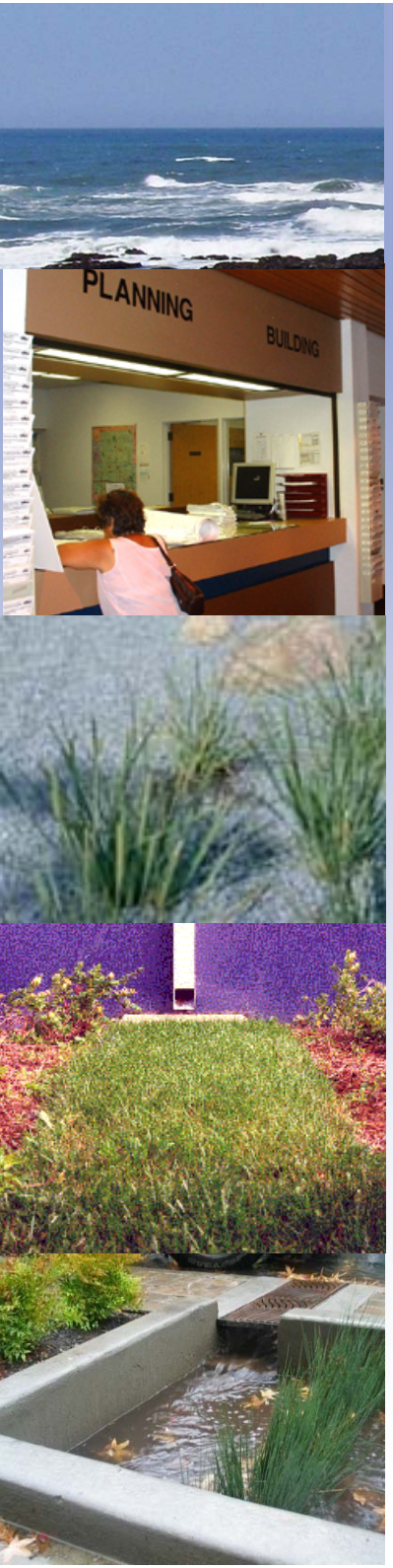


Basic Training:

Permanent Stormwater Controls for Development Projects

Laura Prickett, EOA, Inc.

- October 6, 2011

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program

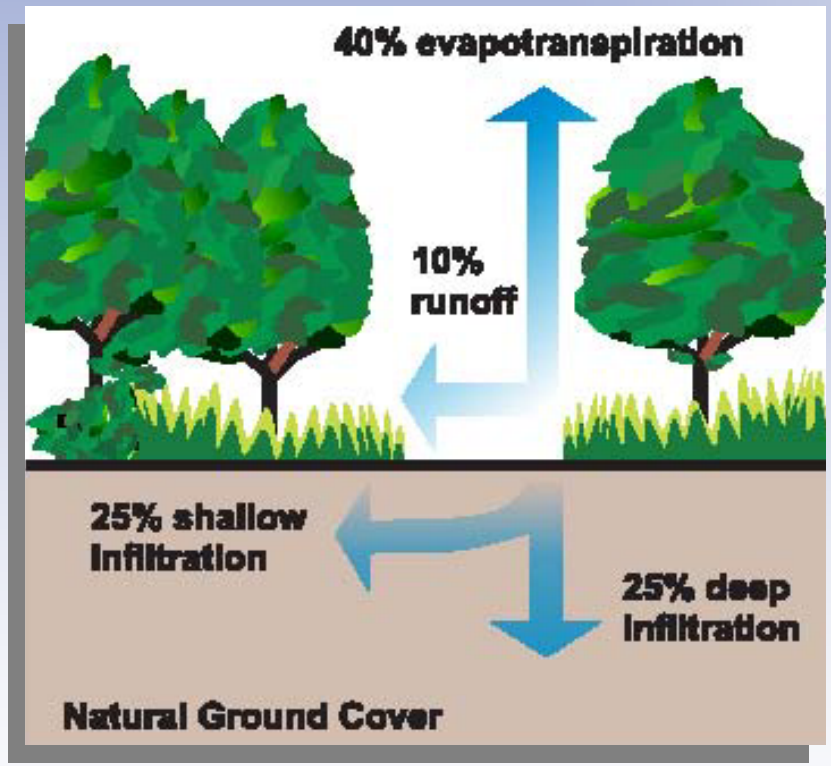
Outline of Presentation

- Why include stormwater controls in development projects?
- What's the difference between construction and post-construction controls?
- Defining post-construction controls
- Current municipal stormwater permit requirements
- For more information…

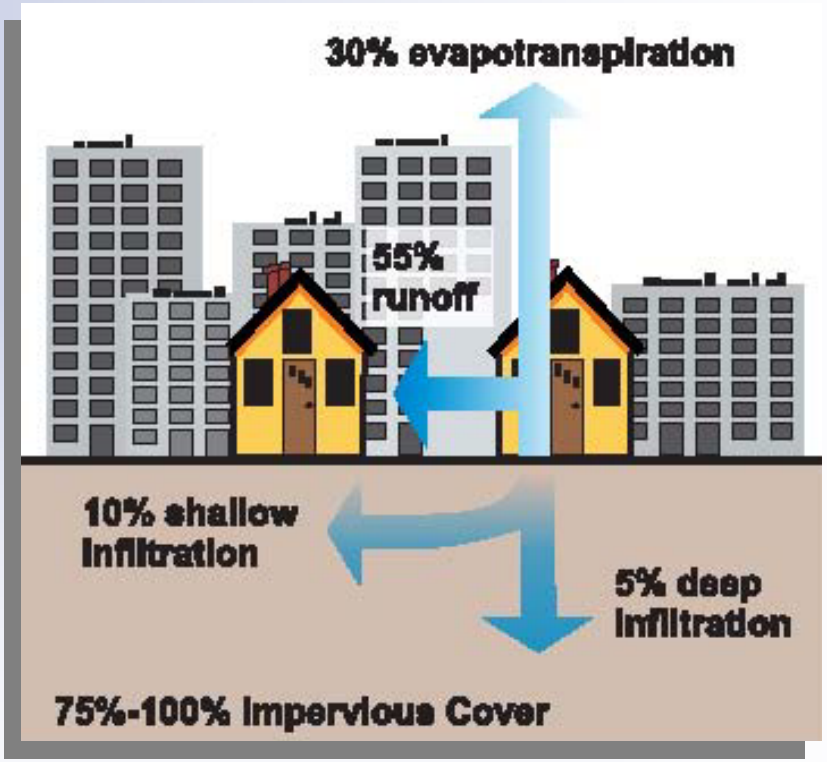
Why include stormwater controls in development projects?

- San Francisco Bay and many local creeks are impaired for numerous pollutants.
- Stormwater runoff is the largest pollutant conveyance.

Why include stormwater controls in development projects?



Little runoff before development



Lots of dirty runoff after development

Stormwater **Quality** and **Quantity** Matter

Quality Problems

Quantity Problems

What's the difference between construction and post-construction controls?

Example of a construction best management practice (BMP)

Example of a post-construction stormwater control measure

Construction controls/ “best management practices”

- Implemented during construction only
- Control sediment and erosion (straw wattles, silt fences, hydroseeding, storm drain inlet filters …)
- Good housekeeping practices to keep pollutants out of stormwater
- Required by State Construction General Permit if one acre or more is disturbed
- Municipalities must require construction BMPs in smaller projects, per municipal stormwater permit

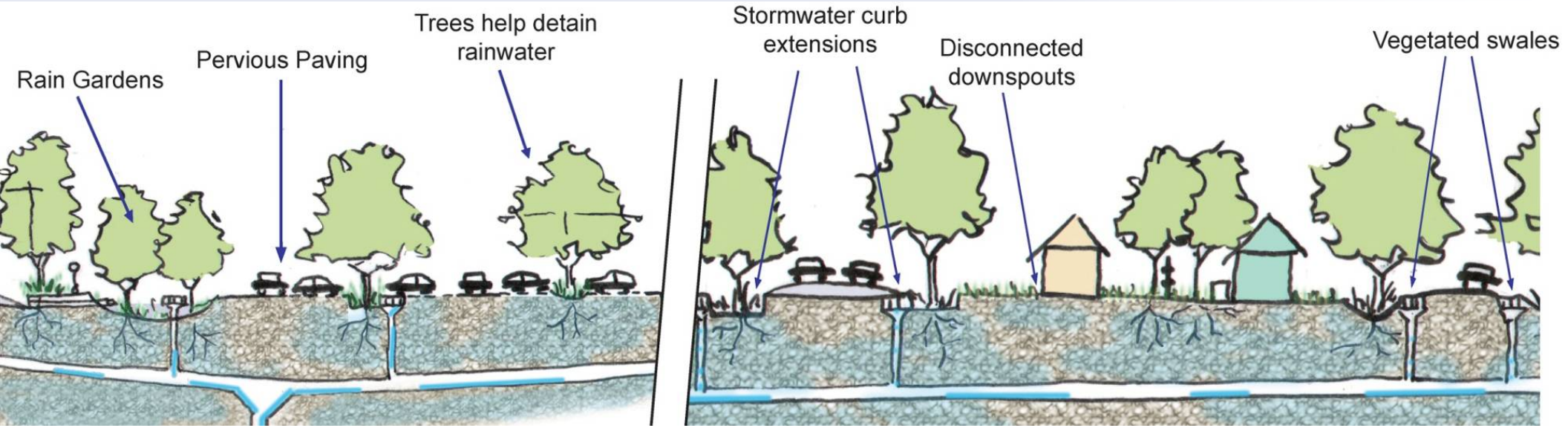
Post-construction controls

- Permanent features of the project design

- Types of Post-construction controls required by Municipal stormwater permit (Provision C.3)
  - Low Impact Development
    - Source control measures
    - Site design measures
    - Stormwater treatment
  - Hydromodification management (HM)

Low Impact Development (LID)

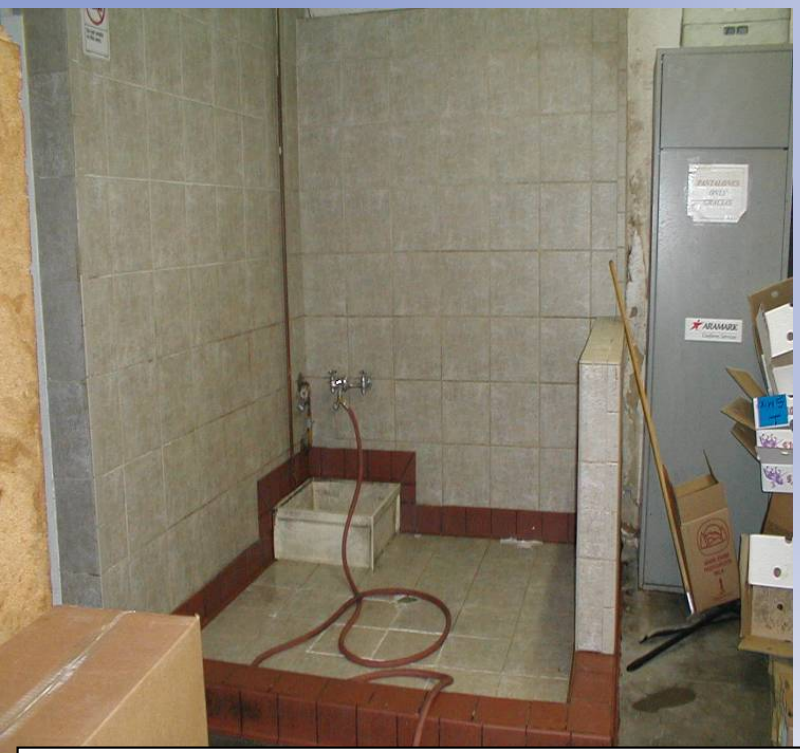
- Reduce runoff and mimic a site's predevelopment hydrology by:
  - Minimizing disturbed areas and impervious surfaces.
  - Infiltrating, evapotranspiring, or harvesting and using stormwater runoff – where this is infeasible, biotreatment is allowed.



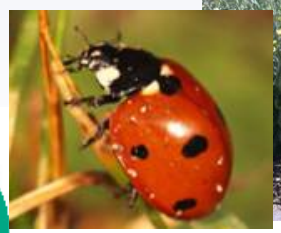
Low Impact Development

The landscape as a sponge

Source Control Measures



Indoor wash area for restaurant floor mats



- Permanent design features that reduce pollutant sources
  - Some discharges drain to landscaping or sanitary system
  - Integrated or organic pest management
  - Select drought-tolerant native or adapted plants
  - High-efficiency irrigation
- Encourage in all projects
- Require in projects that must implement stormwater treatment

Choose less toxic products for your home and garden. Look for this symbol before you buy.

Site Design Measures

Pervious walkway

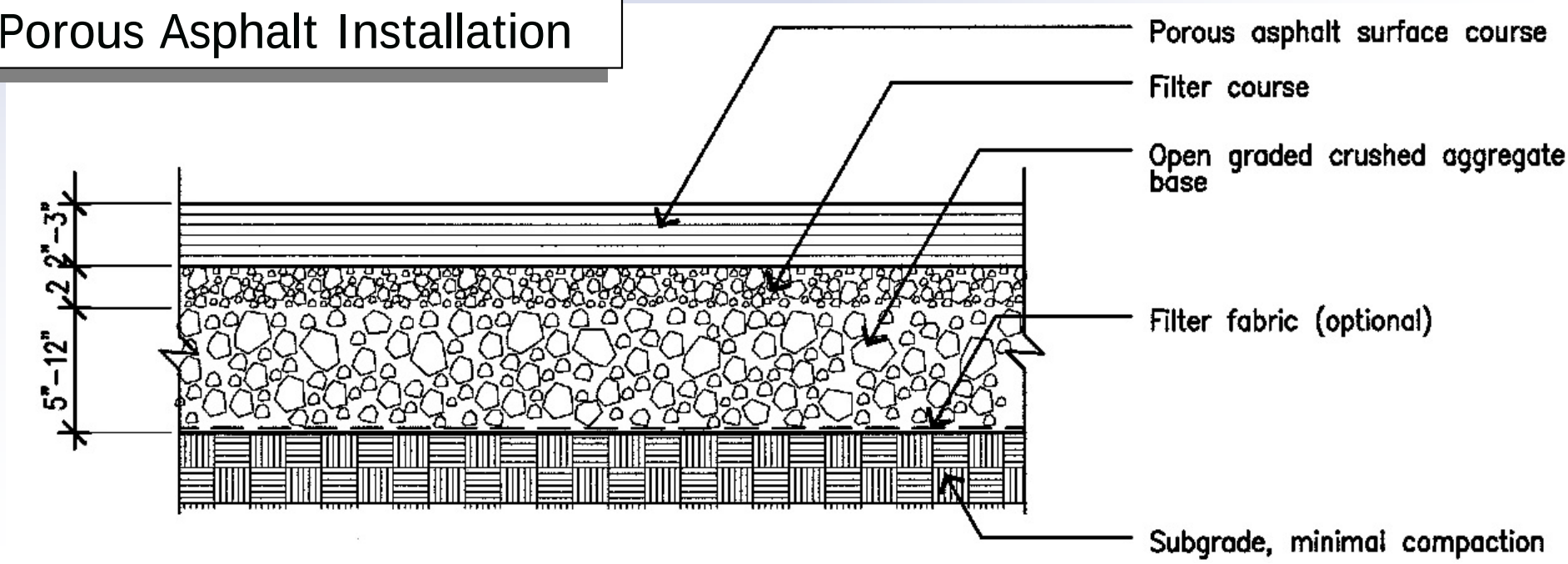
“Disconnected” downspout

- Permanent design features that reduce impervious surfaces
  - Direct runoff to landscaping
  - Pervious paving
  - Self-treating areas
  - Self-retaining areas
- Encourage in all projects
- Require in projects that must implement stormwater treatment

Pervious Paving Reduces the Amount of Stormwater that Requires Treatment

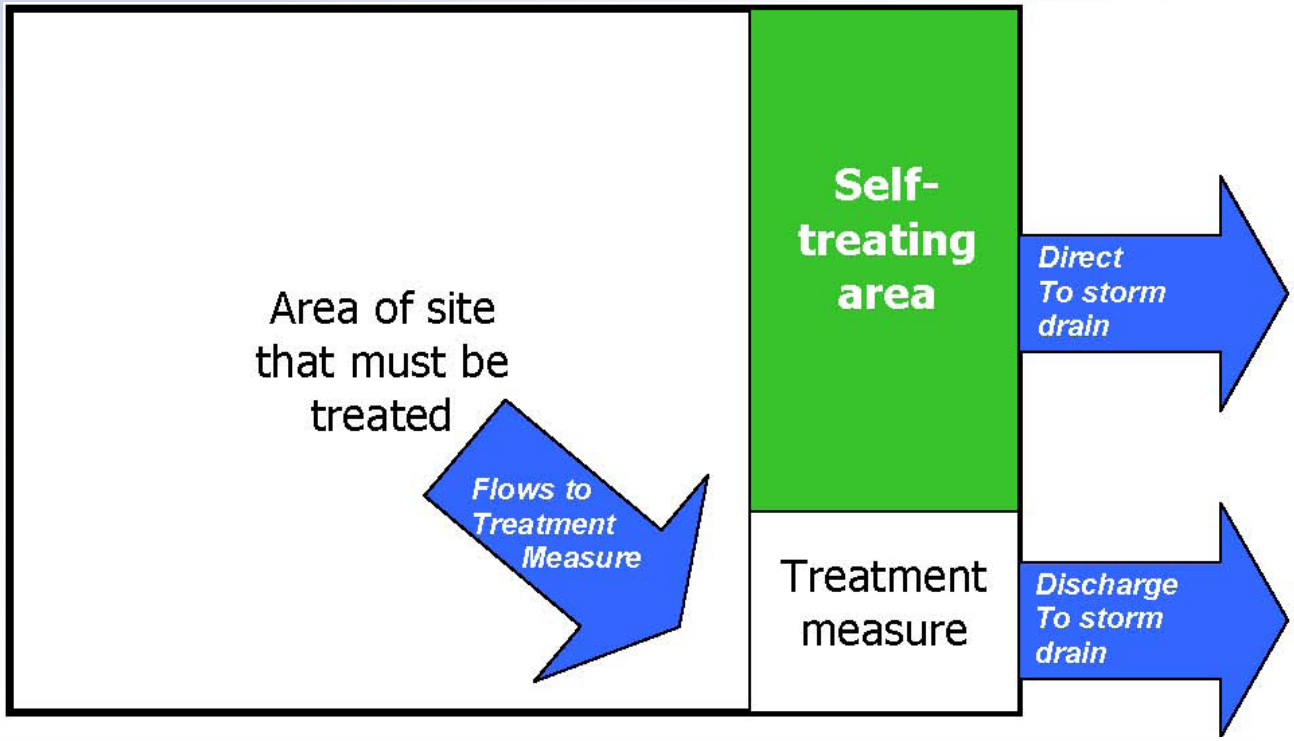
- Pervious paving is not an “impervious surface” if:
  - It stores and infiltrates runoff at a rate equal to immediately surrounding landscaped areas, OR
  - It is underlain with pervious storage material that holds the amount of runoff required to be treated.

Porous Asphalt Installation



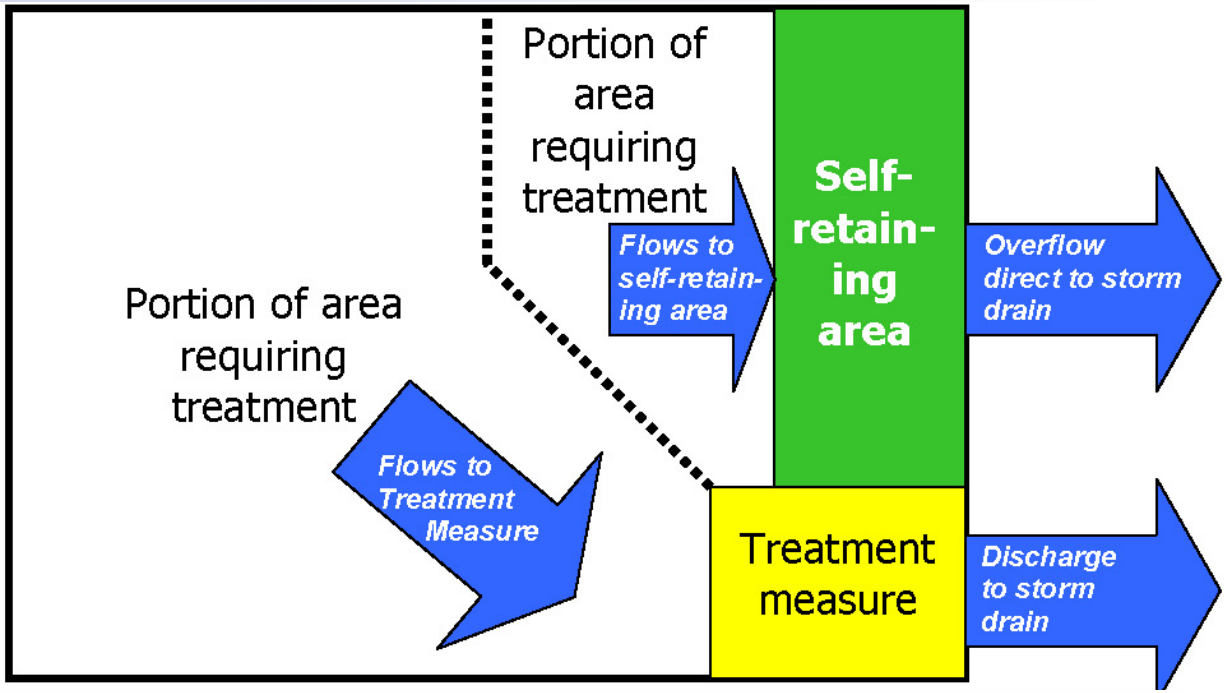
Self-Treating Areas Reduce the Area that Requires Treatment

- Stormwater from **pervious** portions of the project can flow directly to the storm drain (no mixing with runoff from impervious areas):
  - Landscaping
  - Green roof
  - Properly-designed pervious paving



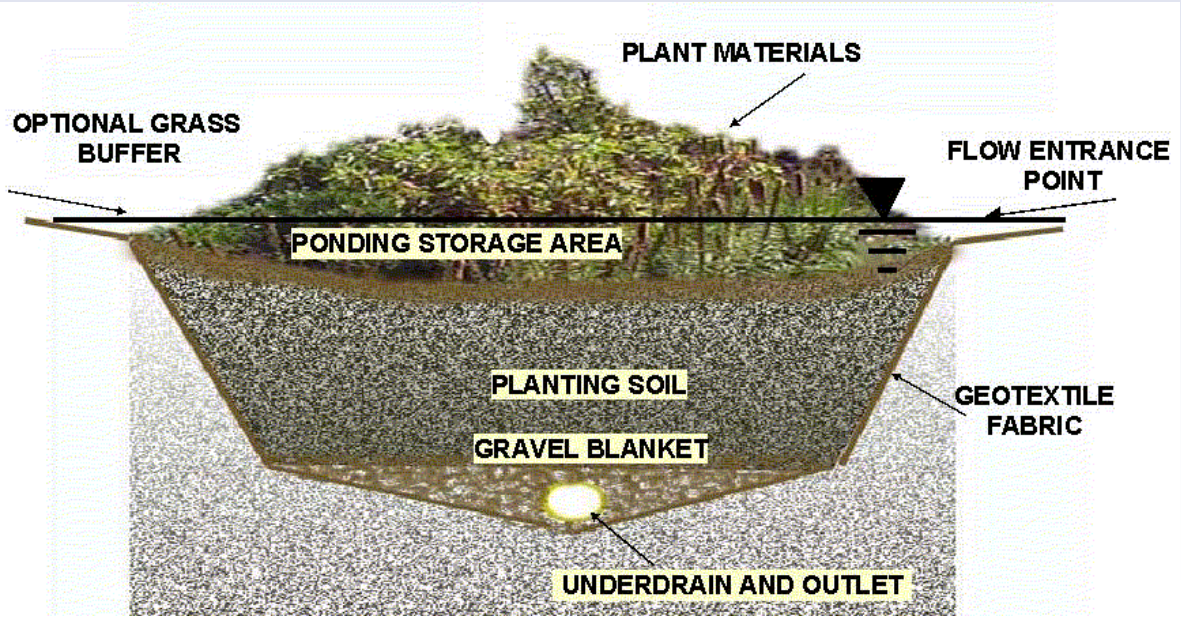
Self-Retaining Areas Reduce the Area that Requires Treatment

- Concave area of landscaping that retains runoff from adjacent impervious surface (e.g, roof)
  - Sized at 2:1 ratio (area of tributary impervious surface: area of landscaping)
  - 3-inch ponding depth
  - No special soils required



Stormwater Treatment Measures

Bioretention/Rain Garden, Brisbane



- Engineered systems that remove pollutants from stormwater using natural processes
  - Hydraulically sized to treat stormwater runoff from **frequent, small storms** (per Provision C.3.d of the Municipal Regional Stormwater Permit)
  - Maintenance agreement required

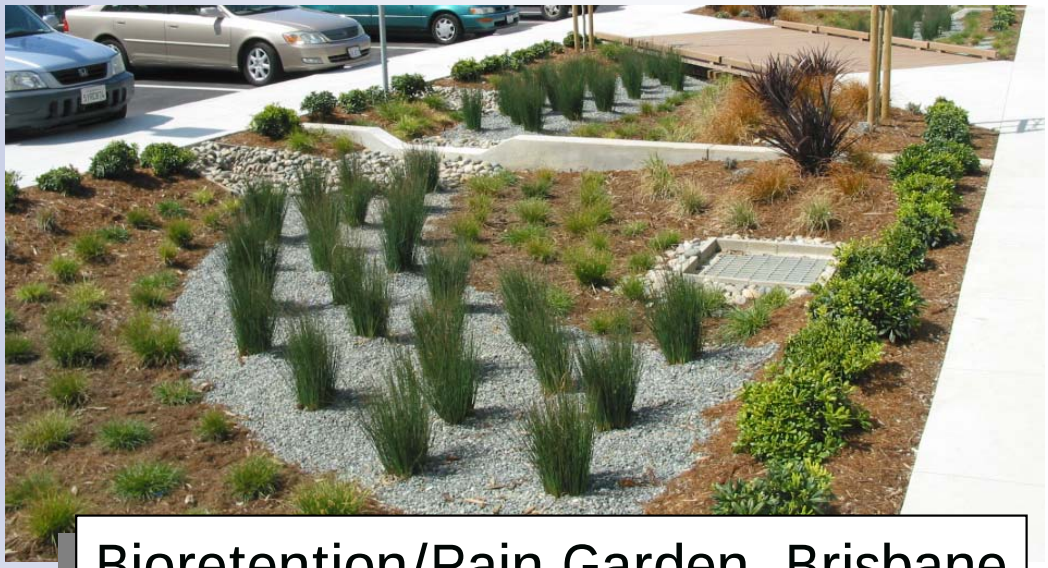
How Much Runoff Must Be Treated?

- Projects must treat 80% of the average annual runoff from 100% of the project.
- This requirement is in Provision C.3.d of the MRP, and so it's called the **"C.3.d amount of runoff."**

Stormwater Treatment Measures

When are they required?

- Required for projects that create and/or replace 10,000 sq. ft. or more of impervious surface



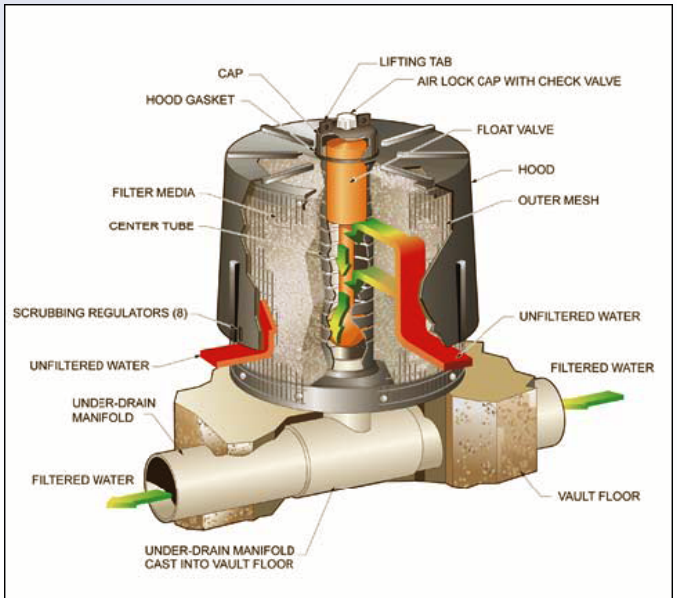
Bioretention/Rain Garden, Brisbane

- **Beginning December 1, 2011**, required if 5,000 square feet or more of impervious surface created/replaced by:
  - Restaurants,
  - Retail gasoline outlets,
  - Auto service facilities,
  - Parking lots (stand-alone or part of other use)

Stormwater Treatment Measures
What are the different types?

- **LID Treatment** measures required beginning December 1, 2011
  - Infiltration, evapotranspiration, and harvesting and use
  - Where this is infeasible, biotreatment is allowed

- **Non-LID treatment** measures
  - Very limited use in “special projects” beginning December 1, 2011!



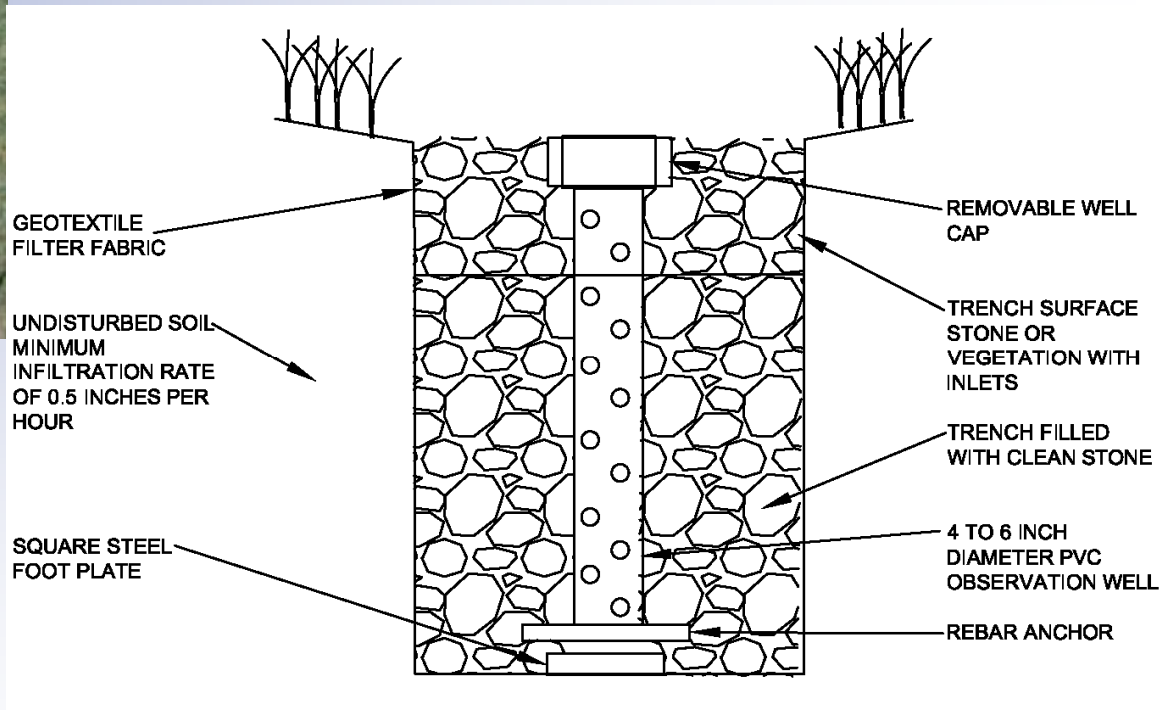
Rainwater Harvesting and Use

- Water used for non-potable uses, such as:
  - Toilet flushing
  - Irrigation

Cisterns installed underground

Infiltration Devices

Infiltration Trench



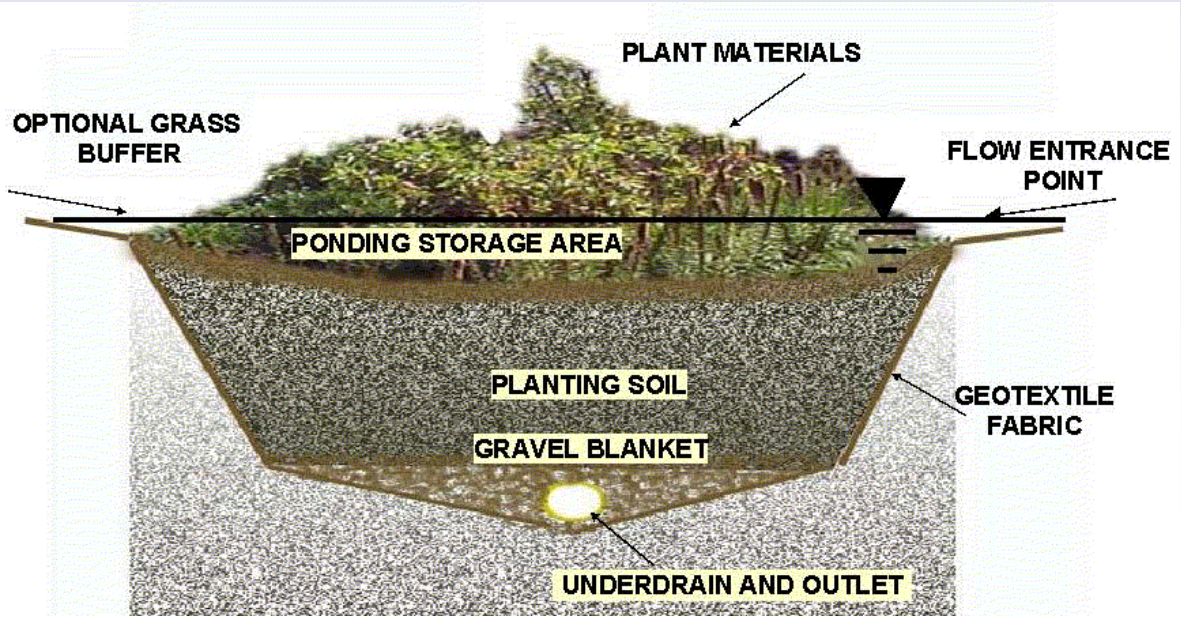
- Store water in void space of rocks, allowing it to infiltrate to surrounding soils
- Requires infiltrative soils

“Biotreatment” Measures Allowed after December 1, 2011

Flow-through planter

- Most Common
  - Bioretention areas/rain gardens
  - Linear bioretention areas (bioretention swales)
  - Flow-through planters
- Less Common
  - Vegetated buffer strips

Bioretention Area/Rain Garden



- Concave landscaped area of any shape.
- Engineered soil with high rate of infiltration (5 to 10 inches/hour).
- Underdrain required if clayey underlying soils.
- Raise underdrain to maximize infiltration, if conditions allow.

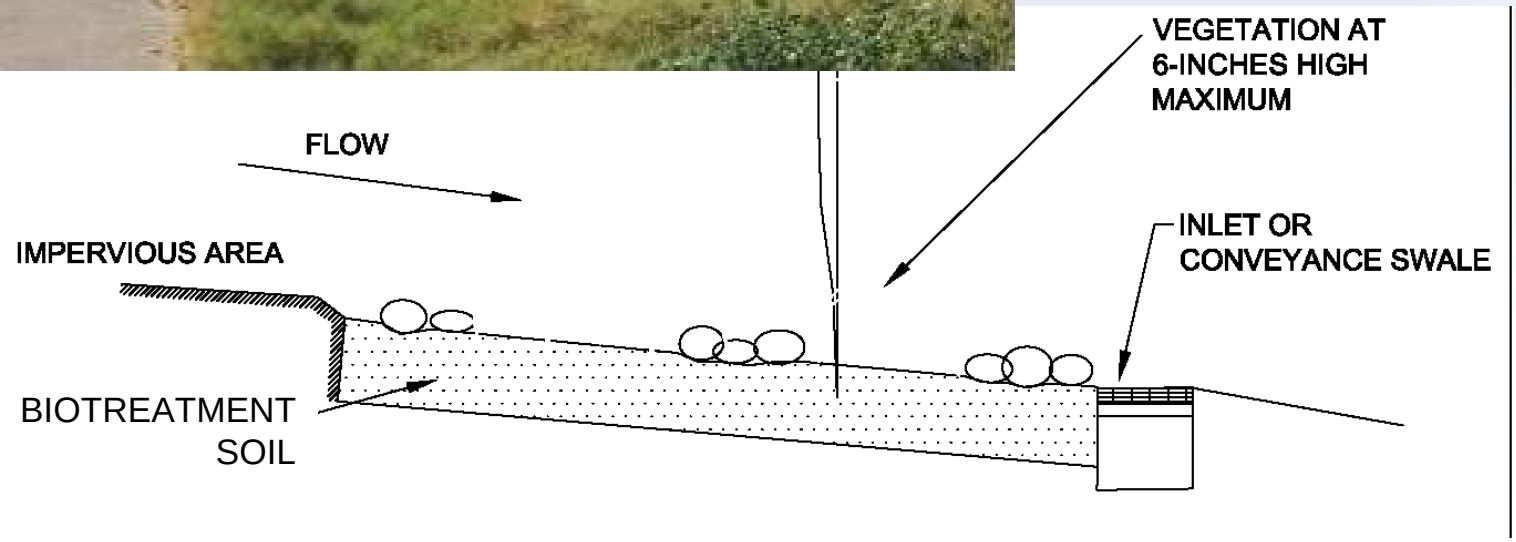
Flow-through Planter

- No infiltration to underlying soils.
- Planter box with engineered soils and underdrain.
- Stormwater filters through soils with high rate of infiltration (5 to 10 inches/hour).
- OK along face of building, if waterproofing is used.

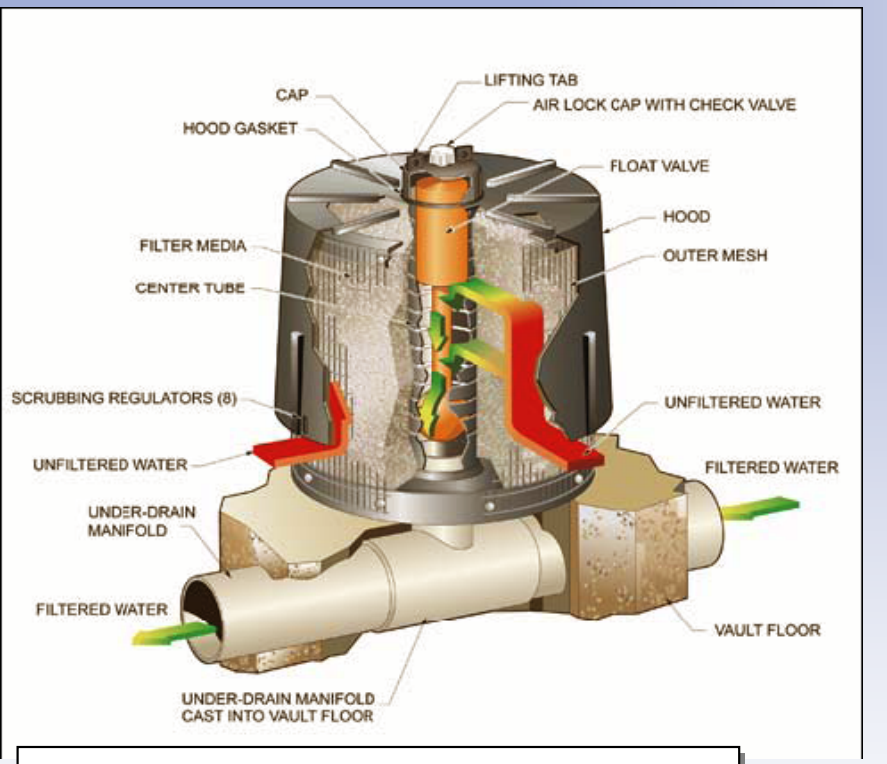
Vegetated Buffer Strip

- Gently sloping surface, allows sheet flow of stormwater across thick vegetation

- Must be designed to filter water through biotreatment soil, with 5 inches per hour surface loading rate.



No Longer Allowed* as Stand-alone Stormwater Treatment Measures



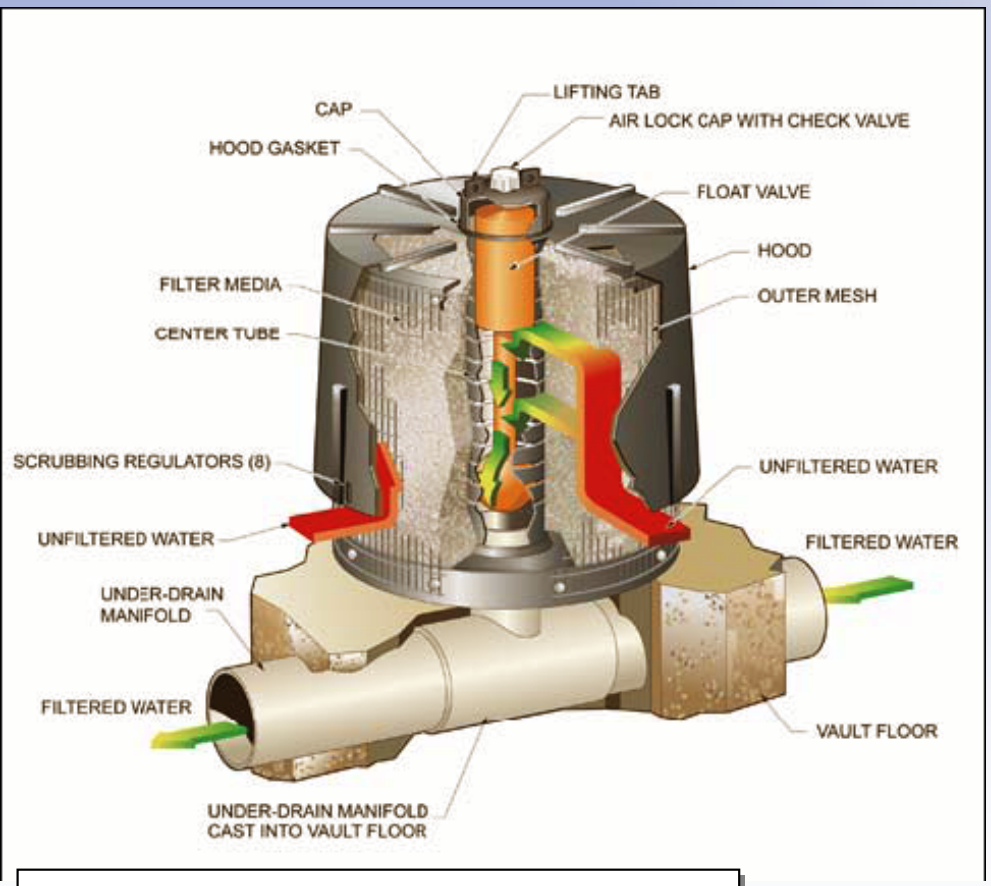
Media Filter Cartridge

- Media filters*
- Manufactured tree well filters*
- Hydrodynamic separator
  - Vortex units, “CDS” units
- Vegetated swales and detention basins (unless designed to filter stormwater through bioretention soil)

Limited use of media filters and manufactured tree well filters allowed in “Special Projects”

Media Filters

(Beginning 12/1/11, limited use ONLY in specific infill, high density and transit oriented development “Special Projects”)

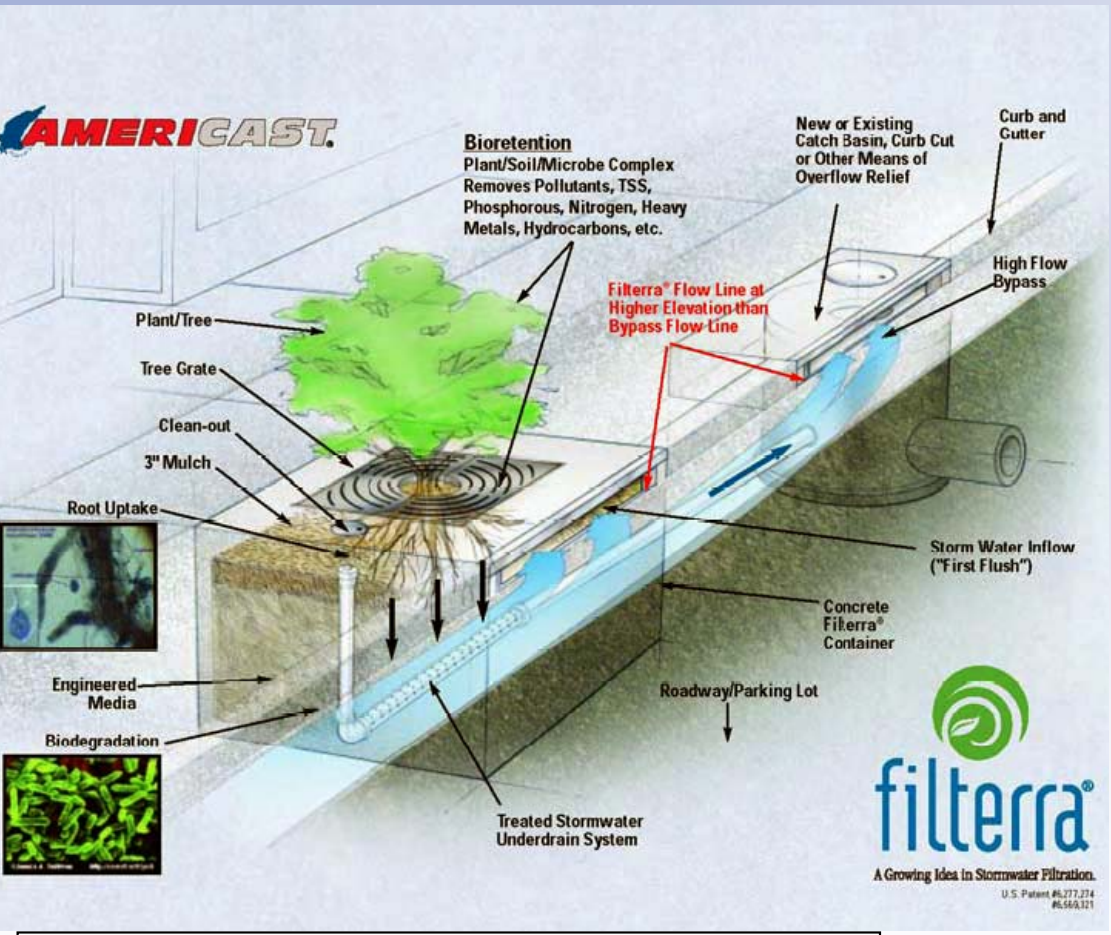


Example of a Media Filter Cartridge

- Vault system, usually with two chambers
  - Large particles settle out in first chamber;
  - Finer particles filtered by filter media in second chamber

Manufactured Tree Well Filters

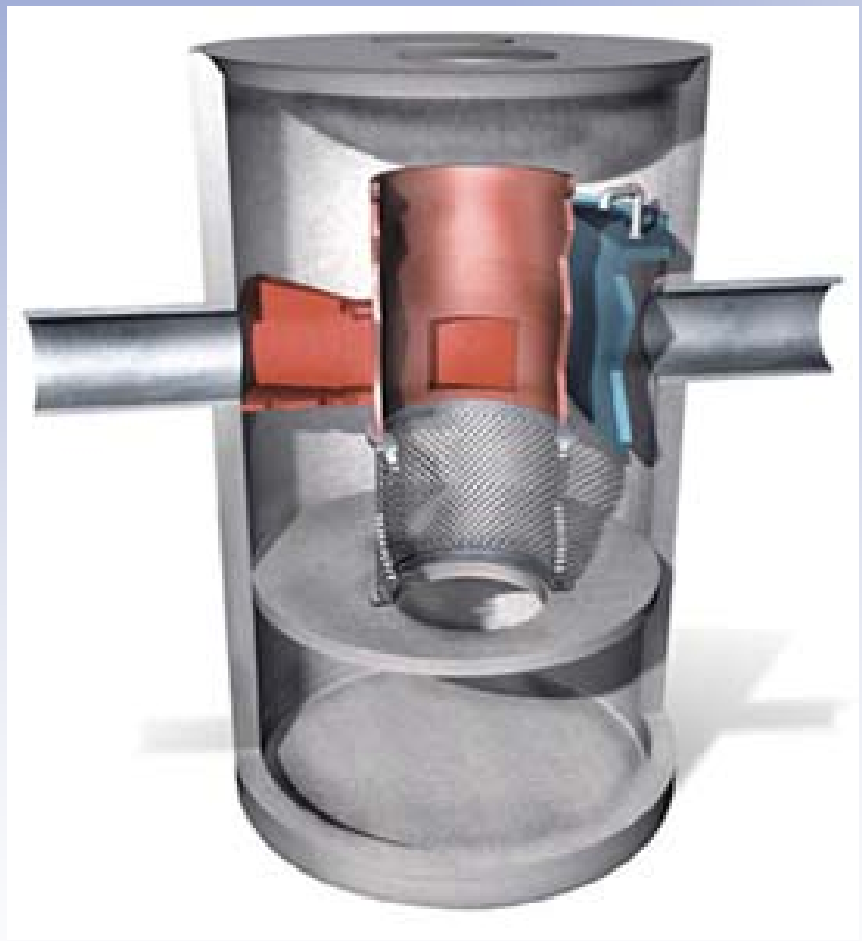
(Beginning 12/1/11, limited use ONLY in specific infill, high density and transit oriented development “Special Projects”)



Example of a Manufactured Tree Well Filter

- Tree well filter with proprietary planting media and underdrain
- Planting media has extremely high infiltration rate.

Hydrodynamic Separators
(NOT a stand-alone treatment measure)



- Vault system
- Settling or separation unit to remove sediments
- Effective for trash and large particles
- Not designed to remove finer particles

Inlet Filters
(NOT a stand-alone treatment measure)

- Insert in storm drain inlet
- Filters out trash and large particles
- Not designed to remove finer particles
- Used as construction BMP
- Frequent maintenance

Vegetated Swale

(Beginning 12/1/11 NOT a stand-alone treatment measure unless designed to filter stormwater through bioretention soils)

- Linear, shallow, vegetated channel
- Used to be allowed to filter stormwater through dense vegetation

Extended Detention Basin

(NOT a stand-alone treatment measure unless designed to filter stormwater through bioretention soils)

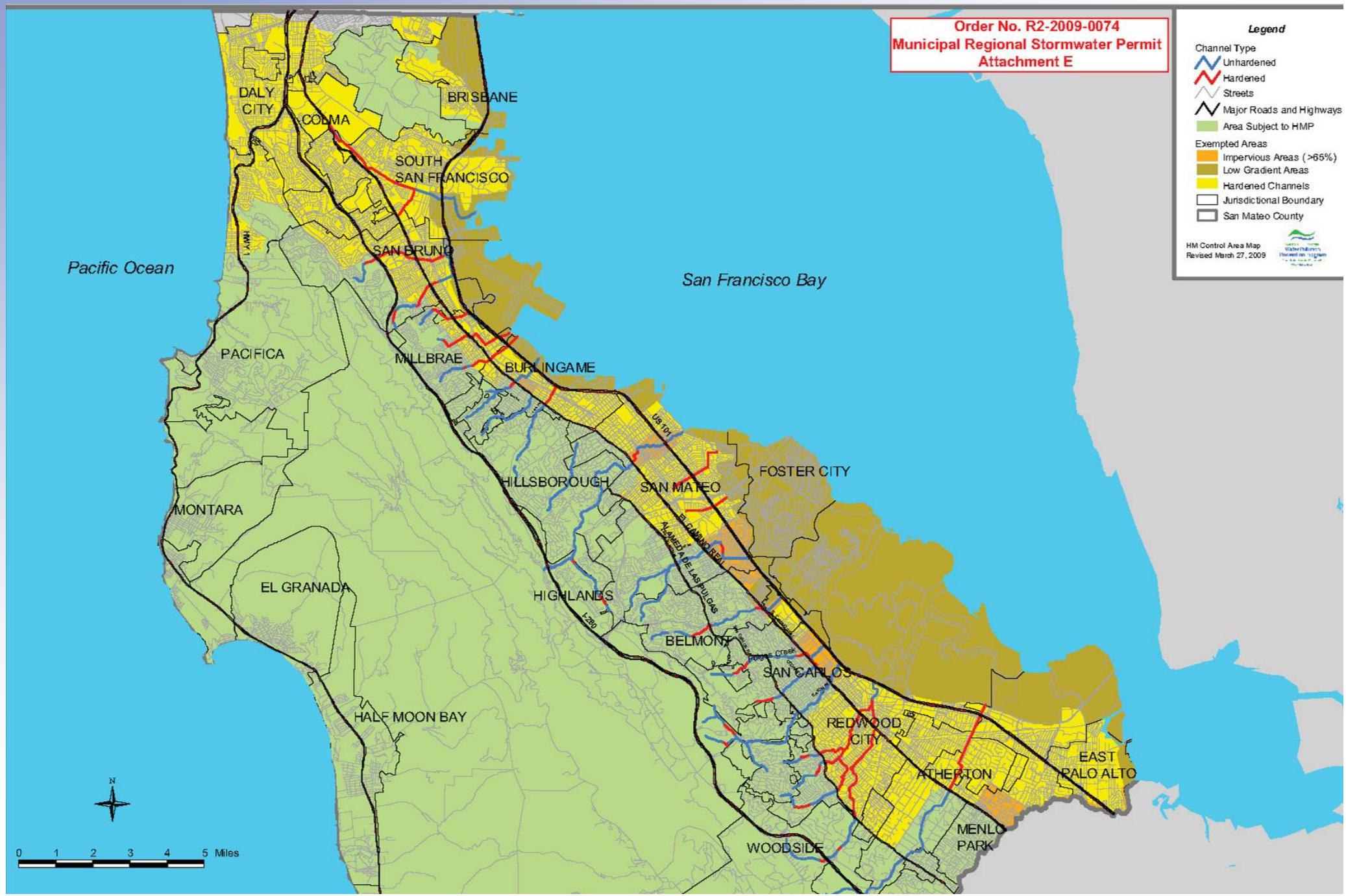
- Basin with specially designed outlet to detain stormwater for at least 48 hours.
- Used to be allowed to treat stormwater by settling

Hydromodification Management

- **Purpose:** Reduce erosive flows.
- **Goal:** Post-project rate and volume of runoff match pre-project (for the 2-10 year storm).

- Required for projects in susceptible areas that
  - Create and/or replace 1 acre or more of impervious surface, and
  - Increase impervious surface over pre-project condition.

Areas susceptible to HM shown in green.



Hydromodification Management Control Measures

- Hydrologic source controls
  - Site design measures to reduce imperviousness

Detention basin

- Flow duration controls
  - Pond, detention basin, tank or vault
  - Specialized outlet to control rate and volume of flow

Municipal Regional Stormwater Permit (MRP) Provision C.3 Overview

- Requires post-construction controls for new development and redevelopment projects.
- Specific requirements for development projects since 2003
- MRP effective date was 12/1/09
- But the major new MRP requirements phase in 12/1/11

Test Your Knowledge!

- What are source control measures?
  - Permanent design features that reduce pollutant sources
- What size projects need to include appropriate source control measures?
  - You must encourage the implementation of appropriate source controls in all projects regardless of size.
  - You must require appropriate source controls in projects that are subject to stormwater treatment requirements.

Test Your Knowledge!

- What are site design measures?
  - Permanent design features that reduce impervious surfaces
- What size projects need to include appropriate site design measures?
  - You must encourage the implementation of appropriate site design measures in all projects regardless of size.
  - You must require appropriate site design measures in projects that are subject to stormwater treatment requirements.

Test Your Knowledge!

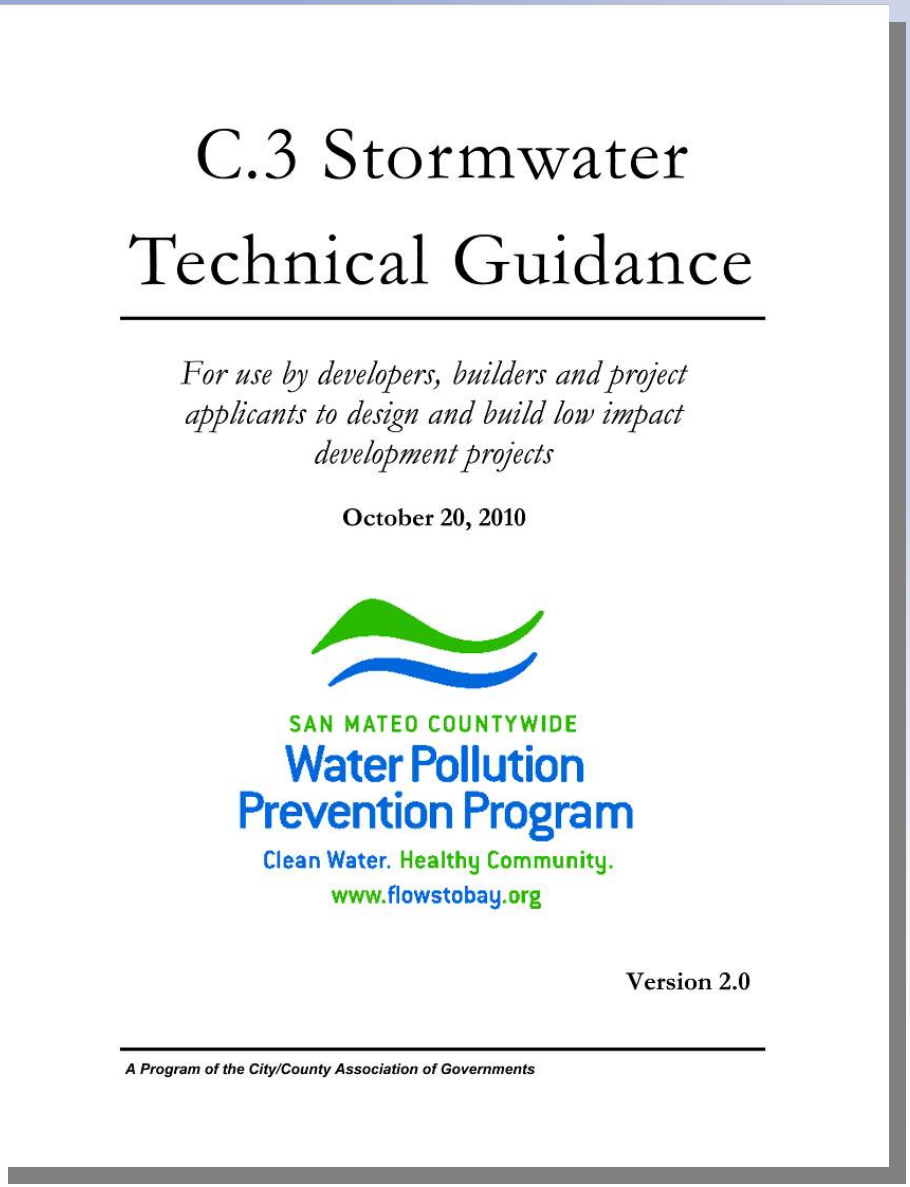
- What are stormwater treatment measures?
  - Permanent engineered systems that remove pollutants from stormwater.
- Which projects must include stormwater treatment measures?
  - Projects that create and/or replace 10,000 sq.ft. or more of impervious surface (stand-alone home exempt)
  - Beginning 12/1/11, projects in the following categories that create and/or replace 5,000 sq. ft. or more of impervious surface:
    - Restaurants,
    - Retail gasoline outlets,
    - Auto service facilities,
    - Parking lots (stand-alone or part of other use)

Test Your Knowledge!

- What is the goal of hydromodification management?
  - Have the post-project rate and volume of runoff match pre-project condition for the 2-10 year storm.
- Which projects must implement hydromodification management?
  - Projects in susceptible areas that
    - Create and/or replace 1 acre or more of impervious surface, and
    - Increase impervious surface over pre-project condition.

Phase-in dates for pipeline projects to comply with new Provision C.3 requirements will be described in a separate presentation

For More Information…



- Material in this presentation is included in the Countywide Program's C.3 Technical Guidance.
- The C.3 Technical Guidance is being updated to include guidance for determining LID feasibility.

For More Information…

- Municipal Regional Stormwater Permit
  - www.flowstobay.org/ms_municipalities.php
- New Development Web Page
  - www.flowstobay.org/bs_new_development.php
  - C.3 Technical Guidance
  - HM Applicability Map
  - Informational flyers and forms

Contact Information:

Laura Prickett

lprickett@eoainc.com

510.832.2852 x 123