supplemental irrigation should be considered. Vegetated buffers can also be situated so they serve as pre-treatment for another stormwater management feature, such as an infiltration BMP.

SAND FILTERS & STORM DRAIN INLET PROTECTIONS

It may be infeasible for specific projects to apply infiltration or biotreatment BMPs. In these cases, sand filters or filter inserts as treatment BMPs can be considered as an alternative. Sand filters and filter inserts can be designed to prevent particulates, debris, metals, and petroleum-based materials conveyed by stormwater from entering the storm drain system. All treatment BMP units should have an overflow system that allows the storm drain to remain functional if the filtration system becomes blocked during rainstorms. All storm drain inlet protections must be of a style and configuration approved by the agency with ownership of the inlet.

Typical maintenance of catch basins includes scheduled trash removal if a screen or other debris capturing device is used. Street sweeping should be performed by vacuum sweepers with occasional weed and large debris removal. Maintenance should include keeping a log of the amount of sediment collected and the data of removal.
The following are examples of possible treatment BMPs:

- **Sand Filters:** Sand filters are designed to filter stormwater through a constructed media bed and to an underdrain system. As stormwater flows through the media pollutants are filtered out of the water. The filtered water is conveyed through the underdrain to a collection system. Pretreatment is necessary to eliminate significant sediment load or other large particles which would clog the system. Minimum set-backs from foundations and slopes should be observed if the facility is not lined. Filters should be designed and maintained such that ponded water should not persist for longer than 48 hours following a storm event.

- **Cartridge Media Filters:** Cartridge media filters contain multiple modular filters which contain engineered media. The filters can be located in a catch basin, manhole, or vault. The manhole or vault may be divided into multiple chambers so that the first chamber may act as a pre-settling basin for removal of coarse sediment while the next chamber may act as the filter chamber. Cartridge media filters are recommended for drainage areas with limited available surface area or where surface BMPs would restrict uses. Depending on the number of cartridges, maintenance events can have long durations. Locations should be chosen so that maintenance events will not significantly disrupt businesses or traffic. Inlet inserts should be sized to capture all debris and should therefore be selected to match the specific size and shape of each catch basin and inlet. Filter media should be selected to target pollutants of concern. A combination of media may be used to remove a variety of pollutants. Systems with lower maintenance requirements are preferred.

- **Storm Drain Inlet Screens:** Inlet screens are designed to prevent large litter and trash from entering the storm drain system while allowing smaller particles to pass through. The screens function as the first preventive measure in removing pollutants from the storm water system. The city's street sweeping department should be consulted to ensure compliance with local specifications and to schedule regular maintenance. Annual inspection of the screen is recommended to ensure functionality. Note that most LA River drainage areas are already protected using connector pipe screens through collective systems.

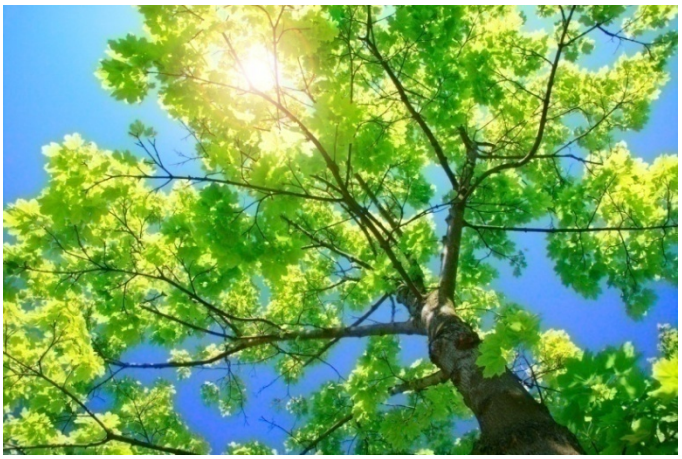
Connector Pipe Screen (Commerce, CA)

Articulated Retractable Screen (Commerce, CA)

- **Storm Drain Pipe Filter Insert:** The storm drain outlet pipe filter is designed to be installed on an existing outlet pipe or at the bottom of an existing catch basin with an overflow. This filter removes debris, particulates, and other pollutants from stormwater as it leaves the storm drain system. This BMP is less desirable than a protection system that prevents debris from entering the storm drain system because the system may become clogged with debris. Outlet pipe filters can be placed on existing curbside catch basins and flush grate openings. Regular maintenance is required and inspection should be performed rigorously. Because this filter is located at the outlet of a storm drain system, clogging with debris is not as apparent as with filters at street level. This BMP may be used as a supplemental filter with an inlet screen or inlet insert unit.

Section 7 –Trees and Landscaping

Description



Healthy urban trees are powerful stormwater management tools. Leaves and branches catch and slow rain as it falls, helping it to soak into the ground. The use of California native trees and plants use less water and provide an infiltration opportunity. Part of this moisture is then returned to the air through evaporation to further cool the city.

The goal of adding trees is to increase the canopy cover of a street, parking lot or walkway, the percentage of its surface either covered by or shaded by vegetation. The selection, placement, and management of all landscape elements should enhance the longevity of trees and healthy, mature plantings should be retained and protected whenever possible.

Benefits to adding trees and other forms of California native landscaping include:

- Creation of shade to lower temperatures in a city, reduces energy use, and makes the area a more pleasant place in which to walk and spend time;
- Slowing and capturing of rainwater, helping it soak into the ground to restore local hydrologic functions and aquifers; and
- Improving air quality by cooling air, producing oxygen, and absorbing and storing carbon in woody plant tissues

Rio Hondo Golf Course parking lot (Downey, CA)

Guidelines

Additional related guidelines include the

City of Commerce Street Tree Ordinance, Chapter 19.23 Landscaping Standards and Chapter 12.06, City Trees and the City of Commerce Water Efficient Landscape Ordinance, Chapter 19.24 obtainable at http://www.ci.commerce.ca.us

Section 8 – Definitions

Approving Agency	*The City of Commerce City Administrator or designee.*
Automotive Service Facility	*A facility that is categorized in any one of the following Standard Industrial Classification (SIC) and North American Industry Classification System (NAICS) codes.*
Basin Plan	*The Water Quality Control Plan, Los Angeles Region, Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties, adopted by the Los Angeles Regional Water Quality Control Board on June 13, 1994 and subsequent amendments.*
Best Management Practice (BMP)	*Practices or physical devices or systems designed to prevent or reduce pollutant loading from stormwater or non-stormwater discharges to receiving waters, or designed to reduce the volume of stormwater or non-stormwater discharged to the receiving water.*
Biofiltration	*A LID BMP that reduces stormwater pollutant discharges by intercepting rainfall on vegetative canopy, and through incidental infiltration and/or evapotranspiration, and filtration. Incidental infiltration is an important factor in achieving the required pollutant load reduction. Therefore, the term "biofiltration" as used in this Ordinance is defined to include only systems designed to facilitate incidental infiltration or achieve the equivalent pollutant reduction as biofiltration BMPs with an underdrain (subject to approval by the Regional Board's Executive Officer). Biofiltration BMPs include bioretention systems with an underdrain and bioswales.*
Bioretention	*A LID BMP that reduces stormwater runoff by intercepting rainfall on vegetative canopy, and through evapotranspiration and infiltration. The bioretention system typically includes a minimum 2-foot top layer of a specified soil and compost mixture underlain by a gravel-filled temporary storage pit dug into the in-situ soil. As defined in the Municipal NPDES permit, a bioretention BMP*

	may be designed with an overflow drain, but may not include an underdrain. When a bioretention BMP is designed or constructed with an underdrain it is regulated by the Municipal NPDES permit as biofiltration.
Bioswale	*A LID BMP consisting of a shallow channel lined with grass or other dense, low-growing vegetation. Bioswales are designed to collect stormwater runoff and to achieve a uniform sheet flow through the dense vegetation for a period of several minutes.*
Clean Water Act	*The Federal Water Pollution Control Act enacted in 1972, by Public Law 92-500, and amended by the Water Quality Act of 1987. The Clean Water Act prohibits the discharge of pollutants to Waters of the United States unless the discharge is in accordance with an NPDES permit.*
Commercial Malls	*Any development on private land comprised of one or more buildings forming a complex of stores which sells various merchandise, with interconnecting walkways enabling visitors to easily walk from store to store, along with parking area(s). A commercial mall includes, but is not limited to: mini-malls, strip malls, other retail complexes, and enclosed shopping malls or shopping centers.*
Construction Activity	*Any construction or demolition activity, clearing, grading, grubbing, or excavation or any other activity that result in land disturbance. Construction does not include emergency construction activities required to immediately protect public health and safety or routine maintenance activities required to maintain the integrity of structures by performing minor repair and restoration work, maintain the original line and grade, hydraulic capacity, or original purposes of the facility. See "Routine Maintenance" definition for further explanation. Where clearing, grading or excavating of underlying soil takes place during a repaving operation, State General Construction Permit coverage by the State of California General Permit for Storm Water Discharges Associated with*

	Industrial Activities or for Stormwater Discharges Associated with Construction Activities is required if more than one acre is disturbed or the activities are part of a larger plan.
Control	*To minimize, reduce or eliminate by technological, legal, contractual, or other means, the discharge of pollutants from an activity or activities.*
Conveyance	The process of water moving from one place to another.
Design Storm	A storm whose magnitude, rate, and intensity do not exceed the design load for a storm drainage system or flood protection project.
Detention	Stormwater runoff that is collected at one rate and then released at a controlled rate. The volume difference is held in temporary storage.
Development	*Construction, rehabilitation, redevelopment or reconstruction of any public or private residential project (whether single-family, multi-unit or planned unit development); industrial, commercial, retail, and other non-residential projects, including public agency projects; or mass grading for future construction. It does not include routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of facility, nor does it include emergency construction activities required to immediately protect public health and safety.*
Directly Adjacent	*Situated within 200 feet of the contiguous zone required for the continued maintenance, function, and structural stability of the environmentally sensitive area.*
Discharge	*Any release, spill, leak, pump, flow, escape, dumping, or disposal of any liquid, semi-solid, or solid substance.*
Disturbed Area	*An area that is altered as a result of clearing, grading, and/or excavation.*
Filtration	A treatment process that allows for removal of solid (particulate) matter from water by means of porous media such as sand, soil, vegetation, or a man-

	made filter. Filtration is used to remove contaminants.
Flow-through BMPs	*Modular, vault type "high flow biotreatment" devices contained within an impervious vault with an underdrain or designed with an impervious liner and an underdrain.*
General Construction Activities Storm Water Permit (GCASP)	*The general NPDES permit adopted by the State Board which authorizes the discharge of stormwater from construction activities under certain conditions.*
General Industrial Activities Storm Water Permit (GIASP)	*The general NPDES permit adopted by the State Board which authorizes the discharge of stormwater from certain industrial activities under certain conditions.*
Green Roof	*A LID BMP using planter boxes and vegetation to intercept rainfall on the roof surface. Rainfall is intercepted by vegetation leaves and through evapotranspiration. Green roofs may be designed as either a bioretention BMP or as a biofiltration BMP. To receive credit as a bioretention BMP, the green roof system planting medium shall be of sufficient depth to provide capacity within the pore space volume to contain the design storm depth and may not be designed or constructed with an underdrain.*
Furniture Zone	The furniture zone is the area which lies between the curb and pedestrian zones and is intended to house utilities and pedestrian amenities.
Hardscape	Impermeable surfaces, such as concrete or stone, used in the landscape environment along sidewalks or in other areas used as public space.
Hazardous Materials	*Any material(s) defined as hazardous by Division 20, Chapter 6.95 of the California Health and Safety Code.*
Hydromodification	*The alteration of the hydrologic characteristics of coastal and non-coastal waters, which in turn could cause degradation of water resources. Hydromodification can cause excessive erosion*

	and/or sedimentation rates, causing excessive turbidity, channel aggradation and/or degradation.
Impervious Surface	*Any man-made or modified surface that prevents or significantly reduces the entry of water into the underlying soil, resulting in runoff from the surface in greater quantities and/or at an increased rate, when compared to natural conditions prior to development. Examples of places that commonly exhibit impervious surfaces include parking lots, driveways, roadways, storage areas, and rooftops. The imperviousness of these areas commonly results from paving, compacted gravel, compacted earth, and oiled earth.*
Industrial Park	*Land development that is set aside for industrial development. Industrial parks are usually located close to transport facilities, especially where more than one transport modalities coincide: highways, railroads, airports, and navigable rivers. It includes office parks, which have offices and light industry.*
Infiltration	The process by which water penetrates into soil from the ground surface.
Infiltration BMP	*A LID BMP that reduces stormwater runoff by capturing and infiltrating the runoff into in-situ soils or amended onsite soils. Examples of infiltration BMPs include infiltration basins, dry wells, and pervious pavement.*
Low Impact Development (LID)	*Consists of building and landscape features designed to retain or filter stormwater runoff.*
MS4	*Municipal Separate Storm Sewer System. The MS4 is a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains):* *a. Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other*

	wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States; b. *Designed or used for collecting or conveying stormwater;* c. *Which is not a combined sewer; and* d. *Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR §122.2.*
National Pollutant Discharge Elimination System (NPDES)	*The national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under CWA §307, 402, 318, and 405. The term includes an "approved program."*
Natural Drainage System	*A drainage system that has not been improved (e.g., channelized or armored). The clearing or dredging of a natural drainage system does not cause the system to be classified as an improved drainage system.*
New Development	*Land disturbing activities; structural development, including construction or installation of a building or structure, creation of impervious surfaces; and land subdivision.*
Non-Stormwater Discharge	*Any discharge to a municipal storm drain system that is not composed entirely of stormwater.*
Parking Lot	*Land area or facility for the parking or storage of motor vehicles used for businesses, commerce, industry, or personal use, with a lot size of 5,000 square feet or more of surface area, or with 25 or more parking spaces.*

Permeability/Impermeability	The quality of a soil or material that enables water to move through it, determining its suitability for infiltration.
Person	*Any individual, partnership, co-partnership, firm, company, corporation, association, joint stock company, trust, state, governmental entity or any other legal entity, or their legal representatives, agents or assigns. The masculine gender shall include the feminine and the singular shall include the plural where indicated by the context.*
Planning Priority Project	*Development projects subject to Permittee conditioning and approval for the design and implementation of post-construction controls to mitigate stormwater pollution, prior to completion of the project(s).*
Pollutant	*Any "pollutant" defined in Section 502(6) of the Federal Clean Water Act or incorporated into the California Water Code Sec. 13373. Pollutants may include, but are not limited to the following:* *a. Commercial and industrial waste (such as fuels, solvents, detergents, plastic pellets, hazardous substances, fertilizers, pesticides, slag, ash, and sludge).* *b. Metals (such as cadmium, lead, zinc, copper, silver, nickel, chromium, and non- metals such as phosphorus and arsenic).* *c. Petroleum hydrocarbons (such as fuels, lubricants, surfactants, waste oils, solvents, coolants, and grease).* *d. Excessive eroded soil, sediment, and particulate materials in amounts that may adversely affect the beneficial use of the receiving waters, flora, or fauna of the State.* *e. Animal wastes (such as discharge from confinement facilities, kennels, pens, recreational facilities, stables, and show*

	facilities). *f. Substances having characteristics such as pH less than 6 or greater than 9, or unusual coloration or turbidity, or excessive levels of fecal coliform, or fecal streptococcus, or enterococcus.*
Project	*All Development, Redevelopment, and land disturbing activities. The term is not limited to "Project" as defined under CEQA.*
Rainfall Harvest and Use	*A LID BMP system designed to capture runoff, typically from a roof but can also include runoff capture from elsewhere within the site, and to provide for temporary storage until the harvested water can be used for irrigation or non-potable uses. The harvested water may also be used for potable water uses if the system includes disinfection treatment and is approved for such use by the local building department.*
Receiving Water	*"Water of the United States" into which waste and/or pollutants are or may be discharged.*
Redevelopment	*Land-disturbing activity that results in the creation, addition, or replacement of 5,000 square feet or more of impervious surface area on an already developed site. Redevelopment includes, but is not limited to: the expansion of a building footprint; addition or replacement of a structure; replacement of impervious surface area that is not part of routine maintenance activity; and land disturbing activity related to structural or impervious surfaces. It does not include routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of facility, nor does it include emergency construction activities required to immediately protect public health and safety.*
Regional Board	*The California Regional Water Quality Control Board, Los Angeles Region.*
Restaurant	*A facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and*

	drinks for immediate consumption (SIC Code 5812).
Retail Gasoline Outlet	*Any facility engaged in selling gasoline and lubricating oils.*
Retention	The reduction in total runoff that results when stormwater is diverted and allowed to infiltrate into the ground through existing or engineered soil systems.
Routine Maintenance	*Include, but are not limited to projects conducted to:* *a. Maintain the original line and grade, hydraulic capacity, or original purpose of the facility.* *b. Perform as needed restoration work to preserve the original design grade, integrity and hydraulic capacity of flood control facilities.* *c. Includes road shoulder work, regarding dirt or gravel roadways and shoulders and performing ditch cleanouts.* *d. Update existing lines* and facilities to comply with applicable codes, standards, and regulations regardless if such projects result in increased capacity.* *e. Repair leaks* *Routine maintenance does not include construction of new lines** or facilities resulting from compliance with applicable codes, standards and regulations.* ** Update existing lines includes replacing existing lines with new materials or pipes.* *** New lines are those that are not associated with existing facilities and are not part of a project to update or replace existing lines.*
Runoff	Water from rainfall that flows over the land surface that is not absorbed into the ground.

Sedimentation

The deposition and/or settling of particles suspended in water as a result of the slowing of the water.

Significant Ecological Areas (SEAs)

An area that is determined to possess an example of biotic resources that cumulatively represent biological diversity, for the purposes of protecting biotic diversity, as part of the Los Angeles County General Plan. Areas are designated as SEAs, if they possess one or more of the following criteria:

a. The habitat of rare, endangered, and threatened plant and animal species.

b. Biotic communities, vegetative associations, and habitat of plant and animal species that are either one of a kind, or are restricted in distribution on a regional basis.

c. Biotic communities, vegetative associations, and habitat of plant and animal species that are either one of a kind or are restricted in distribution in Los Angeles County.

d. Habitat that at some point in the life cycle of a species or group of species, serves as a concentrated breeding, feeding, resting, migrating grounds and is limited in availability either regionally or within Los Angeles County.

e. Biotic resources that are of scientific interest because they are either an extreme in physical/geographical limitations, or represent an unusual variation in a population or community.

f. Areas important as game species habitat or as fisheries.

g. Areas that would provide for the preservation of relatively undisturbed examples of natural biotic communities in Los Angeles County.

	h. Special areas.
Site	*Land or water area where any "facility or activity" is physically located or conducted, including adjacent land used in connection with the facility or activity.*
Storm Drain System	*Any facilities or any part of those facilities, including streets, gutters, conduits, natural or artificial drains, channels, and watercourses that are used for the purpose of collecting, storing, transporting or disposing of stormwater and are located within the City of Commerce.*
Stormwater	Water runoff from rain or snow resulting from a storm.
Stormwater Runoff	*Water that originates from atmospheric moisture (rain or snow) and that falls onto land, water, or other surfaces. Without any change in its meaning, this term may be spelled or written as one word or two separate words.*
SUSMP	*The Los Angeles Countywide Standard Urban Stormwater Mitigation Plan. The SUSMP was required as part of the previous Municipal NPDES Permit (Order No. 01-182, NPDES No. CAS004001) and required plans that designate best management practices (BMPs) that must be used in specified categories of development projects.*
Transportation Corridor	A major arterial, state route, highway, or rail line used for the movement of people or goods by means of bus services, trucks, and vehicles.
Urban Runoff	*Surface water flow produced by storm and non-storm events. Non-storm events include flow from residential, commercial, or industrial activities involving the use of potable and non-potable water.*