

ackground / Regulatory Requirements

This Chapter summarizes stormwater problems resulting from development and explains the post-construction requirements for development projects.

2.1 Stormwater Problems in Developed Areas

Throughout the country, stormwater runoff is a leading source of pollutants entering water bodies¹. In the San Francisco Bay watershed, urban and agricultural runoff is generally considered to be the **largest source of pollutants** to aquatic systems.² Although stormwater runoff is part of the natural hydrologic cycle, human activities can alter the natural drainage patterns, introduce pollutants, and increase erosion, degrading the natural habitats.

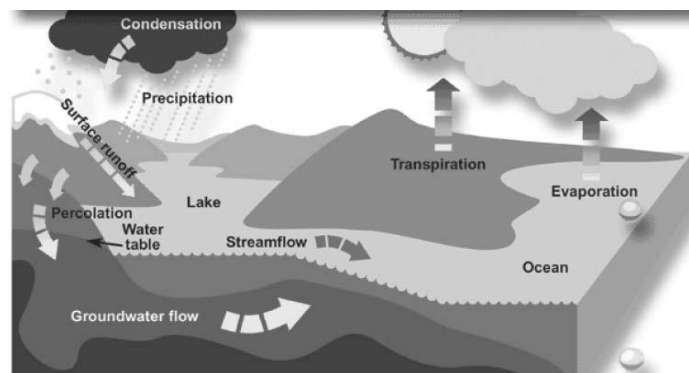


Figure 2-1. The Water Cycle

Source: NGRDC/GDNR, 2005/06

¹ See USEPA's NPDES Stormwater Program webpage, at <https://www.epa.gov/npdes/npdes-stormwater-program>

² San Francisco Bay Regional Water Quality Control Board, Basin Plan, 2004

2.1.1 Stormwater Runoff in a Natural Setting

The natural water cycle circulates the earth’s water from sky, to land, to sea, to sky in a never-ending cycle. In a pristine setting, soil is covered with a complex matrix of mulch, roots and pores that absorb rainwater. As **rainwater infiltrates slowly into the soil**, natural biologic processes remove impurities. Because most rainstorms are not large enough to fully saturate the soil, only a small percentage of annual rainwater flows over the surface as runoff. The natural vegetation tends to slow the runoff in a meandering fashion, allowing suspended particles and sediments to settle. In the natural condition, the hydrologic cycle creates a stable supply of groundwater, and surface waters are naturally cleansed of impurities. Sediment is carried with the flow of stormwater runoff, but in a natural setting, creeks typically find an equilibrium in which they manage normal sediment flows with no impairment of their vital functions.

2.1.2 Stormwater Runoff in Urban or Urbanizing Areas

In developed areas, impervious surfaces – such as roads, parking lots and rooftops – prevent water from infiltrating into the soil. **Most of the rainfall remains on the surface**, where it washes debris, dirt, vehicle fluids, chemicals, and other pollutants into the local storm drain systems. Once in the storm drain, polluted runoff flows directly into creeks and other natural bodies of water. Figure 2-2 contrasts the percentage of rainfall that becomes stormwater runoff in a natural and an urban setting.

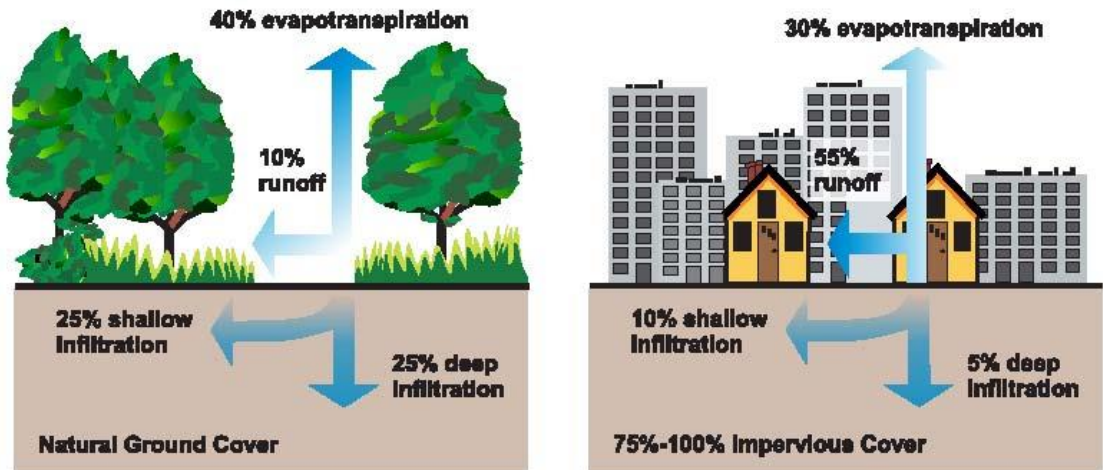


Figure 2-2. Change in Volume of Stormwater Runoff after Development.

Source: USEPA, 2003

Not only does urban stormwater runoff **wash pollutants into local waterways**, but it can also cause natural creek channels to erode. When impervious surfaces are built, rainwater runs off at **faster rates and in larger volumes** than in the natural condition. Natural creek channels must suddenly handle much greater volumes of water traveling at much faster rates, greatly increasing the duration of erosive forces on their bed and banks. In response to these changes, creek channels enlarge by eroding and may also become less stable. This effect is called hydrograph modification or hydromodification. Photos 2-1 and 2-2 contrast creek channels in the natural condition and creek channels subject to hydromodification.

2.2 Post-Construction Stormwater Controls

Various permanent control measures have been developed in order to **reduce the long-term impacts** of development on stormwater quality and creek channels. These permanent control measures are often called post-construction stormwater controls/low impact development (LID), or post construction best management practices (BMPs) to distinguish them from the temporary construction BMPs that are used to control sedimentation and erosion while a project is being constructed. LID reduces water quality impacts by preserving and re-creating natural landscape features, minimizing imperviousness, and then infiltrating, storing, detaining, evaporating, and then infiltrating, storing, detaining, evaporating (evaporating stormwater into the air directly or through plant transpiration), and/or biotreating stormwater runoff close to its source, or onsite.



Photo 2-1. : Creek Subject to Hydromodification

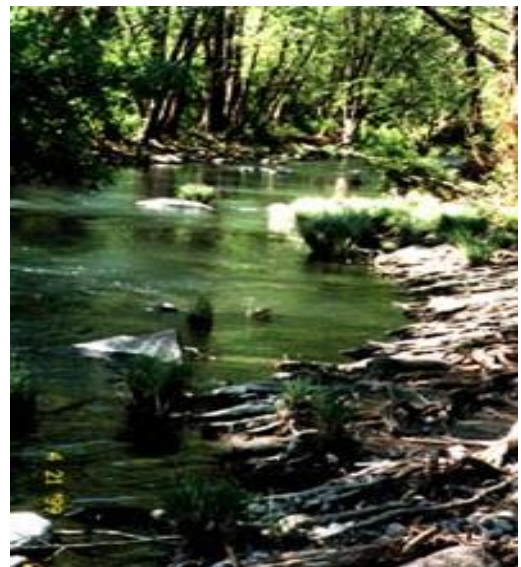


Photo 2-2. : Creek with Natural Banks

Post-construction stormwater control measures can be divided into four categories: site design measures, source control measures, stormwater treatment measures, and hydromodification management measures. Each of these categories is described below.

2.2.1 Site Design Measures

Site design measures are **site planning techniques** that help reduce stormwater pollutants and increases in the peak runoff flow and duration, by protecting existing natural resources and reducing impervious surfaces of development projects. Some examples of site design measures include:

- Minimize land disturbance and preserve high-quality open space;
- Minimize impervious surfaces by using narrow streets, driveways and sidewalks;
- Minimize impervious surfaces that are directly connected to the storm drain system (unless the connection includes a stormwater treatment measure). One example of “disconnecting” impervious surfaces is to direct roof downspouts to splash blocks or “bubble-ups” in landscaped areas;
- Cluster structures and paved surfaces; and

- Use landscaping as a drainage feature.

2.2.2 Source Control Measures

Source control measures consist of either structural project features or operational “good housekeeping” practices that **prevent pollutant discharge and runoff** at the source, and keeping pollutants from coming into contact with stormwater. Examples of structural source controls include:

- Roofed trash enclosures,
- Berms that control runoff to or runoff from a potential pollutant source, and
- Indoor mat/equipment washracks that are connected to the sanitary sewer. (Note that any sanitary sewer connections must be approved by the local permitting authority.)

Examples of operational source controls include:

- Street sweeping and
- Regular inspection and cleaning of storm drain inlets.

2.2.3 Stormwater Treatment Measures

Stormwater treatment measures are engineered systems that are designed to **remove pollutants from stormwater** using natural processes such as filtration, infiltration, flotation and sedimentation. Stormwater treatment measures must be sized to comply with one of the hydraulic design criteria listed in the municipal stormwater permit’s Provision C.3.d, which are described in Section 5.1 of this guidance document. Chapter 6 provides technical guidance specific to the following treatment measures:

- Bioretention areas,
- Flow-through planter boxes,
- Tree well filters (high flow rate tree well filters are allowed only in Special Projects - see Appendix J),
- Infiltration trenches,
- Extended detention basins,
- Pervious paving,
- Grid pavements,
- Green roofs,
- Rainwater harvesting and use, and
- Media filters (media filters are allowed only in Special Projects - see Appendix J).

The Municipal Regional Stormwater NPDES Permit’s (MRP) stormwater treatment requirements must be met by using evapotranspiration, infiltration, rainwater harvesting and reuse, or biotreatment. Media filters and high flow rate tree well filters are allowed only in Special Projects. See Section 2.3.2 for more information on stormwater treatment requirements, and Appendix J for more information on Special Projects.

2.2.4 Hydromodification Management Measures

Hydromodification management (HM) measures include site design and source control measures that promote infiltration or otherwise **minimize the change in the rate and flow of runoff**, when compared to the pre-development condition. HM measures also include

constructed facilities (such as basins, ponds, or vaults) that manage the flow rates of stormwater leaving a site, and under some conditions can also include re-engineering of at-risk channels downstream from the site. In some cases a single stormwater treatment measure may be used to meet both the treatment and HM objectives for a project. A dual-use measure of this type is sometimes called an “integrated management practice,” or IMP.

2.3 Municipal Stormwater Permit Requirements

The development or redevelopment of property represents an opportunity to incorporate post-construction controls that can reduce water quality impacts over the life of the project. Since the first countywide municipal stormwater permit was adopted in 1991, the Clean Water Program municipal agencies have required new development and redevelopment projects to incorporate post-construction stormwater site design, source control, and treatment measures in their projects to the maximum extent practicable (MEP). To meet the MEP standard, municipalities must employ stormwater control measures that are technically feasible (that is, are likely to be effective) and are not cost prohibitive.

The Municipal Regional Stormwater NPDES Permit (MRP), which was reissued by the Water Board in November 2015, includes prescriptive requirements for incorporating post-construction stormwater control/LID measures into new development and redevelopment projects. These requirements are in Provision C.3 of the MRP, which can be found at http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/stormwater/Municipal/R2-2015-0049.pdf.

2.3.1 Do the C.3 LID Requirements Affect My Project?

Provision C.3.b establishes thresholds at which new development and redevelopment projects must comply with the LID requirements in Provisions C.3.c and C.3.d, although the municipal stormwater permit also requires agencies to encourage all projects subject to local development review to include adequate source control and site design measures that minimize stormwater pollutant discharges. Regardless of a project’s need to comply with the requirements in Provision C.3, municipalities apply standard **stormwater conditions of approval** for projects that receive development permits. These conditions of approval require appropriate site design, source control measures, and, in some cases, treatment measures.

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PROVISION C.3 LID THRESHOLDS

The thresholds for determining whether a project is a Regulated Project and must comply with the LID requirements in Provisions C.3.c and C.3.d are based on the amount of impervious surface that is created and/or replaced by the project, as described below.

- Since August 15, 2006, private or public projects that create and/or replace **10,000 square feet or more** of impervious surface are Regulated Projects under Provision C.3.b.
- Since December 1, 2011, the following special land use project categories that create and/or replace **5,000 square feet or more** of impervious surface are Regulated Projects

under Provision C.3.b: uncovered parking areas (stand-alone or part of another use), restaurants, auto service facilities¹ and retail gasoline outlets.

Projects that meet or exceed the two thresholds described above are known as Regulated Projects and must comply with the LID requirements described in Provisions C.3.c and C.3.d.

GRANDFATHERED PROJECTS

All projects that meet the descriptions of Regulated Projects in Provision C.3.b are required to implement LID source control, site design, and stormwater treatment requirements as described in Provisions C.3.c and C.3.d of the MRP. However, Provision C.3.b provides for grandfathering of projects that were approved under a previous municipal stormwater permit, have not yet been constructed, and meet specific criteria described as follows:

- Any Regulated Project that has been approved with stormwater treatment measures in compliance with Provision C.3.d (numeric sizing criteria) under a previous municipal stormwater permit is exempt from the requirements of Provision C.3.c. (low impact development requirements).
- Any Regulated Project that was approved with no Provision C.3 stormwater treatment requirements under a previous municipal stormwater permit and that has not begun construction by the January 1, 2016, is required to fully comply with the requirements of the Provisions C.3.c (LID) and C.3.d (numeric sizing criteria). The local agencies may grant exemptions from this requirement as follows:

(a) An exemption may be granted to:

- (i) Any Regulated Project that was previously approved with a vesting tentative map that confers a vested right to proceed with development in substantial compliance with the ordinance, policies, and standards in effect at the time the vesting tentative map was approved or conditionally approved, as allowed by State law.
- (ii) Any Regulated Project for which the local agency has no legal authority to require changes to previously granted approvals, such as projects that have been granted building permits.

(b) This exemption from the LID requirements of Provision C.3.c. may be granted to any Regulated Project as long as stormwater treatment with media filters is provided that comply with the hydraulic sizing requirements of Provision C.3.d.

OTHER EXCLUSIONS FROM PROVISION C.3

Provision C.3.b of the MRP excludes specific types of development and redevelopment projects from Provision C.3.c LID requirements for stormwater treatment, source controls and site design measures, even if the thresholds described above are met or exceeded. The list of excluded project types is shown in Table 2-1, below.

¹ Auto service facilities include the specific Standard Industrial Classification Codes, as follows:
5013: Wholesale distribution of motor vehicle supplies, accessories, tools, equipment, and parts.
5014: Wholesale distribution of tires and tubes for passenger and commercial vehicles.
7532: Repair of automotive tops, bodies, and interiors, or automotive painting and refinishing.
7533: Installation, repair, or sale and installation of automotive exhaust systems.
7534: Repairing and retreading automotive tires.
7536: Installation, repair, or sales and installation of automotive glass.
7537: Installation, repair, or sales and installation of automotive transmissions.

Table 2-1. Projects Excluded from Provision C.3 Numerically Sized Treatment Requirements	
	Excluded Projects
Residential projects	<ul style="list-style-type: none"> ▪ Detached single-family home projects that are not part of a larger plan of development⁴.
Road projects	<ul style="list-style-type: none"> ▪ Roadway reconstruction that does not add one or more new lanes of travel (turn lanes are considered lanes of travel); ▪ Widening of roadways that does not add one or more new lanes of travel; ▪ Impervious trails with a width of 10 feet or less and located more than 50 feet from top of creek banks. ▪ Sidewalk projects in the public right of way that are not built as part of new streets or roads; ▪ Bicycle lane projects in the public right of way that are not built as part of new streets or roads.⁵ ▪ Sidewalks built as part of new streets or roads that are constructed to drain to adjacent vegetated areas; ▪ Bicycle lanes built as part of new streets or roads that are not hydraulically connected to the new streets or roads, and that are constructed to direct stormwater runoff to adjacent vegetated areas; ▪ Impervious trails built to direct stormwater runoff to adjacent vegetated areas or other non-erodible pervious areas, preferably away from creeks or toward the outboard side of levees; ▪ Sidewalks, bicycle lanes or trails built with permeable surfaces; ▪ Caltrans highway projects and associated facilities (Caltrans must comply with its own NPDES stormwater permit.).

⁴ Detached single-family home projects that are not part of a larger plan of development and that create and/or replace 2,500 square feet or more of impervious surface are required to implement site design measures specified in Provision C.3.i.

⁵ If an existing road is widened to add a traffic lane in addition to a new bicycle lane, and the bike lane is not hydraulically separated from the road, treatment of runoff from the bike lane would be required.

Table 2-1. Projects Excluded from Provision C.3 Numerically Sized Treatment Requirements	
	Excluded Projects
Redevelopment projects (including pavement resurfacing)	Interior remodels and routine maintenance or repair, including: <ul style="list-style-type: none"> ▪ Roof replacement. This exclusion applies to all roof replacement projects, including those that remove the entire roof. ▪ Exterior wall surface replacement; ▪ Pavement resurfacing within the existing footprint. This exclusion applies to any routine maintenance of paved surfaces within the existing footprint, including the repaving that occurs after conducting utility work under the pavement, and the routine reconstruction of pavement, which may include removal and replacement of the subbase. If a repaving project results in changes to the footprint, grade, layout or configuration of the paved surfaces⁶, it would trigger the requirements of Provision C.3. The pavement resurfacing exclusion also applies to the reconstruction of existing roads and trails. ▪ Similar types of routine maintenance or repairs

CONSTRUCTION OF IMPERVIOUS SURFACE OVER EXISTING PAVEMENT

In some cases, the construction of impervious surface over existing impervious surface may be considered a C.3 Regulated Project; in some cases it would not. Please see the following examples:

- The construction of a highway overpass that creates 10,000 square feet or more of impervious surface over an existing roadway or rail line would be subject to Provision C.3, since stormwater runoff from the new overpass would be collected and discharged to the storm drain system.
- A parking garage that is constructed over an existing parking lot would be subject to Provision C.3. Although this would not change the use (parking), it would intensify the use.
- The construction of a roof over existing parking spaces would NOT be considered a C.3 Regulated Project, unless the project would change the footprint, grade, layout or configuration of the parking lot surface.

CONSTRUCTION OF IMPERVIOUS SURFACE OVER EXISTING PERVIOUS AREA

Installation of a raised deck is not covered by C.3, unless the deck has a water-tight surface. Installation of awnings and solar panels over a pervious area are excluded from C.3, since they do not provide water-tight covering of land.

ROAD PROJECTS

Please note the following specific requirements for road projects.

- The construction of a new street or road (including sidewalks and bicycle lanes built as part of new streets or roads) that creates 10,000 square feet or more of **newly**

⁶ A change of grade of the paved surface would involve the regrading of the paved area. For example, the existing pavement may be removed, and the underlying soil may be regraded to increase or decrease the grade of the subject area before repaving. A change of layout or configuration of the paved surface would involve changing the overall shape of the paved area and/or connections between paved areas; for example, a driveway may be reconfigured to modify the turning radius from the adjacent street.

constructed, contiguous impervious surface is subject to the requirements of Provision C.3.

- Impervious trails 10 feet wide or more that are constructed within 50 feet of the top of a creekbank are also considered roadway projects, as are roadway projects that widen existing roads with one or more additional traffic lanes.
- Projects that widen existing roads with additional travel lanes are subject to the “**50 Percent Rule**” for stormwater treatment (see the C.3 requirements for redevelopment projects, below). Road projects excluded from Provision C.3 are listed in Table 2-1.

2.3.2 What is Required by Provisions C.3.c and C.3.d?

Except for the excluded projects listed in Table 2-1, projects that create and/or replace **10,000 square feet or more** of impervious surface (“Regulated Projects”) must incorporate the stormwater controls listed below. Projects that consist of restaurants, auto service facilities, retail gasoline outlets, and surface parking areas (stand-alone or part of another use) that create and/or replace **5,000 square feet or more** of impervious surface (“Regulated Special Land Use Projects”) must also implement the stormwater controls listed below.

- Site design measures,
- Source control measures, and
- Low impact development (LID) treatment measures that are hydraulically sized as specified by Provision C.3.d. LID treatment is defined as **evapotranspiration, infiltration, rainwater harvesting and reuse, or biotreatment**. In some limited cases, LID treatment reduction is allowed for certain smart growth, high density or transit-oriented development Special Projects, described below.

Biotreatment systems are landscape-based treatment measures that filter water through soils that are engineered to have a long-term infiltration rate of 5 to 10 inches per hour, in accordance with the soil specifications approved by the Regional Water Board in Appendix K. Biotreatment systems must have a surface area no smaller than what is required to accommodate a 5 inches per hour stormwater runoff surface loading rate. Biotreatment systems generally include an underdrain in a rock layer below the engineered soil, and are used in locations where the saturated hydraulic conductivity (KSAT) rate of native soil is too low to infiltrate the full amount of runoff specified in Provision C.3.d. Except in locations where infiltration is precluded, the underdrain should be in the upper portion of the rock layer, in order to maximize infiltration.

LID treatment requirements are reduced for certain smart growth, high density, or transit-oriented development **Special Projects**. LID treatment reductions are provided in terms of a percentage of the total C.3.d amount of runoff that requires treatment. The percentage that is not treated with LID must be treated with either a high flow rate tree well filter, or a high flow rate media filter. Guidance for identifying Special Projects, calculating the percentage of LID treatment reduction, and preparing a narrative discussion that establishes the infeasibility of 100 percent LID treatment are provided in Appendix J.

HYDROMODIFICATION MANAGEMENT REQUIREMENTS

Projects that create and/or replace **one acre or more** of impervious surface and increase impervious surface area over the pre-project condition need to incorporate hydromodification management measures, if the project is located in an area susceptible to hydromodification. See Chapter 7 for more information.

REDEVELOPMENT PROJECTS

If your project is located on a previously developed site and will result in the **replacement of impervious surface**, then it is considered a redevelopment project and the following special provisions apply to it:

- **“50 Percent Rule:”** Projects that replace 50 percent or less of existing impervious surface need to treat stormwater runoff only from the portion of the site that is redeveloped. Projects that replace more than 50 percent of the existing impervious surface are required to treat runoff from the entire site.
- A redevelopment project that does not increase the amount of impervious surface over the pre-project condition is exempt from the hydromodification management (HM) requirements.

ALTERNATIVE COMPLIANCE

The MRP allows projects to use “alternative compliance,” to meet stormwater treatment requirements offsite. See Chapter 9 for more information.

HOW DO PROJECTS MEET THE C.3 REQUIREMENTS?

Your permit application submittals must include detailed information showing how the Provision C.3 stormwater requirements will be met. Chapter 3 provides step-by-step instructions for incorporating C.3 stormwater submittals into your permit application.

2.3.3 Site Design Requirements for Small Projects

Specific sizes and types of small projects must meet site design requirements in Provision C.3.i of the Municipal Regional Stormwater NPDES Permit (MRP). This applies to:

- Projects that create and/or replace at least 2,500 but less than 10,000 square feet of impervious surface⁷; and
- Individual single family home projects that create and/or replace 2,500 square feet or more of impervious surface.

Applicable projects must implement at least one of the following site design measures:

- Direct roof runoff into cisterns or rain barrels for use.
- Direct roof runoff onto vegetated areas.
- Direct runoff from sidewalks, walkways, and/or patios onto vegetated areas.
- Direct runoff from driveways and/or uncovered parking lots onto vegetated areas.
- Construct sidewalks, walkways, and/or patios with permeable surfaces.
- Construct bike lanes, driveways, and/or uncovered parking lots with permeable surfaces.

⁷ The threshold at which Special Land Use Projects are considered C.3 Regulated Projects is 5,000 square feet of impervious surface. For these projects, the implementation of LID site design and stormwater treatment systems per Provision C.3.b of the MRP will also satisfy the requirements of Provision C.3.i.

C.3 STORMWATER TECHNICAL GUIDANCE

The requirements apply to your project if it meets the size thresholds described above, and it received final discretionary approval on or after December 1, 2012. If your project does not require discretionary approval, such as tract map approval, conditional use permit, or design review, then the requirements apply if the building permit was issued on or after December 1, 2012.

Appendix L provides guidance to assist in selecting and implementing appropriate site design measures for small projects. Included in Appendix L are four fact sheets that provide detailed information for implementing the six site design measures listed above.

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