City of Carmel-by-the-Sea

Low Impact Development Guidance Manual

December 9, 2010

CONTENTS

1.0 INTRODUCTION

1.1 Purpose

This Low Impact Development Guidance Manual (Manuel) is intended for use by project developers such as architects, engineers, and building contractors, in designing and constructing projects within the City of Carmel-by-the-Sea (City) to comply with the City's Low Impact Development (LID) requirements. City staff involved in reviewing plans and issuing permits for a project will use this Manual to determine whether or not the project has been designed to meet these requirements.

1.2 Background

Discharges from the City's storm drainage system are regulated under a National Pollutant Discharge Elimination System (NPDES) permit issued by the Central Coast Regional Water Quality Control Board (RWQCB) of the State of California. The NPDES permit is called the *"General Permit for the Discharge of Storm Water from Small Municipal Separate Storm Sewer Systems, Order No. 2003-0005-DWQ."* The City became subject to this permit on May 1, 2008.

A condition of compliance under the NPDES permit is that the City implements its Storm Water Management Program. One of the State-required components of that Program is to develop and implement a set of Best Management Practices (BMPs) to reduce storm water runoff and storm water pollution emanating from new development and redevelopment projects located within the City. This is accomplished by using the LID concepts described in this Manual during the design and construction of those projects.

LID is a development approach that (1) reduces the amount of storm water runoff by retaining a portion of the storm water on the project site where it can infiltrate into the ground, and (2) in some instances reduces the amount of pollutants in storm water through natural or manmade treatment processes.

1.3 Authority

Chapters 17.10, 17.34, 17.42, 17.43, and 17.70 of the Carmel-by-the-Sea Municipal Code (CMC) establish certain of the BMP requirements described in this Manual. For ease of reference, citations from sections of these Chapters are designated herein as (§xx.xx.xxx). In addition, on November 3, 2009 the City Council adopted a document titled "*BMP Guidance Series"* as official City policies pertaining to storm water pollution prevention from new development and redevelopment projects. Requirements taken from that document are designated herein as (BGS).

The CMC may be viewed and downloaded from the following website:
http://www.codepublishing.com/CA/carmel.html

The BGS may be viewed and downloaded from the following website:
http://www.montereysea.org/Literature/literature.asp

At this website, click on *"Monterey Regional Stormwater Management Program, Revision 2 (May 28, 2010)."* The BGS is contained on pages E-106 through E-125 of that document.

The City has adopted the requirements described in this Manual to control the volume, rate, and potential pollutant load of stormwater runoff from new development and redevelopment projects as may be appropriate to minimize the generation, transport and discharge of pollutants as defined by Chapter 17.43 of the CMC. The City will incorporate these requirements into any construction or building-related permit to be issued for the development or redevelopment. (§17.42.020)

The purpose of the requirements in Chapter 17.43 is to protect and enhance coastal waters within the City in accordance with the policies of the City's Local Coastal Plan, the California Coastal Act, and the City's NPDES permit requirements, and to ensure that permitted development shall be sited and designed to conserve natural drainage features and vegetation, minimize the introduction of pollutants into coastal waters to the maximum extent practicable, limit the discharge of stormwater runoff, and protect the overall quality of coastal waters and resources. (§17.43.010)

1.4 LID BMP Implementation Tracking

In order to facilitate the design review and permitting process, when the plans for a project are submitted to the City they should include a completed copy of the "BMP Implementation Tracking Form" contained in Attachment 1. The plans should also show the locations of the BMPs that have been incorporated into the design of the project.

2.0 DESIGN

2.1 Selection of BMPs

In selecting BMPs to incorporate into the project design, the applicant should first identify the pollutants of concern that are anticipated to be generated as a result of the development. Table 1 in Attachment 3 should be used as a guide in identifying these pollutants of concern. Pollutants generated by the development that exhibit one or more of the following characteristics will be considered the primary pollutants of concern:

- Current loadings or historical deposits of the pollutant are impairing the beneficial uses of a receiving water.
- Elevated levels of the pollutant are found in water or sediments of a receiving water and/or have the potential to be toxic to or bioaccumulate in organisms therein.
- Inputs of the pollutant are at a level high enough to be considered potentially toxic.

2.1.1 Site Design and Source Control BMPs. Site design and source control BMPs should be selected based on pollutants commonly associated with the project type, as identified in Table 1 of Attachment 3. BMPs that minimize the identified pollutants of

concern should be selected from the matrix in Table 2 of Attachment 3. In the event that the implementation of a BMP listed in Table 2 of Attachment 3 is determined to be infeasible at any site, the implementation of other BMPs that will achieve the equivalent reduction of pollutants will be required.

2.1.2 Treatment Control BMPs. In many cases proper application of appropriate site design and source control BMPs will meet the City's LID requirements, and treatment control BMPs will not be necessary. However, when site design and source control BMPs are not adequate, treatment control BMP(s) will be necessary. Treatment control BMPs should be selected from the matrix in Table 3 of Attachment 3 as guidance to determine the removal efficiency of the BMP for the pollutants of concern for that project. Treatment control BMPs that maximize pollutant removal for the identified primary pollutants of concern should receive priority for BMP selection, followed by BMPs that maximize pollutant removal for all other pollutants of concern identified for the project. The most effective combination of BMPs for polluted runoff control that results in the most efficient reduction of pollutants should be implemented. In the event that the implementation of a BMP listed in the matrix in Table 3 of Attachment 3 is determined to be infeasible on the project site, the implementation of other treatment control BMP(s) that will achieve the equivalent reduction of pollutants will be required.

Where treatment controls are required, the BMPs (or suites of BMPs) should be designed to infiltrate and/or treat the amount of stormwater runoff as follows:

- For volume-based BMPs, the amount of storm water runoff produced by the eighty-fifth percentile, 24-hour storm event.
- For flow-based BMPs, two times the amount of storm water runoff produced by the eighty-fifth percentile, one-hour storm event.
- Limited Exclusion: Restaurants and retail gasoline outlets where the land area for development or redevelopment is less than 5,000 square feet are excluded from these volume- and flow-based numerical treatment control BMP design standards.

The term "treatment" includes physical, biological and chemical processes such as filtration, the use of bioswales, detention and retention ponds and adsorption media. The actual type of treatment should be suited to the pollutants generated by the development as indicated in Table 1 of Attachment 3.

Descriptions of commonly used treatment control BMPs are contained in Attachment 2. Detailed design information for treatment control BMPs, and examples, can be found in Sections 2 through 5 of the CASQA Handbook, and in Appendices C through E of the Santa Barbara Manual, both of which are described in Section 6.0 of this Manual.

At its discretion and for good cause, the City may waive one or more of the requirements pertaining to treatment control BMPs if impracticability for a specific property can be established. A waiver of impracticability will be granted only when all other treatment control BMPs have been considered and rejected as infeasible.

Recognized situations of impracticability include, (i) extreme limitations of space for treatment on a project site, (ii) unfavorable or unstable soil conditions at a site to attempt infiltration, and (iii) risk of ground water contamination because a known unconfined aquifer lies beneath the land surface or an existing or potential underground source of drinking water is less than 10 feet from the soil surface. A waiver may be revoked for cause and with proper notice.

2.2 Watercourse Protection

Watercourses located on private property are required to be kept free of trash, debris, excessive vegetation, stagnant pools of water and other obstacles that would pollute, contaminate, or significantly retard the flow of water through the watercourse to the extent required by the City. Healthy bank vegetation should not be removed beyond that actually necessary for maintenance, nor should such vegetation be removed in a manner which increases the vulnerability of the watercourse to erosion. The property owner is responsible for maintaining and stabilizing that portion of the watercourse that is within their property lines to protect against erosion and degradation of the watercourse on-site and downstream. Property owners shall select "Soft Engineered" techniques when possible for maintaining and stabilizing stream banks. (§17.42.020).

2.3 Landscaping Requirements

In order to protect and enhance the City's urbanized forest and landscaped amenities, to protect environmentally sensitive habitat areas from degradation, to provide for the restoration of native vegetation, and to promote water conservation the following landscaping requirements will be imposed on new development and redevelopment projects. (§17.34.010)

These requirements apply to all new development or substantial alteration of existing development proposed on private property anywhere in the City. (§17.34.020)

2.3.1 Plantings:

2.3.1.1 All Sites (§17.34.060):

1. In order to reduce the potential for irrigation run-off that could contribute to storm water pollution, a minimum of 75 percent of new plant materials on the project site shall be native plants and/or noninvasive drought-tolerant plants as determined by the City Forester.
2. All plants within landscaped areas on any public right-of-way adjacent to private property shall be drought-tolerant and low water use predominantly native species as determined by the City Forester.
3. A minimum of 75 percent of new plant materials in all open space areas on project sites in the commercial, R-4, and R-1 districts shall be planted with drought-tolerant and low water use species as determined by the City Forester.

2.3.1.2 Residential Sites (§17.34.070):

1. All properties located in the R-1 or R-4 district shall contribute to the urbanized forest or other vegetation characteristic of the neighborhood by harboring an appropriate mix of upper and lower canopy trees and/or

shrubs consistent with the neighborhood context and the neighborhood streetscape.

2. Landscaping in public rights-of-way in the R-1 district shall be limited to native, drought-tolerant plants.

2.3.1.3 Commercial Sites (§17.34.080):

1. In all commercial districts a minimum of 50 percent of the required open space on the project site shall be landscaped. The combined total area of nonliving materials such as garden benches, water features and patterned paving treatments shall not comprise more than 25 percent of the required landscaping on the site. All landscaping improvements shall include upper canopy trees on-site and/or in the sidewalk in front of the property whenever possible.
2. Building sites incorporating surface parking lots shall include at least 15 percent of the site area in landscaping. To help reduce runoff into the City's storm drainage system, landscaping shall be distributed along all street frontages and pedestrian walkways that are adjacent to parking areas. Landscaping shall also be provided within the interior of surface lots to break up large expanses of paving. Parking lots with four or more vehicles shall provide interior landscaping of at least 10 square feet per vehicle.

2.3.2 Materials of Construction (§17.34.060):

1. Use of materials that allow for percolation of rain into the soil and reduce water run-off is encouraged.
2. Paved areas shall be designed to be small, and large continuous areas of paving shall be avoided. Paved areas shall include design features such as sand-set paving and/or drainage collection and distribution systems that enhance surface water percolation.
3. Landscaping plans for projects in any zoning district shall, where feasible, include the use of water retention storage devices such as cisterns or underground bladders to capture precipitation or surface runoff for landscape maintenance purposes or detention basins or berms to retain water on-site for natural percolation into the soil.

2.4 Impermeable Site Coverage (§17.10.030)

These requirements apply to all new development, or substantial alteration of existing development, proposed on private property anywhere in the City.

1. Impermeable site coverage, which is defined in Chapter 17.70 of the City's Municipal Code to mean a surface artificially constructed so as to prevent or largely inhibit the infiltration of rainwater or runoff into the natural soils or underlying geologic materials, shall be limited to a maximum of 22% of the base floor area allowed for the site. Allowable base floor areas for typical lot sizes are contained in Table 17.10-D of the CMC. For a typical 4,000 square-foot site the maximum allowable impermeable site coverage equals 396 square feet or approximately 10% of the site.

2. If at least 50 percent of all site coverage on the property is made of permeable or semi-permeable materials, an additional amount of site coverage of up to 4% of the site area may be allowed for use in a single driveway of up to nine feet in width.

2.5 Site Design

Projects should be designed with the objectives of minimizing the introduction of pollutants that may result in water quality impacts, and controlling post-development peak runoff rates and average volumes to maintain or reduce pre-development downstream erosion rates. (§17.43.010)

All development should be evaluated for potential adverse impacts to water quality, and the applicant is to consider site design, source control, and treatment control BMPs in order to minimize polluted runoff and water quality impacts resulting from the development. In order to maximize the reduction of water quality impacts, BMPs should be incorporated into the project design in the following progression: (1) Site design BMPs, (2) Source control BMPs, and (3) Treatment control BMPs. (§17.43.060).

2.5.1 Development on Steep Slopes (§17.43.060)

Project designs should incorporate soil stabilization and infiltration practices during the construction of roads, bridges, culverts and outfalls to prevent stream bank or hillside erosion. Project plans must include the following BMPs to decrease the potential of slopes and/or channels from eroding and impacting stormwater runoff:

1. Convey runoff safely from the tops of slopes and stabilize disturbed slopes.
2. Utilize existing natural drainage systems to the maximum extent feasible.
3. Control and minimize excess flow to natural drainage systems to the maximum extent feasible.
4. Stabilize permanent channel crossings using "soft engineering" practices when possible.
5. Vegetate slopes with native or drought-tolerant vegetation.
6. Additional measures to prevent downstream erosion, such as cisterns, infiltration pits and/or contour drainage outlets that disperse water back to sheet flow, should be implemented for projects discharging onto slopes greater than 10%.

2.5.2 Residential Projects

2.5.2.1 Small Residential Projects

For small residential projects that must only go through a ministerial review process and conform to the site zoning requirements, such as either a new single-family unit or minor modifications to an existing single family unit or a single structure, LID objectives are to be accomplished by applying the following principles to the design (§17.43.080 and BGS):

1. Use low-maintenance drought-tolerant landscaping that does not require frequent fertilizer, pesticide and herbicide application.
2. Label all storm drain inlets and catch basins within the project area with prohibitive language (such as: "NO DUMPING – DRAINS TO OCEAN") and/or graphical icons to discourage illegal dumping.
3. Minimize areas that are directly connected to the City's storm drainage system by directing roof gutters and other impervious areas to landscaped areas where possible. Roof drains may be eliminated only in one to two-story buildings in residential and some commercial areas. Where these cannot be eliminated, direct the downspout of the gutter to landscaped areas or into an infiltration trench. Install several gutters to distribute the flow.
4. Minimize impervious areas and increase rainfall infiltration by using alternate paving materials (pavers), landscaping, mulch, gravel and cobbles where appropriate to provide ground cover, and reduce the use of asphalt or other impervious pavement. Pavers are recommended for driveways, walkways, and patios in single-family residences if Americans with Disabilities Act (ADA) requirements do not have to be met.

2.5.2.2 Large Residential Projects

For large residential projects that must go through a discretionary design review process and which typically require a use permit or a subdivision map, LID objectives are to be accomplished by applying the following principles to the design (§17.43.010 and BGS):

1. Maintain and use existing natural drainage courses and vegetation by not filling in the natural drainage features at the site, preserving riparian areas and wetlands, maintaining invert/streambeds to maximize capacity, and providing vegetated setbacks or buffer strips outside of the maximum water surface level.
2. Conserve natural resources and areas by clustering development on the least environmentally sensitive portions of a site while leaving the remaining land in a natural, undisturbed condition.
3. Protect slopes and channels from eroding and impacting storm water runoff by:
    1) Conveying runoff safely from the tops of slopes and stabilizing disturbed slopes.
    2) Utilizing natural drainage systems to the maximum extent practicable.
    3) Stabilizing permanent channel crossings.
    4) Vegetating slopes with native or drought tolerant vegetation, as appropriate.
    5) Installing energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels
4. Minimize the amount of directly connected impervious surface and total area of impervious surface**.**

5. Minimize the length of driveways and avoid installing curb and gutter along driveways and streets where appropriate, so that runoff from these areas can flow into adjacent landscaped or other permeable areas.
6. In low-traffic areas, reduce sidewalk widths as much as possible while still being in compliance with ADA requirements.
7. Incorporate or connect to existing on-site retention and infiltration measures.
8. Direct rooftop runoff to permeable areas rather than driveways or impervious surfaces to reduce the amount of stormwater leaving the site.
9. Minimize clearing and grading, and set aside open space to the extent feasible.
10. Use alternate paving materials (e.g., porous asphalt, pervious concrete, pavers), landscaping, mulch, gravel and cobbles where appropriate to provide ground cover, and reduce the use of asphalt or other impervious pavement. Pavers are recommended for driveways, walkways, and patios in single-family residences if ADA requirements do not have to be met. In non-residential areas, pavers are recommended for emergency access roads, overflow parking areas, and non-handicapped parking stalls, keeping in mind that some types of alternate paving materials may not be suitable where heavy loads such as trucks.
11. In new residential areas reduce street width by eliminating on-street parking (where such actions do not pose a safety hazard). In addition to reducing the impervious area, this control has the added benefit of removing cars from streets and making street sweeping easier and more effective. If on-street parking in residential areas is eliminated, the developer must provide adequate off-street visitor parking.
12. If alleys are included in a proposed development, width should be minimized or alternate paving materials should be used.
13. Provide green areas in new residential developments where people can walk their pets and keep pet excrement away from sidewalks and streets where it may contribute to storm water pollution.
14. Install landscaping or other cover materials to minimize erosion from graded surfaces. Promote the use of natural vegetation by using parking lot islands and other landscaped areas. Use of native plant materials is recommended because native plants require less maintenance and irrigation. Since native plants take longer to cover slopes, during the first few years supplemental protection (erosion blanket, mulch, etc.) may be necessary.
15. Use low-maintenance landscaping that does not require frequent fertilizer, pesticide and herbicide application.
16. Label all storm drain inlets and catch basins within the project area with prohibitive language (such as: “NO DUMPING – DRAINS TO

OCEAN") and/or graphical icons to discourage illegal dumping. Legibility of stencils and signs must be maintained.

17. Where possible, eliminate gutters/roof drains or direct runoff to landscaped areas. Roof drains can be eliminated only in one to two-story buildings. Where these cannot be eliminated, direct the downspout of the gutter to landscaped areas or into an infiltration trench. Install several gutters to distribute the flow.

18. In new residential developments involving more than 50 units, construct a designated vehicle wash area so that the runoff from vehicle washing can be property treated and/or disposed. Contact the local wastewater authority to determine if the discharge can be plumbed to the sanitary sewer. If not, provide appropriate treatment and disposal of this runoff.

19. Grade and pave outdoor waste receptacle areas to prevent run-on of storm water, and install a low containment berm around it. Alternately, construct a covered enclosure with wash-down capabilities plumbed into the sanitary sewer, after first contacting the local wastewater authority to verify that this practice will be acceptable.

2.5.3 Commercial Projects

For commercial projects, in addition to the applicable requirements described elsewhere within this Manual, the following additional LID principles are to be incorporated into the design of all commercial projects, as appropriate (§17.43.070 and BGS):

2.5.3.1 Commercial Developments – General Requirements

2.5.3.1.1 Loading/Unloading Dock Areas

1. Shall be covered or designed to minimize run-on and runoff of stormwater.
2. Shall have no direct connections to storm drains from depressed loading docks (truck wells).
3. Should have valve(s) on storm drain inlets receiving runoff from non-depressed loading docks to control runoff in the event of spills.

2.5.3.1.2 Vehicle/Equipment Washing/Steam Cleaning Areas

1. Shall be self-contained and/or covered.
2. Shall be equipped with a clarifier or other pretreatment facility.
3. Shall be properly connected to a sanitary sewer.

2.5.3.1.3 Parking Areas

1. Shall be designed to minimize impervious surface land coverage.
2. Shall be designed to infiltrate runoff as much as feasible before it reaches the storm drain system.
3. Parking lots that are heavily used, e.g. lots with 25 or more parking spaces, performing arts parking lots, shopping malls, or grocery stores shall have treatment controls installed to treat

any remaining runoff before it reaches the storm drain system. The treatment controls shall be designed to remove oil and petroleum hydrocarbons, and shall be operated and maintained to ensure that sludge and oil is removed at a frequency that will prevent the treatment controls from fouling or plugging.

4. If feasible, build underground or multi-story parking structures so that not only is impervious surface minimized but the parking surfaces are under a roof and not exposed to storm water.
5. Where possible use cooperative or shared parking. This may be a cooperative effort between commercial entities or between commercial entities and the City.

2.5.3.1.4 Outdoor *Material Storage Areas* **(**areas or facilities used solely for the storage of materials)

1. Shall be designed to prevent stormwater contamination from stored materials.
2. Where outdoor areas for storage of materials are included that may contribute pollutants to the stormwater conveyance system, those materials shall be placed in an enclosure such as a cabinet, shed or similar structure that prevents contact with runoff or spillage to the stormwater conveyance system, or shall be protected by secondary containment structures such as berms, dikes or curbs.
3. Shall be paved and sufficiently impervious to contain leaks and spills.
4. Shall have a roof or awning to minimize collection of stormwater within the secondary containment area.

2.5.3.1.5 Trash *Storage Areas* (areas where a trash receptacle or receptacles are located for use as a repository for solid wastes):

1. Shall be designed to prevent stormwater contamination by loose trash and debris.
2. Shall have drainage from adjoining roofs and pavement diverted around the area(s).
3. Shall be screened or walled to prevent off-site transport of trash.

2.5.3.2 Restaurants – Additional Specific Requirements

1. Shall be designed to minimize runoff of oil and grease, solvents, phosphates, and suspended solids to the storm drain system.
2. Shall include an area for the washing/steam cleaning of equipment and accessories and which is self-contained, equipped with a grease trap, and properly connected to a sanitary sewer. If the wash area is to be located outdoors, it must be covered, paved, and have secondary containment which is connected to the sanitary sewer.

2.5.3.3 Retail Gasoline Outlets and Automotive Repair Facilities - Additional Specific Requirements

2.5.3.3.1 Fuel Dispensing Area

1. Shall be covered with an overhanging roof structure or canopy. The canopy's minimum dimensions must be equal to or greater than the area within the grade break. The canopy must not drain onto the fuel dispensing area, and the canopy downspouts must be routed to prevent drainage across the fueling area. As an alternative, the site must be served by an oil/water separator or other source or treatment control BMPs that will achieve equivalent mitigation.
2. Shall be paved with Portland cement concrete (or equivalent smooth impervious surface). The use of asphalt concrete is not allowable.
3. Shall have a 2% to 4% slope to prevent ponding, and must be separated from the rest of the site by a grade break that prevents run-on of stormwater to the extent practicable.
4. Shall at a minimum extend 6.5 feet (2.0 meters) from the corner of each fuel dispenser, or the length at which the hose and nozzle assembly may be operated plus one foot (0.3 meter), whichever is less.

2.5.3.3.2 Repair/Maintenance Bays

1. Shall be indoors or designed in such a way that does not allow stormwater runoff or contact with stormwater runoff.
2. Shall have drainage systems designed to capture all wash water, leaks, and spills.
3. Shall have drains connected to a sump for collection and disposal.
4. Shall have no direct connections to the storm drain system.
5. Shall be covered by a State-issued Industrial Waste Discharge Permit, if so-required by the RWQCB.

3.0 EROSION AND DRAINAGE CONTROL PLANS (§17.43.030)

An Erosion and Drainage Control Plan (EDCP) to minimize post-construction polluted runoff containing the following information shall be included in the submitted design plans for projects that are defined as a substantial alteration, a rebuild or a demolition:

1. Site design and source control BMPs that will be implemented to minimize post-construction polluted runoff, including details regarding how the project will use these BMPs to minimize adverse effects of the project on water quality.
2. Drainage improvements (e.g., locations of infiltration basins).
3. Potential flow paths where erosion may occur after construction.
4. Methods to accommodate on-site percolation, revegetation of disturbed portions of the site, address on-site and/or off-site impacts and construction of any necessary improvements.

5. Storm drain pollution prevention measures including all construction elements and BMPs to address the following goals in connection with both construction and long-term operation of the site:

    1) Maximize on-site retention and infiltration measures including directing rooftop runoff to permeable areas rather than driveways.

    2) Maximize, to the extent practicable, the percentage of permeable surfaces and limit impervious areas that are directly connected to the City's storm drainage system in order to allow more percolation of runoff into the ground.

4.0 WATER QUALITY MITIGATION PLANS (§17.43.030 AND BGS)

A Water Quality Mitigation Plan (WQMP) is required for any project which requires an EDCP and which either:

(1) Fails to adequately address water quality impacts using appropriate site design and source control measures, or

(2) Is in one of the following categories but is not able to provide the required site design and source control BMPs for this type of development as listed in Table 2 of Attachment 3:

1. Single-Family Hillside Residences
2. 100,000 Square Foot Commercial Developments
3. Automotive Repair Shops
4. Retail Gasoline Outlets
5. Restaurants
6. Home Subdivisions with 10 or more housing units
7. Parking lots 5,000 square feet or more of impervious surface area or with 25 or more parking spaces and potentially exposed to storm water runoff

In addition to the site design and source control BMPs being provided in the project, the WQMP shall include treatment control BMPs identified in Table 3 of Attachment 3 to minimize post-construction runoff of the types of pollutants listed in Table 1 of Attachment 3, which are characteristic of this type of project. The WQMP shall also include an operation and maintenance plan for these treatment control BMPs.

The WQMP shall be certified by a California Registered Civil Engineer or Licensed Architect approved by the City, and shall include the following information:

1. Site design, source control and treatment control BMPs that will be implemented to minimize post-construction polluted runoff.
2. Pre-development peak runoff rate and average volume.
3. Drainage improvements (e.g., locations of diversions/conveyances for upstream runoff).
4. Potential flow paths where erosion may occur after construction.

5. Methods to accommodate on-site percolation, revegetation of disturbed portions of the site, address on-site and/or off-site impacts, and construction of any necessary improvements.
6. Measures to treat, infiltrate, and/or filter runoff from impervious surfaces (e.g., roads, driveways, parking structures, building pads, roofs, patios, etc.) on the subject parcel(s) and to discharge the runoff in a manner that avoids erosion on or downslope of the subject parcel, the need for upgrades to the City's storm drainage system, discharge of pollutants (e.g., oil, heavy metals, toxics) to coastal waters, or other potentially adverse impacts. Such measures may include, but are not limited to, the use of structures (alone or in combination) such as biofilters and grasses waterways, on-site desilting basins, detention ponds, dry wells, etc.
7. Where treatment controls are required, information describing how the BMPs (or suites of BMPs) have been designed to infiltrate and/or treat the amount of stormwater runoff produced by all storms as described in Section 2.1.2 of this Manual. The actual type of treatment should be linked to the pollutants generated by the development as indicated in Table 1 of Attachment 3.
8. A long-term plan and schedule for the monitoring and maintenance of all drainage-control devices. All treatment control BMPs shall be inspected, cleaned, and repaired when necessary prior to September 30th of each year. Owners of these devices will be responsible for insuring that they continue to function properly, and additional inspections should occur after storms as needed throughout the rainy season. Repairs, modifications, or installation of additional BMPs, as needed, should be carried out prior to the next rainy season. The City will determine if the treatment control BMPs require monitoring, and if so, the City must approve the monitoring program.

5.0 ONGOING MAINTENANCE OF TREATMENT CONTROL BMPS (§17.43.040 AND BGS)

If a project is required to include treatment control BMPs, the applicant will be required to provide verification of maintenance provisions for these BMPs through such means as may be appropriate, including, but not limited to legal agreements, covenants, CEQA mitigation requirements and/or Conditional Use Permits. Verification at a minimum shall include the developer's signed statement accepting responsibility for maintenance until the responsibility is legally transferred and either:

1. A signed statement from the public entity assuming responsibility for structural and treatment control BMP maintenance and that it meets all local agency design standards; or
2. Written conditions in the sales or lease agreement, which require the recipient to assume responsibility for maintenance and conduct a maintenance inspection at least once a year; or
3. Written text in project conditions, covenants, and restrictions (CCRs) for residential properties assigning maintenance responsibilities to the home owners association for maintenance of the structural and treatment control BMPs; or

4. Any other legally enforceable agreement acceptable to the City that assigns responsibility for the maintenance of post-construction structural and treatment control BMPs.

A sample form of Agreement to accomplish these objectives is contained in Attachment 4.

Printed educational materials will be required to accompany the first deed transfer to highlight the existence of the requirement and to provide information on what storm water management facilities are present, signs that maintenance is needed, and how the necessary maintenance can be performed. The transfer of this information will also be required with any subsequent sale of the property.

6.0 SOURCES OF ADDITIONAL INFORMATION

Two excellent sources of additional information on many of the site design, source control, and treatment control topics and concepts discussed in this Manual are the California Stormwater Quality Association (CASQA) *"New Development and Redevelopment Handbook,"* dated 2003, and the *"City of Santa Barbara Storm Water BMP Guidance Manual (Technical Guidance Manual for Post-Construction Storm Water Management),"* dated June 2008.

The CASQA document may be viewed and downloaded at the following website:
http://www.cabmphandbooks.com

The Santa Barbara document may be viewed and downloaded at the following website:
http://www.santabarbaraca.gov/Resident/Community/Creeks/Low_Impact_Development.htm

The BGS also contains a listing of reference documents on many of these same topics, but those may or may not be accessible via the internet.

ATTACHMENT 1

BMP Implementation Tracking Form

Source: Appendix I from Chapter 17.43 of the CMC

BMP IMPLEMENTATION TRACKING FORM

The following are a list of BMPs that may be used to minimize or prevent the introduction of pollutants of concern that may result in significant impacts to receiving waters. Other BMPs that are equally or more effective in pollutant reduction than the comparable BMPs listed below may also be acceptable, if approved by the City. All BMPs must comply with local zoning and building codes and other applicable regulations.

In order to facilitate the design review and permitting process, when the application for the project is submitted to the City it should include a copy of this form with the Project Information filled-in and the applicable check boxes marked to indicate which of these BMPs have been incorporated into the design of the project. The locations of these BMPs should also be shown on the site plan for the project.

Project Information

Owners Name: _____

Blk/Lot/APN: _____

Address: _____

Project Type (see Sections 2.5.2 and 2.5.3 of this Manual for Project Type descriptions):

☐ Small Residential ☐ Large Residential

☐ Commercial (describe type of business):_____

Site Design BMPs

Minimize Impervious Areas

- ☐ Reduce sidewalk widths where it is practicable
- ☐ Incorporate landscaped buffer areas between sidewalks and streets
- ☐ Design residential streets for the minimum required pavement widths
- ☐ Minimize the number of residential street cul-de-sacs and incorporate landscaped areas to reduce their impervious cover.
- ☐ Use open space development that incorporates smaller lot sizes
- ☐ Increase building density while decreasing the building footprint
- ☐ Reduce overall lot imperviousness by promoting alternative driveway surfaces and shared driveways that connect two or more homes together

- ☐ Reduce overall imperviousness associated with parking lots by providing compact car spaces, minimizing stall dimensions, incorporating efficient parking lanes, and using pervious materials in spillover parking areas

Increase Rainfall Infiltration

- ☐ Use permeable materials for private sidewalks, driveways, parking lots, and interior roadway surfaces (examples: hybrid lots, parking groves, permeable overflow parking, etc.)
- ☐ Direct rooftop runoff to pervious areas such as yards, open channels, or vegetated areas, and avoid routing rooftop runoff to the roadway or the urban runoff conveyance system

Maximize Rainfall Interception

- ☐ Maximize canopy interception and water conservation by preserving existing native trees and shrubs and planting additional native or drought-tolerant trees and large shrubs

Minimize Directly Connected Impervious Areas (DCIAs)

- ☐ Draining rooftops into adjacent landscaping prior to discharging to the storm drain
- ☐ Draining parking lots into landscape areas co-designed as biofiltration areas
- ☐ Draining roads, sidewalks, and impervious trails into adjacent landscaping

Slope and Channel Protection

- ☐ Use of existing natural drainage systems to the maximum extent feasible
- ☐ Stabilizing permanent channel crossings
- ☐ Planting native or drought-tolerant vegetation on slopes
- ☐ Using energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels

Maximize Rainfall Interception

- ☐ Cisterns
- ☐ Foundation planting

Increase Rainfall Infiltration

- ☐ Dry wells

Source Control BMPs

- ☐ Storm drain system stenciling and signage
- ☐ Regular street and parking lot sweeping
- ☐ Outdoor material and trash storage area designed to reduce or control rainfall runoff
- ☐ Efficient irrigation system

Treatment Control BMPs

Biofilters

☐ Grassy swale ☐ Grass strip ☐ Wetland vegetation swale
☐ Bioretention

Detention Basins

☐ Extended/dry detention basin with grass lining
☐ Extended/dry detention basin with impervious lining

Infiltration Basins

☐ Infiltration basin ☐ Infiltration trench ☐ Porous asphalt
☐ Porous concrete ☐ Porous modular concrete block

Wet Ponds and Wetlands

☐ Wet pond (permanent pool) ☐ Constructed wetland

Drainage Inserts

☐ Oil/Water separator ☐ Catch basin insert ☐ Storm drain inserts
☐ Catch basin screens

Filtration Systems

☐ Media filtration ☐ Sand filtration

Hydrodynamic Separation Systems

☐ Swirl Concentrator ☐ Cyclone Separator

ATTACHMENT 2

Descriptions of Treatment Control BMPs

Source: Best Management Practices Guidance Series (BGS)

The BMPs described below are treatment control BMPs that can be built at new development and redevelopment sites to capture and treat the polluted runoff before it enters the City's storm drain system or other receiving waters. Many of these are included in Table 3 of Attachment 3. When site design and source control BMPs alone are inadequate to fulfill the City's storm water pollution prevention requirements for a proposed project, treatment control BMPs which are feasible for the proposed development should be incorporated into its design.

Treatment controls must be designed such that volumes and flows in excess of the design rainfall event bypass the unit, otherwise there is the possibility of aggravating flooding and also causing resuspension of previously captured sediments or other constituents. Also, all of the treatment BMPs described below require some inspection, maintenance, and disposal of solids to ensure optimum performance and often to avoid flooding.

- **Rooftop Catchment Systems** - These are rooftops which can sometimes be designed into large commercial and industrial sites to pool stormwater which, following the storm, evaporates. This effectively eliminates rooftop runoff from the storm drain system, and thereby reduces the hydraulically-connected impervious area. Another function of these systems is to slow down the runoff to reduce peaks. Problems with rooftop catchment systems are mainly related to leakage.

- **Vegetated Filter Strips** - Vegetated filter strips, buffer strips, or riparian buffer zones are strips of vegetation placed between receiving waters (e.g., along streams) and pollutant sources. The effectiveness of the strips depends primarily on the width of the strip, and the vegetation type and condition. Strips of 100-300 feet in width are often considered. Such strips have been successfully applied to urban, agricultural, and forestry situations. Vegetation type selection must take into account the climate and usually should be drought-resistant. Maintenance is primarily annual cutting. Such strips are recommended for developments located along receiving waters such as streams, rivers and lakes, but outside the flood control boundary.

- **Vegetated Swales** - Swales are shallow low gradient channels that are vegetated. They are commonly applied in rural residential areas in lieu of traditional curb/gutters and underground stormwater drainage pipes. Water quality improvement is achieved primarily through filtration, and performance is dependent on the swale hydraulic capacity and vegetation type and condition. Influent water should be relatively free of coarse sediment to avoid burying the vegetation. Where sediment loads are of concern, sediment settling basins can be provided upstream of the swales. Maintenance consists primarily of vegetation management and settling basin cleanouts. Swales are generally recommended for low-density residential developments located in relatively flat terrain.

- **Infiltration Basins** - Infiltration basins store and infiltrate stormwater into the surficial groundwater aquifer. Performance is critically dependent on soil porosity and adequate depth to groundwater. Such conditions are typical of inland valleys, in contrast to low lying coastal areas. In order to maintain recharge rates, influent water may require pretreatment to remove sediments. Infiltration basins are effective at reducing runoff rates

and volumes and can provide water supply benefits through aquifer recharge. Maintenance primarily consists of periodic removal of accumulated trash, debris and sediments to maintain recharge rates. Infiltration basins are generally recommended in areas where the depth to groundwater is relatively high and the soils are highly pervious. Where such conditions exist, this technology is generally applicable to the entire range of urban development, although the potential for groundwater contamination is often of concern in industrial areas.

- **Infiltration Trenches** - Infiltration trenches are shallow drains filled with high porosity materials (e.g. gravel). Stormwater discharged to these trenches is stored during the runoff event and infiltrates into the groundwater during dry weather periods. As with infiltration basins, performance requires porous subsoils and adequate depth to the groundwater table. The acceptability and designs of infiltration trenches must take into consideration the potential for infiltrating water to adversely affect soil strength around foundations. Infiltration trenches are generally not recommended for roof runoff near buildings because of building code requirements; but can be effective as part of the overall open channel drainage system.

- **Dry Detention Ponds/Basins** - These are basins designed to temporarily store and treat storm water prior to gradually releasing it downstream. Such basins can provide flood control and storm water treatment benefits. Treatment performance depends on storage volume (12-24 hours of residence time is considered a good rule of thumb), and good circulation (avoidance of short circuiting). A major factor limiting good performance is that, during larger storm runoff events, water entering a dry basin may resuspend previously settled material in which case the ponds may act as a source of sediment and associated chemicals. In general dry basins are not as effective as wet basins (discussed below), however, in certain arid areas, wet basins are not feasible. Performance of dry basins can be improved by incorporating slow release outlet structures. Such basins are generally applicable to residential, commercial, and industrial development in areas where there is insufficient runoff to maintain wet basins.

- **Retention Ponds/Wet Basins** - These are basins that contain a permanent pool of water. Such ponds can provide flood control, ecological, and water quality benefits. The performance of wet basins depends on the size of the basin, watershed characteristics, and influent conditions. The primary treatment process in retention ponds is settling. Maintenance is required for removing debris, vegetation management, and maintaining the inlet and outlet structures. Accumulation rates in such basins typically require that accumulated sediment be removed about once every 10-20 years. Retention ponds are generally applicable to most urban situations, as long as there is adequate space for the facility and acceptable geological conditions.

- **Constructed/Restored Wetlands** - In addition to providing flood control and water supply benefits through artificial recharge of groundwater, constructed wetlands designed for stormwater management provide water quality benefits through a number of processes including sedimentation, filtration, absorption, biological processes, and nutrient uptake. Pollutant removal performance depends on the size of the wetland

relative to the watershed, the design of the wetland, and the type and composition of wetland vegetation. Wetlands also provide additional ecological and recreational benefits. If a significant amount of sedimentation is anticipated, a deep settling basin could be constructed (which the water would enter prior to reaching the wetland). The basin would require periodic maintenance to remove accumulated sediment. Constructed wetlands require maintenance, especially in the first 5-10 years during which vegetation is growing and natural seeding is occurring. Providing suitable hydrologic conditions for vegetation growth and water treatment is key to successful performance of constructed wetlands. Constructed wetlands are generally applicable to most urban situations, as long as there is adequate space for the facility, an adequate source of water, and appropriate soils. In California, such wetlands would likely be seasonal in nature. The cost of urban lands often precludes this type of treatment in the more densely developed portions of urban areas.

A variation of this control is the use of existing wetlands for urban runoff treatment. Existing wetlands at or downstream of a new development/redevelopment project can be enhanced to improve hydrology, and runoff from the development project can be directed to the wetlands. Note that the dry detention ponds/basins, retention ponds/wet basins, and the constructed wetlands need to be periodically monitored for accumulation of toxic materials, and provisions made for cleanout and disposal pretreatment may be added (to remove heavy sediment trash and debris) to reduce maintenance. If a significant amount of sediment is anticipated, a deep settling basin could be constructed. This would also need to be periodically cleaned out to maintain capacity.

- **Filtration Systems** - Filtration systems convey stormwater through filter media (e.g., sand, compost, charcoal) to treat the storm water. The chemicals treated vary depending on the type of media and may include fine sediment, colloidal material, hydrocarbons, organics, nutrients and dissolved metals. Such systems come in many sizes and designs including: (1) inserts placed in individual storm drain inlets, (2) linear units that treat stormwater from small impervious areas such as parking lots, and (3) large 1-2 acre sand filters that treat runoff from urban catchments. Filters are effective as long as the capacity of the filter is not exceeded, and the filter is not allowed to clog. Filter inserts are particularly problematic in this regard, and recent testing and evaluation questions their applicability where material in runoff will clog or block the filter. In stormwater applications filter systems are required to remove blocking materials (leaves, trash, debris, sediments, oil and grease) and storage to better manage flowrates. Experience to date with filter type inserts for drain inlets suggest that the units are easily clogged with sediment and debris, with resultant bypassing of most of the flows. Therefore, inserts are not recommended unless require frequent inspection and cleaning is performed. Filtration systems will have limited application in small well-maintained parking lots.

- **Oil/Grit Separators** - Oil/grit (gravity) separators are usually multi-chambered treatment units that are placed underground and treat stormwater from a drainage catchment. The individual chambers often are designed to trap grit and floatables, and adsorb hydrocarbons. Flows in excess of the design capacity should be diverted around the unit, otherwise there is the possibility that sediment previously trapped in the

chambers will be resuspended and flushed downstream. Inspection and maintenance is required to ensure that the units are not filling up with sediment, as accumulation can affect performance. Traditional gravity oil/water separators that utilize skimming devices and coalescing plates (to increase droplet size and capture) are generally not applicable to stormwater conditions where total hydrocarbon concentrations are generally less than 10 mg/l. The performance of oil/grit separators varies depending on the chosen design. Research should be done before selecting any separators to verify that they will perform as desired. In general, oil/grit separators are useful only at sites where there are chances that oil spills could occur and to a limited degree at development sites that have high oil and grease loadings such as petroleum storage yards and vehicle storage facilities.

ATTACHMENT 3

BMP Implementation Tables

Source: Appendix J from Chapter 17.43 of the CMC

BMP IMPLEMENTATION TABLES

Table 1. Anticipated and Potential Pollutants Generated by Land Use Type

	General Pollutant Categories								
Priority Project Categories	**Sediments**	**Nutrients**	**Heavy Metals**	**Organic Compounds**	**Trash and Debris**	**Oxygen Demanding Substances**	**Oil and Grease**	**Bacteria and Viruses**	**Pesticides**
Detached Residential Development	X	X			X	X	X	X	X
Attached Residential Development	X	X			X	P(1)	P(2)	P	X
Commercial Development >100,000 ft.^{2}	P(1)	P(1)		P(2)	X	P(5)	X	P(3)	P(5)
Automotive Service Facilities			X	X(4)(5)	X		X		
Retail Gasoline Outlets			X	X(4)(5)	X		X		
Restaurants					X	X	X	X	
Hillside Development	X	X			X	X	X		X
Parking Lots	P(1)	P(1)	X		X	P(1)	X		P(1)
Streets, Highways and Freeways	X	P(1)	X	X(4)	X	P(5)	X		

X = anticipated
P = potential
(1) A potential pollutant if landscaping exists on-site
(2) A potential pollutant if the project includes uncovered parking areas
(3) A potential pollutant if land use involves food or animal waste products
(4) Including petroleum hydrocarbons
(5) Including solvents

Table 2. Site Design and Source Control BMP Selection Matrix									
Specific Areas for Implementation of Site Design and Source Control BMPs									
Priority Project Categories	**Driveways, Roads, and Guest Parking**	**Loading/Unloading Dock Areas**	**Repair/Maintenance Bays**	**Vehicle/Equipment Washing/Steam Cleaning Areas**	**Parking Areas**	**Fueling Areas**	**Outdoor Material Storage Areas**	**Trash Storage Areas**	**Pools and Spas**
Small Residential Development	R								R
Large Residential Development	R	R		R	R			R	R
General Commercial Development	R	R		R	R		R	R	
Automotive Service Facilities	R	R	R	R	R	R	R	R	
Retail Gasoline Outlets	R	R	R	R	R	R	R	R	
Restaurants	R	R		R	R		R	R	
R = Required – minimize pollutants of concern by selecting appropriate site design and source control BMPs									

Table 3. Treatment Control BMP Selection Matrix[1]

Pollutant of Concern	Treatment Control BMP Categories						
	Biofilters	**Detention Basins**	**Infiltration Basins[2]**	**Wet Ponds or Wetlands**	**Drainage Inserts**	**Filtration**	**Hydrodynamic Separator Systems[3]**
Sediment	M	H	H	H	L	H	M
Nutrients	L	M	M	M	L	M	L
Heavy Metals	M	M	M	H	L	H	L
Organic Compounds	U	U	U	U	L	M	L
Trash and Debris	L	H	U	U	M	H	M
Oxygen Demanding Substances	L	M	M	M	L	M	L
Bacteria	U	U	H	U	L	M	L
Oil and Grease	M	M	U	U	L	H	L
Pesticides	U	U	U	U	L	U	L

(1) The City is encouraged to periodically assess the performance characteristics of many of these BMPs to update this table.

(2) Including trenches and porous pavement

(3) Also known as hydrodynamic devices and baffle boxes

L: Low removal efficiency

M: Medium removal efficiency

H: High removal efficiency

U: Unknown removal efficiency

Sources: Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters (1993), National Stormwater Best Management Practices Database (2001), and Guide for BMP Selection in Urban Developed Areas (2001).

ATTACHMENT 4

Sample Form of Agreement for Ongoing Maintenance of Treatment Control BMPs

Source: Best Management Practices Guidance Series (BGS)

Agreement Regarding Maintenance of Treatment Control BMPs (Best Management Practices)

for APN No._____

_____, being the owner of the real property located at _____, California, consents and agrees to inspect and maintain annually, prior to September 30 of each year, the Treatment Control BMPs (such as silt and/or grease traps or detention systems) on the subject property as shown on the improvement plans dated _____, on file with the City of _____. I agree to forward a letter providing proof of inspection and maintenance to the City of _____ Public Works Department prior to October 15 of each year.

In order to transfer the property to a private or public owner, I shall require the recipient to assume responsibility for maintenance of any Treatment Control BMPs in the sales or lease agreement for that property. The condition of transfer shall include a provision that the new property owner agrees to forward a letter providing proof of BMP inspection and maintenance to the City of _____ Public Works Department prior to October 15 of each year.

Printed educational materials will be required to accompany the first deed transfer to highlight the existence of the requirement and to provide information on what storm water management facilities are present, signs that maintenance is needed, and how the necessary maintenance can be performed. The transfer of this information shall also be required with any subsequent sale of the property.

I have read the above agreement and understand it.

_____
Owner

_____
Date