Ch 1: Introduction

1.1 Purpose of this Handbook

The purpose of this handbook is to provide guidance and direction on how to comply with post-construction stormwater requirements within San Luis Obispo County. This handbook is intended for the use by developers, contractors, builders, designers, engineers, architects, planners, homeowners, and all others interested in learning how to address stormwater quality during the planning, design, and maintenance phases of a project.

Project applicants should use this handbook to:

- Determine which performance requirement apply
- Understand how each performance requirement will be applied within the County
- Obtain direction regarding means of demonstrating compliance

1.2 How to Use this Handbook

This handbook is a supplement to current County land use and development permit policies. It is meant to be used as a design aid for both the onsite and public improvement portions of projects; however, all improvements within the public right-of-way must be consistent with County Public Improvement Standards. Requests for adjustments to Design Standards, Standard Specifications or Standard Drawings for public improvements must follow the process identified in Section 1.2 "Design Adjustments" of the Public Improvement Standards. This process is also referenced in Land Use Ordinance Section 22.52.150B.1 and Coastal Zone Land Use Ordinance Section 23.05.048.b(1).

Overview

- **Chapter 2** gives the background and regulatory requirements for post-construction stormwater management.
- **Chapter 3** gives the steps for how to complete a successful project permit application.
- **Chapter 4** provides guidance for optimizing site design to minimize stormwater impacts using Low Impact Development techniques.
- **Chapter 5** provides additional measures which can be taken to reduce runoff volumes and rates. Chapter 5 also includes implementation detail regarding mandatory site design measures.

The appendices provide permit coverage area reference maps, checklists and forms, and support for calculations. A glossary is also provided.

Since LID and bio-retention designs are highly site-specific, only broad considerations can be provided in this handbook. References are provided to assist designers find detailed information for finalizing designs.

Ch 2: Background & Regulatory Requirements

2.1 The Impact of Development on Water Resources

Undeveloped natural landscape areas such as forests and grasslands act like sponges for rainfall. When natural landscape areas are covered with impervious (nonporous) surfaces like roads, parking lots, and roofs, this "sponge-like" function is lost and the amount of rainfall that can be absorbed is dramatically reduced. As shown in Figure 2-1, the percentage of impervious surface area of a site influences how much stormwater is infiltrated into the ground, evapotranspirated back into the atmosphere, or leaves the site as stormwater runoff.

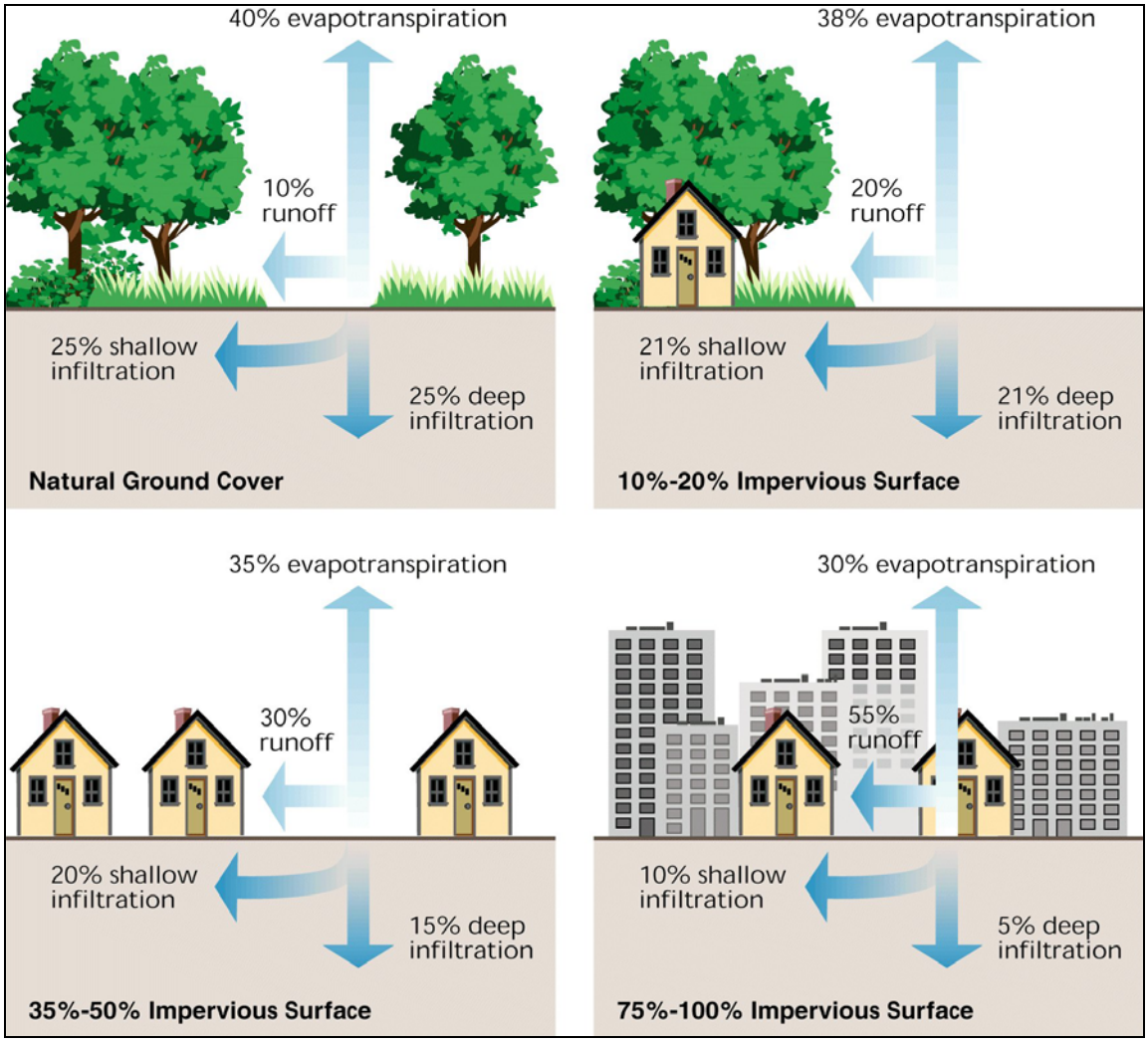

Figure 2-1 Relationship between impervious surface area, surface runoff, infiltration and evapotranspiration
(Source: Stream Corridor Restoration: Principles, Processes, & Practices, FISWG 1998)

Increasing the amount of impervious surface area of a site can interrupt normal watershed processes and lead to a host of problems in surface waters including:

- Increased loads of chemical pollutants;
- Increased toxicity;
- Changes to flow magnitude, frequency, and seasonality of various discharges;
- Physical changes to stream, lake, or wetland habitats
- Changes in the energy dynamics of food webs, sunlight, and temperature
- Changes in biotic interactions between native and exotic species

Additionally, urbanization can alter the amount and quality of stormwater that infiltrates and recharges groundwater aquifers.

Development projects can also impact neighboring properties. Traditional stormwater management practices emphasize conveyance; that is, using street gutters, curbs, pipes and canals to remove water from the developed areas as quickly as possible and engineered flood control measures such as dams, dikes, levees, and detention facilities to offset the impact of development. This transfers the immediate problems downstream by increasing the amount of runoff leaving sites. The compound effect of increased impervious surface area with more efficient collection and conveyance systems is an increase in downstream flooding and erosion.

Figure 2-2 Bank scour along San Luis Obispo Creek
(Source: USFWS)

When runoff leaves a storm drain network and empties into a creek, the excessive volume and energy can scour creek banks, damaging streamside vegetation and harming aquatic habitat. Runoff that travels over impervious surfaces often picks up pollutants that accumulated on that surface as a result of everyday activities such as driving, maintaining vehicles and lawns, disposing of waste, washing cars and even walking pets. Polluted runoff may contain nutrients, pathogens, hydrocarbons, toxic organics, sediments, metals, trash, and debris. Increased creek and lake temperatures may result as the runoff picks up heat from paved surfaces. Pollutants and warmer water are carried to the storm drain system and are discharged directly to lakes, streams, and the ocean where pollutants can accumulate and degrade water quality and aquatic habitat for fish and wildlife.

The loss of infiltration from urbanization has also resulted in profound groundwater changes. As more surface area becomes covered with impervious surfaces, less water is able to seep back into the ground. Reduced groundwater recharge rates may result in lower base flows during dry weather as less groundwater is available to move through the soil and into stream channels and aquifers.

To protect surface water quality and groundwater resources, new development and significant redevelopment projects should be designed, constructed, and maintained to minimize the interruption of natural watershed processes and to treat storm water as a resource and an asset, instead of a waste product.

2.2 Local Environmental and Economic Impacts

Polluted stormwater has measurable negative environmental and economic impacts, including increased flooding and public health concerns, harm to aquatic life, (including coastal shellfisheries), aesthetic impacts, impacts to tourism and recreation, and harm to community water supplies.

Flooding

According to the County Local Hazard Mitigation Plan[1] San Luis Obispo County has experienced severe flooding events that have resulted in loss of life and extensive property damage. Flooding can also inundate sewage treatment plants, prevent the safe passage of people and commodities, contaminate water supplies, damage agricultural resources, and result in accelerated rates of erosion.

Public Health

Stormwater can transport disease-causing bacteria, viruses, and protozoa. The County of San Luis Obispo Environmental Health Division consistently monitored 20 beach locations in 2007. Twenty percent of the samples taken during wet weather years received a grade of 'C' or 'D' according to the Heal the Bay Foundation. This grade indicates the presence of total coliforms, fecal coliforms, enterococcus and fecal ratios observed in the overall number of samples taken. A complete listing of San Luis Obispo County health advisories is available on Heal the Bay's website[2].

Harm to Aquatic Life

Urban runoff can harm aquatic life in many ways due to changes in water chemistry and habitat loss, including:

Nitrogen and Phosphorous promote toxic and non-toxic alga blooms that harm aquatic life by depleting the amount of oxygen in the water and by

The percentages on the map show how many samples exceeded the bacteria levels established for safe shellfish harvesting. This figure shows the approximate locations of established shellfish harvesting parcels. Harvesting is not currently allowed in portions of two parcels (shown in red on the map) due to elevated bacteria levels. The California Department of Health Services continues to monitor the areas surrounding the closed harvesting parcels to track the bacteria trends over time. The hope is that these parcels will eventually have clean enough water quality to resume shellfish operations. In the three active parcels (shown in green), growers are allowed to harvest shellfish during times of adequate water quality.

Figure 2-3 Excerpts from MBEP
(Source: http://www.mbnep.org/publications/)

[1] www.slocountyoes.com/lhmp_bos.pdf
[2] http://www.healthebay.org/brc/annual/2007/counties/slo/analysis.asp

decreasing light penetration for photosynthetic organisms. These pollutants also promote unwanted weeds.

Parking lots and roads can have an accumulation of **oil and grease.** The oil and grease forms a film over water which spreads and makes oxygen transfer difficult and is toxic to aquatic animals and plants.

Metals such as lead, copper, cadmium, zinc, mercury, chromium, selenium and nickel are toxic to fish and other forms of aquatic life and can cause genetic defects.

Organics may lead to human and animal reproductive abnormalities.

Sediment can reduce the suitability of creeks for spawning beds, decrease the light available for photosynthetic organisms and increase the transport of heavy metals and nutrients that adhere to the sediment particles.

Non-sediment solids, such as small plastic particles. Small plastic particles are ubiquitous in the surface layer of the ocean off the coast of California[3]. The degrading plastic pieces can look like food to wildlife. While further research is needed to know the consequences of these particles as they advance through the food chain, preliminary concerns include bio-accumulation of toxins and adverse impacts to endocrine systems.

Figure 2-4 Plastic particles removed from gut of Pacific Ocean fish
(Source: Drew Wheeler, Algalita Marine Research Foundation)

Plastics are also the most common type of debris found on the seafloor in both central and southern California[4].

Pathogens in stormwater also contaminate shellfish beds. Contaminated stormwater, along with pollution from other sources, have caused the closure of shellfish beds. According to the Morro Bay Estuary Program publication, "Estuary Tidings: A Report on the Health of the Morro Bay Estuary," two of the three harvesting parcels in Morro Bay have been partially closed to shellfish harvesting by the California Department of Health Services (DHS). DHS is responsible for ensuring that harvested shellfish are safe. DHS has concluded that bay waters are clean enough to support commercial shellfish operations in portions of the three parcels but require mandatory closures immediately following rainfall events due to high bacteria levels.

A key contributing factor is that levels of bacteria and viruses are usually 100 to 1,000 times greater in the bottom sediment, where shellfish live, than in the water above.

[3] Doyle, Miriam J.; Watson, William; Bowlin, Noelle M.; Sheavly, Seba B. Plastic particles in coastal pelagic ecosystems of the Northeast Pacific ocean. *Mar. Environ. Res*. **2011**, 71 (1): 41-52.
[4] Watters, Diana L.; Yoklavich, Mary M.; Love, Milton; Schroeder, Donna M. Assessing marine debris in deep seafloor habitats off California. *Bull. Mar. Sci*. **2010**, 60: 131-138.

Trash in stormwater harms wildlife. The plastic loops that hold six-packs of beer or soda together can strangle gulls and plastic bags cause the death of marine animals through ingestion or entanglement.

Aesthetic Impacts

The beauty of San Luis Obispo County's coastlines is world renowned. The presence of cigarette butts, polystyrene cups, and other trash that storm sewers dump into the streams, lakes and the ocean creates an unwelcome eyesore. Sediment loads in these waters reduce water clarity.

Impacts to Tourism and Recreation

Potential human illness and aesthetic losses result in more than unpleasantness. Coastal and recreational tourism are major components of the local economy. On a typical weekend, many visitors look to the Central Coast as a getaway destination. If the degradation of the water bodies that accept contaminated stormwater is allowed to continue, these locations will be less attractive for visitors and may deter people from making San Luis Obispo County a vacation or travel destination.

Harm to Community Water Supplies

Many groundwater basins within San Luis Obispo County are at or near overdraft. Excessive water withdrawals from our inland and coastal streams and basins will have potentially significant environmental impacts, including impacts to riparian habitats and altering of stream flows potentially affecting anadromous fish.

2.3 Stormwater NPDES Regulatory Requirements

To address the impacts of development on water quality, the National Pollutant Discharge Elimination System (NPDES) Small Municipal Separate Storm Sewer System (MS4) General Permit requires the County to develop and implement a Guidance Document that includes specific Best Management Practices (BMPs), measurable goals, and timetables for implementation in the following eleven program elements:

1. Program Management

   The County must have legal authority to control pollutant discharges into, and from within, the County's permit boundaries. This element also includes development of a Enforcement Response Plan to address repeat and continuing violations by implement a progressively stricter response as needed to achieve compliance.

2. Education and Outreach

   The County must educate the public, construction site operators and its staff, about the importance of their role in controlling pollutant discharges into, and from within, the County's permit boundaries.

3. Public Involvement and Participation

   The County must develop a strategy to get the community involved in development and implementation activities related to this permit. This element seeks to encourage volunteerism, public comment and input on policy, and activities in the community.

4. Illicit Discharge Detection and Elimination

The County must monitor outfalls and enforce ordinances or take equivalent measures to prohibit illicit discharges. The County must also implement a program to detect and eliminate illicit discharges.

5. Construction Site Stormwater Runoff Control

   The County must develop a program to identify, monitor and control the discharge of pollutants from construction sites within its permitted jurisdiction. The program must include review of construction plans, inspections of construction sites and enforcement actions against violators.

6. Pollution Prevention/Good Housekeeping for Municipal Operations

   The County must examine its own activities and develop a program to prevent the discharge of pollutants from these activities. The County must identify facilities that have a high potential to generate storm water and non-storm water pollutants. These potential hot-spot sites require additional monitoring.

   Additionally, the County must develop a process for incorporating water quality and habitat enhancement into new and rehabilitated flood management projects; and to reduce the amount of water, pesticides and fertilizers used in municipal operations.

7. Post-Construction Stormwater Management for New Development and Redevelopment

   The County must address storm water runoff from development and redevelopment projects through post-construction stormwater requirements based on a watershed-process approach developed and approved by the Central Coast Water Board, per Water Board Resolution R3-2013-0032.

   This handbook addresses the Post-Construction Stormwater Management aspect of the Program. For this program element, the County is required to develop procedures and update regulations as necessary to implement Central Coast Water Board Resolution R3-2013-0032. Central Coast Water Board Resolution R3-2013-0032 requires the County to:

   - Control urban runoff pollution by requiring a combination of onsite source control and LID BMPs augmented with treatment control BMPs before the runoff enters the MS4.

   - Provide long-term operation and maintenance of structural flow/volume control and treatment BMPs.

8. Water Quality Monitoring

   The County must conduct monitoring of discharges of water bodies with established Total Maximum Daily Loads (TMDL) and/or listing as a 303(d) impaired water body. Section *303(d) listed water bodies are those designated by the State as water bodies that do not meet water quality standards and are not supporting their beneficial uses.*

9. Program Effectiveness Assessment

   The County must examine its plan to obtain compliance with the General Permit and implement adaptive management strategies to reduce pollutants of concern, achieve the Maximum Extent Practicable (MEP) standard, and protect water quality. The County will document its approach to evaluating the effectiveness of prioritized BMPs

and the program implementation as a whole. The County is expected to continuously improve on the program based on the information gathered in the previous years.

10. Total Maximum Daily Loads Compliance Requirements

    The County must comply with all applicable Total Maximum Daily Loads (TMDLS) in its permit boundary that have an assigned Waste Load Allocation. TMDL designated water bodies in the County include Chorro Creek, Diary Creek, Las Tablas Creek, Los Osos Creek, etc. A complete listing of TMDL in the County can be obtained at:

    http://www.waterboards.ca.gov/centralcoast/water_issues/programs/tmdl/303d_and_tmdl_projects.shtml

11. Annual Reporting Program

    The County must submit a summary of the past year activities for each program element and certify compliance with all requirements of the General Permit.

2.4 Post Construction Requirements

The Central Coast Regional Water Quality Control Board recognizes that it is necessary to protect watershed processes so that beneficial uses of receiving waters are maintained and, were applicable, restored. The Central Coast Water Board secured funds from the State Water Quality Control Board's Cleanup and Abatement Account to support acquisition and assessment of local information that would create a methodology for development of appropriate post-construction requirements. Three types of post-construction requirements were developed: Performance, Alternative Compliance, Operation and Maintenance Plans, and Reporting Requirements.

The requirements are intended to support:

1. Utilization of Low Impact Development strategies to the extent feasible
2. Applicant-provided Stormwater Control Plans to demonstrate compliance
3. Implementation of retention and peak flow management techniques, where appropriate
4. Requirements commensurate with project size

Regulated projects may be required to meet some or all of these requirements. More detail regarding each of these requirements, as well as information regarding the specific steps that are required to identify which, if any, of the requirements will be required for your project, is provided in subsequent chapters.

Performance Requirements

The five Post-Construction Requirements (PCRs) developed from that effort are summarized below.

1. **Performance Requirement 1: Site Design and Runoff Reduction**

   All regulated projects are subject to PR 1 and must minimally incorporate the following Low Impact Development (LID) design strategies into the project:

   i) Limit disturbance of creeks and natural drainage features

   ii) Minimize compaction of highly permeable soils

iii) Limit clearing and grading of native vegetation at the site to the minimum area needed to build the project, allow access, and provide fire protection

iv) Minimize impervious surfaces by concentrating improvements on the least-sensitive portions of the site, while leaving the remaining land in a natural undisturbed state

v) Minimize stormwater runoff by implementing one or more of the following site design measures:

(1) Direct roof runoff into cisterns or rain barrels for reuse

(2) Direct roof runoff onto vegetated areas safely away from building foundations and footings, consistent with California building code

(3) Direct runoff from sidewalks, walkways, and/or patios onto vegetated areas safely away from building foundations and footings, consistent with California building code

(4) Direct runoff from driveways and/or uncovered parking lots onto vegetated areas safely away from building foundations and footings, consistent with California building code

(5) Construct bike lanes, driveways, uncovered parking lots, sidewalks, walkways, and patios with permeable surfaces

2. Performance Requirement 2: Water Quality Treatment

Regulated projects subject to PR2 must treat a defined minimum volume or maximum surface loading rate of runoff using onsite measures. Allowable onsite measures are listed in the order of preference (highest to lowest):

i) Low Impact Development

ii) Biofiltration Treatment Systems

iii) Non-Retention Based Treatment Systems

3. Performance Requirement 3: Runoff Retention

Regulated projects subject to PR3 must retain a designated design storm volume. Applicants of regulated projects subject to this requirement must:

i) Submit a Site Assessment Map that documents the development site's opportunities and constraints to implement LID Stormwater Control Measures.

ii) Submit a Stormwater Control Plan that supports a decentralized approach to stormwater management

4. Performance Requirement 4: Peak Management

Regulated projects subject to PR 4 must ensure that post-development peak flows, discharged from the site, do not exceed pre-project peak flows for the 2- through 10-year storm events.

5. Performance Requirement 5:Special Circumstances

Regulated projects subject to PR 5 may be exempt from Runoff Retention (PR3) and/or Peak Management (PR 4) performance requirements if those performance requirements would be ineffective to maintain or restore beneficial uses of receiving waters.

Alternative Compliance

Regulated projects unable to achieve some or all of the Performance Requirements determined to be applicable to their project on-site, must satisfy requirements using an alternative approach at another site within the same watershed as the regulated project.

Operational and Maintenance Plans

Operational and Maintenance Plans and Maintenance Agreements are required for projects that utilize structural Water Quality Treatment, Runoff Retention, and/or Peak Management controls on private and public Regulated Projects.

Reporting

The resolution requires two types of reporting.

1. Project applicant reporting to the County

   Applicants of regulated projects subject to Performance Requirement (PR 3) are required to demonstrate compliance with a Stormwater Control Plan. Additional supporting information is required if the project is subject to additional Performance Requirements.

2. County Reporting to the Water Board

   The County is required to report on all aspects of the Resolution, including quantification of the number of projects subject to each performance requirement, and providing supporting rationale for any projects granted approval for a deviation from the prescribed requirements.

2.5 Process Based Stormwater Management Strategies

The italicized text in this section is extracted directly from Attachment 2 of Resolution No. R3-2013-0032.

These Post-Construction Requirements shift from the historic, symptomatic approach to stormwater management and hydromodification control to an approach focusing on the protection of key watershed processes. Instead of identifying a problematic outcome of urban development (e.g., "eroding stream channels") and requiring a targeted 'fix' to the 'problem' (e.g., "armor the bank"), these Post-Construction Requirements target the root causes of changes to receiving waters—namely, aspects of development projects that disrupt the watershed processes that sustain the health and function of these waterbodies.

Furthermore, these Post-Construction Requirements reflect the geographic diversity of the Central Coast by stratifying the region into Watershed Management Zones allowing management to focus on watershed processes where they are known to occur. Management strategies, therefore, must focus on the key watershed processes of each Watershed Management Zone. The result is a process-based stormwater management approach.

To support process-based stormwater management, broad sets of management strategies can be assigned that target the protection of watershed processes in various settings, and for which numeric performance requirements are provided. Although there is no formally accepted "list" of such strategies, the following set offers a useful organizational framework:

1) Flow Control

Flow Control encompasses a broad range of stormwater criteria for addressing hydraulic and hydrologic goals. This includes regulations that typically mandate that (1) post-development peak flows are less than or equal to pre-development peak flows for a series of intermediate and/or large design storm events (i.e., "storm event peak flow" control); (2) runoff from flows with the highest risk potential for channel erosion, and by extension damage to aquatic habitat, are not increased in duration ("flow-duration control"); and (3) runoff is infiltrated or retained onsite, without specific reference to the range of stream-channel flows that are affected, to maintain groundwater flow or reduce overall runoff volume ("retain volume").

2) Water Quality Treatment

Water Quality Treatment includes a suite of Stormwater Control Measures (SCMs) that address the major link between urbanization and water quality impairment, which is caused by the increased runoff from impervious surfaces and soil compaction of pervious areas, and the delivery of urban sources of pollutants such as nutrients from fertilizer, metals from brake pads, and sediment from exposed soil surfaces.

3) Preserve Delivery of Sediment and Organics

Preserve Delivery of Sediment and Organics into the channel network is critical for the maintenance of various habitat features and aquatic ecosystems in the fluvial setting. While preservation of these functions is not a goal found in most stormwater regulations, it is often discussed qualitatively as a goal in establishing or justifying riparian buffer requirements.

4) Maintain Soil and Vegetation Regime

Maintain Soil and Vegetation Regime is a valuable and highly effective alternative to water quality treatment, because much impairment is due to the isolation of soil and vegetation from the path of urban stormwater runoff, which in turn eliminates the processes of filtration, adsorption, biological uptake, oxidation, and microbial breakdown (collectively termed the watershed process of "Chemical and Biological Transformations" by the Joint Effort). Note that this management strategy overlaps with several others: not only can it accomplish water-quality treatment, but also it can constitute stormwater volume-based flow control and preserve the delivery of sediment and organics to waterbodies if located adjacent to waterbodies. Moreover, it is a (typically intentional) byproduct of any application of land-preservation strategies as well.

5) Land Preservation

Land Preservation includes open space requirements and minimization of effective impervious area. Both have the goal of avoiding or directing runoff from impervious surfaces to pervious areas, rather than routing it directly to the storm drainage system.

Land Use Ordinance Section 22.52.110 and Coastal Zone Land Use Ordinance Section 23.05.040 et seq. require that the control of drainage and drainage facilities minimize harmful effects of stormwater runoff and resulting inundation and erosion on proposed projects, and protect neighboring and downstream properties from drainage problems resulting from new development. Where conflicts exist between the ordinances and the thresholds provided herein, the ordinances shall control.