

Preparing Permit Application Submittals

This Chapter outlines the development review process and gives step-by-step instructions for preparing C.3 stormwater submittals for permit applications.

3.1 The Development Review Process

The municipalities have integrated their review of post-construction stormwater controls into the development review process. If C.3 requirements apply to your project, your permit application submittal must show how you have incorporated the required post-construction stormwater controls into the design of the project. Section 3.2 gives step-by-step instructions on how to do this, beginning at the earliest phases of project planning. Section 3.3 provides guidance for preparing for construction. Section 3.4 provides ***simple instructions for small sites***.

Project compliance with stormwater requirements must be addressed early in the design process. Preparing the preliminary design of stormwater controls ***simultaneously with the preliminary site plan*** and the landscaping plan will achieve the following benefits:

- Maximize the stormwater benefits of project landscaping.
- Reduce overall project costs.
- Improve site aesthetics and produce a better quality project
- Speed project review times.
- Avoid unnecessary redesign.

Preparing the preliminary design of stormwater controls simultaneously with the ***preliminary site plan*** and the landscaping plan can help reduce overall project costs.

Check with the local municipality to determine what stormwater-related submittals are required and at what stages of the municipality's development project review process. Municipalities typically require a preliminary Stormwater Management Plan showing how your project will incorporate post-construction stormwater controls as part of the Planning Permit application. A review of the preliminary Stormwater Management Plan by municipal staff will either result in requests for more information (if incomplete), or conditions of approval which allow staff to grant final discretionary approval of the project. Submittal of a revised Stormwater Management Plan is typically required as part of the Building Permit application.

Some municipalities will require you to obtain a **third-party review** of the preliminary or revised Stormwater Management Plan by a qualified engineer or consulting firm. You may need to either pay a development fee to the municipality for this service, or contract directly with a qualified engineer. A list of qualified consultants for design, review and/or certification of stormwater treatment measures and hydromodification flow control facilities is provided on the Urban Runoff Program website and updated every two years by the Program. The list can be found at: http://www.scvurppp-w2k.com/consultants_list.shtml

The municipality will also require you to prepare and submit separate documents to show how erosion, sediment and other pollutants will be controlled **during construction**. See Section 3.3 for more information.

3.2 How to Prepare a Stormwater Management Plan

A checklist is provided in this section to help identify the C.3 stormwater-related items that you will need to include with your project-specific Stormwater Management Plan. Contact the planning staff of the local jurisdiction to discuss the specific requirements that may apply to your project. After you have a complete list of submittal requirements, you can use the instructions in this section to prepare your submittal. Applicants with smaller projects are encouraged to read Section 3.4, "**Simple Instructions for Small Sites**," before using these instructions.

C.3 submittals show how the project will reduce pollutant loading and prevent increases in creek channel erosion during **long-term project operations**.

3.2.1 The Permit Submittal Checklist

Table 3-1 presents a checklist of items that are typically included in a project's Stormwater Management Plan. Municipal staff may use this checklist or something similar to determine whether your submittal is complete. It is important to demonstrate that your project will:

- Incorporate **site design measures** to reduce impervious surfaces, promote infiltration and reduce water quality impacts;
- **Apply source control measures** to keep pollutants out of stormwater runoff;
- Use **stormwater treatment measures** to remove pollutants from stormwater; and
- Where applicable, manage **hydromodification (erosion-inducing flows)** by reducing the rate and amount of runoff.

Table 3-1: Stormwater Management Plan Checklist		
Required?*		Information on Plan Sheets
Yes	No	
<input type="checkbox"/>	<input type="checkbox"/>	Existing natural hydrologic features (low points where ponding may occur, watercourses) and other natural resources (mature trees, areas of undisturbed vegetation)
<input type="checkbox"/>	<input type="checkbox"/>	Soil types and depth to groundwater
<input type="checkbox"/>	<input type="checkbox"/>	Existing and proposed site drainage network and connections to offsite
<input type="checkbox"/>	<input type="checkbox"/>	Drainage Management Area (DMA) boundaries
<input type="checkbox"/>	<input type="checkbox"/>	Amount of existing pervious and impervious areas, for total project site and each DMA
<input type="checkbox"/>	<input type="checkbox"/>	Amount of proposed impervious area, including roof, plaza, sidewalk, street, and parking lot areas (for total site and each DMA)
<input type="checkbox"/>	<input type="checkbox"/>	Amount of proposed pervious area, including sensitive natural areas to be preserved and protected from development (for total site and each DMA)
<input type="checkbox"/>	<input type="checkbox"/>	Proposed site design measures to minimize impervious surfaces and promote infiltration**
<input type="checkbox"/>	<input type="checkbox"/>	Pollutant source areas – including loading docks; food service areas; refuse areas; outdoor processes and storage; vehicle cleaning, repair or maintenance; fuel dispensing; equipment washing; etc. – and corresponding source controls from the local source control list
<input type="checkbox"/>	<input type="checkbox"/>	Proposed locations and sizes of stormwater treatment measures and (if applicable) hydromodification management (HM) measures
<input type="checkbox"/>	<input type="checkbox"/>	Stormwater treatment measure and HM measure details
<input type="checkbox"/>	<input type="checkbox"/>	Preliminary planting palette for stormwater treatment/HM measures
Written Information on Municipal Forms		
<input type="checkbox"/>	<input type="checkbox"/>	Soil types and infiltration rate (saturated hydraulic conductivity if available)
<input type="checkbox"/>	<input type="checkbox"/>	Completed C.3 Data Form (obtain from local agency)
<input type="checkbox"/>	<input type="checkbox"/>	Completed Special Projects Worksheet (if applicable)
<input type="checkbox"/>	<input type="checkbox"/>	List of source control measures included in the project
<input type="checkbox"/>	<input type="checkbox"/>	Sizing calculations for treatment and/or HM measures
<input type="checkbox"/>	<input type="checkbox"/>	Preliminary maintenance plan for treatment and/or HM measures and responsible party
* Municipal staff may check the boxes in the “Required” column to indicate which items are required for your project.		
** Site design, treatment, and HM measures that promote infiltration should be designed consistent with the recommendations of the project geotechnical engineer.		

3.2.2 Project-Specific Stormwater Management Plan

Step-by-step instructions are offered below to help you incorporate post-construction stormwater controls into your project and prepare your Stormwater Management Plan.

Step 1: Collect Information

Collecting the appropriate information is essential to selecting and siting post-construction stormwater measures. A list of the most **commonly needed information** is provided below, but municipal staff may request additional information as well.

- Existing natural features, especially **hydrologic features** including creeks, wetlands, watercourses, seeps, springs, ponds, lakes, areas of 100-year floodplain, and any contiguous natural areas. This information may be obtained by site inspections, a topographic survey of the site, and existing maps such as US Geologic Survey (USGS) quadrangle maps, Federal Emergency Management Agency (FEMA) floodplain maps, and US Fish and Wildlife Service (USFWS) wetland inventory maps.
- Existing site **topography**, including the general direction of surface drainage, high and low points on the site, any steep slopes, outcrops, or other significant geologic features. This may be obtained from topographic maps and site inspections.
- **Existing site drainage.** For undeveloped sites, this would be identified based on the topographic information described above. For previously developed sites, information on drainage and storm drain connections may be obtained from municipal storm drain maps, project plans for the previous development, and site inspections. Identification of the creek to which the site ultimately drains (i.e., the watershed in which the site is located) will also be required.
- **Soil types** and **depth to groundwater.** The project soils report, if available, should be used to determine hydrologic soil groups and/or the saturated hydraulic conductivity of site soils. If a soils report is not required for the project, planning-level information may be obtained from the soils map in Appendix B or from the Natural Resource Conservation Service (NRCS) soil survey website¹ to determine the feasibility of onsite infiltration of stormwater. However, the local jurisdiction may require site-specific soils testing prior to project approval.
- **Existing impervious areas.** Measuring the area of existing impervious surface is necessary to calculate the amount of impervious surface that will be replaced or the increase in impervious surface that may need to be mitigated with HM controls. The MRP requires that redevelopment projects that replace more than 50 percent of impervious surface treat the stormwater runoff from the entire site, not just the redeveloped area. If 50 percent or less of the existing impervious surface is replaced, and the existing development was not subject to stormwater treatment measures, then only the redeveloped portion must be included in treatment measure design.
- **Zoning** information, including requirements for setbacks and open space.

Review the information collected in Step 1. Identify the principal constraints on site design and stormwater treatment measure selection, as well as opportunities to reduce imperviousness and incorporate stormwater controls into the site and landscape design. For example, **constraints** might include low permeability soils, high groundwater, steep slopes, geotechnical

Constraints may include low permeability soils, high groundwater, steep slopes, geotechnical instability, high-density land use, or heavy vehicle traffic. **Opportunities** may include existing natural areas, low areas, and landscaping areas.

¹ The NRCS Web Soil Survey can be accessed at: <http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>.

instability, high-intensity land use, heavy vehicular traffic, or safety concerns. **Opportunities** might include existing natural upland areas, areas set aside for landscaping, including open space and buffers (which can serve as locations for stormwater treatment measures), and low areas (suitable locations to site stormwater treatment measures to facilitate gravity flow of runoff, but which are not state or federal jurisdictional waters). Preparing a table or brief written summary of constraints and opportunities may prove helpful in selecting and siting stormwater controls.

Step 2: Determine the Applicable Post-Construction Stormwater Requirements

Stormwater treatment is required for projects that create and/or replace **10,000 square feet** or more of impervious surface, and for special land use projects that create and/or replace **5,000 square feet** or more, of impervious surface – with some exceptions listed in Chapter 2. Special land use projects include: uncovered parking areas (stand-alone or part of another use), restaurants, auto service facilities, and retail gasoline outlets.

The **C.3 Data Form** provided by the local jurisdiction must be completed as part of the permit application submittal. Excerpts from the Urban Runoff Program’s model C.3 Data Form are provided throughout this section to illustrate the process. Figure 3-1 shows how the form is used to calculate the amount of impervious surface that will be created and/or replaced. The C.3 Data Form is also used to determine whether treatment and/or HM measures are required, and indicate which site design measures, source control measures, treatment control measures and HM measures will be provided.

2. Project Size

a. Total Site Area: _____ acre	b. Total Site Area Disturbed: _____ acre (including clearing, grading, or excavating)			
	Existing Area (ft ²)	Proposed Area (ft ²)		Total Post-Project Area (ft ²)
		Replaced	New	
Impervious Area				
Roof				
Parking				
Sidewalks and Streets				
c. Total Impervious Area				
d. Total new and replaced impervious area				
Pervious Area				
Landscaping				
Pervious Paving				
Other (e.g. Green Roof)				
e. Total Pervious Area				
f. Percent Replacement of Impervious Area in Redevelopment Projects $(\frac{\text{Replaced Total Impervious Area}}{\text{Existing Total Impervious Area}} \times 100\% = \text{_____}\%)$				

Figure 3-1: Excerpt from C.3 Data Form (Impervious Surface Calculation)

Impervious surfaces are those areas covered by a structure or solid surface that prevents water from infiltrating into the ground, causing rainwater to run off. Impervious surfaces include, but are not limited to, the following:

- Footprints of all buildings and structures, including garages, carports, sheds, etc.;
- Driveways, patios, parking lots, and decking;
- Streets and sidewalks.

“New” impervious surface is hardscape or a building roof that is created on an area of the site that was previously pervious. “Replaced” impervious surface is hardscape or roof area installed on an area of the site that was previously impervious, even if the type of impervious surface changes. For example, when a building is constructed in an area that used to be a parking lot, the parking lot impervious surface is replaced by the building roof surface, even though it is a new roof.

Areas of pervious paving that are underlain with pervious soil or pervious storage material, such as a gravel layer sufficient to hold at least the Provision C.3.d volume of runoff are not considered impervious surfaces, and are excluded from the calculation of impervious surfaces.

Figure 3-2 shows how the C.3 Data Form is used to determine whether Provision C.3 requirements apply. As indicated in Item 4.a of the form, projects that meet or exceed the size thresholds for impervious surface must include site design measures (Step 3), pollutant source controls (Step 4), and stormwater treatment measures (Step 6). If your project is below the C.3. thresholds, check with the local jurisdiction to determine whether Steps 3 and 4 will apply to your project. As indicated in Item 4.b of the form, if a project replaces more than 50% of the existing impervious area, C.3 requirements apply to the entire site. For projects that replace 50% or less of the existing impervious area, C.3 requirements apply only to the impervious area created and/or replaced.

<p>4. MRP Provision C.3 Applicability:</p> <p>a. Is #2.d. equal to 10,000 sq. ft. or more, or 5,000 sq. ft. or more for restaurants, auto service facilities, retail gas outlets, and uncovered parking?</p> <p><input type="checkbox"/> Yes, C.3. source control, site design and treatment requirements apply</p> <p><input type="checkbox"/> No, C.3. source control and site design requirements may apply – check with local agency</p> <p>b. Is #2.f. greater than 50%?</p> <p><input type="checkbox"/> Yes, C.3. requirements (site design and source control, as appropriate, and stormwater treatment) apply to entire site</p> <p><input type="checkbox"/> No, C.3. requirements only apply to impervious area created and/or replaced</p>

Figure 3-2: Excerpt from C.3 Data Form (C.3 Applicability)

To determine HM applicability, you will answer the questions on page two of the C.3 Data Form, shown in Figure 3-3:

5. Hydromodification Management (HM) Applicability:

a. Does project create and/or replace one acre or more of impervious surface AND create an increase in total impervious surface from the pre-project condition (i.e., is 2.g. > 2.c.)?

Yes (continue)
 No – exempt from HM, go to page 3

b. Is the project located in an area of HM applicability (green area) on the HM Applicability Map? (www.scurppp-w2k.com/hmp_maps.htm)

Yes, project must implement HM requirements
 No, project is exempt from HM requirements

Figure 3-3: Excerpt from C.3 Data Form (HM Applicability)

HM measures are required for projects that create and/or replace one acre or more of impervious surface, AND result in an increase in impervious surface, AND are located in susceptible areas identified in the HM Applicability Maps. See Chapter 7 for more information on HM requirements.

Projects that are adjacent to streams and creeks may be required to comply with the Santa Clara Valley Water District's stream stewardship requirements. Check with the local municipality for the applicable requirements.

Step 3: Incorporate Site Design Measures

Design the site layout to minimize changes to the natural topography. Using the information collected in Step 1, identify any existing sensitive natural resources on the site that will be protected and preserved from development. These may include the following types of areas:

- Development should be set back from ***creeks and riparian habitat*** as required by the local jurisdiction. If your project involves impacts to creeks and riparian habitat, contact municipal staff to determine what coordination with the Regional Water Board and/or other resource agencies is required.
- If the project includes ***wetlands*** subject to Section 404 of the federal Clean Water Act, or habitat for ***special-status species*** protected by federal or State laws, these areas should be indicated, and evidence should be provided to demonstrate compliance with the applicable laws.
- The project will need to comply with any local tree preservation ordinances and other policies protecting ***heritage or significant trees***. Mature trees can offer substantial stormwater benefits, and their preservation is recommended, where feasible, even if it is not required by law. (See Section 4.5 for potential treatment credits for existing trees.)

- The project needs to comply with any local restrictions on development of **steep slopes** and soils that are susceptible to **erosion**. Even where not required by law, the avoidance of such areas is advisable in order to reduce stormwater impacts.

Using site design measures to reduce impervious surfaces on your site can **reduce the size** of stormwater treatment measures that you will need to install.

Design the project to minimize the overall coverage of impervious paving and roofs, with a special focus on reducing the amount of impervious area that is directly connected to the storm drain system. Using site design measures to reduce impervious surfaces on your site can **reduce the size and cost of stormwater treatment measures** that you will need to install. But remember, even vegetated areas will generate some runoff. If runoff from landscaped areas flows to a stormwater treatment measure, that treatment measure will need to be sized to handle these relatively small amounts of runoff, as well as runoff from impervious surfaces. The use of self-treating areas (described below) can reduce the size of treatment measures even further.

Page 3 of the C.3 Data Form includes a checklist of site design measures (Figure 3-4), where you will indicate which site design measures have been incorporated into your project.

Site Design Measures

- Minimum land disturbed
- Minimized impervious surfaces
- Minimum-impact street or parking lot design
- Cluster structures/ pavement
- Disconnected downspouts
- Pervious pavement
- Green roof
- Microdetention in landscape
- Other self-treating area
- Self-retaining area
- Rainwater harvesting and use (e.g., rain barrel, cistern connected to roof drains)
- Preserved open space: _____ ac. or sq. ft. (circle one)
- Protected riparian and wetland areas, riparian buffers (Setback from top of bank: _____ft.)
- Other _____

Figure 3-4: Excerpt from C.3 Data Form (Site Design Measures)

Options for site design techniques include the following:

- Direct **runoff to depressed landscaped areas**. You may be able to design an area within your site to function as a “self-retaining area,” in which the amount of stormwater runoff that is required to be treated is infiltrated or retained in depressed landscaped areas. A maximum 2:1 ratio of impervious area to the receiving pervious area is acceptable, where the pervious area can pond up to 3 inches in depth (see Chapter 4). Much higher ratios are possible if the runoff is directed to a bioretention area or other landscape-based treatment measures.
- Use **alternative site layout techniques** to reduce the total amount of impervious area. This may include designing compact, multi-story structures or clustering buildings. Some cities may allow narrow streets and (in very low-density neighborhoods) sidewalks on only one side of the street.
- **Minimize surface parking** areas, in terms of the number and size of parking spaces.
- Use **rainwater as a resource**. Capturing and retaining roof runoff in rain barrels or cisterns can be a practical way to reduce the amount of runoff from the site and store rainwater for use in on-site irrigation. Small-scale rainwater harvest systems (e.g., rain barrels) are considered a “site design” practice and do not need to be hydraulically sized for treatment. Use of larger scale rainwater harvest systems for treatment is described in Step 6 and Chapter 6.
- Use **drainage as a design element**. Vegetated swales, depressed landscape areas, vegetated buffers, and bioretention areas can serve as visual amenities and focal points in the landscape design of your site.



Figure 3-5: Stevens Creek Corridor Park in Cupertino includes turf block pavers in parking lot.

- Include alternative, pervious surfaces. **Green roofs** can partially or fully replace traditional roofing materials. **Pervious surfaces** such as crushed aggregate, turf block, unit pavers, or pervious paving can be used for sidewalks, parking lots, and low-volume residential streets. Green roofs and areas of pervious paving may be designed to function as self-treating areas (see next bullet).
- Identify **self-treating areas**. Some portions of your site may provide “self-treatment” if properly designed and drained. Such

areas may include conserved natural spaces, large landscaped areas (such as parks and lawns), green roofs and areas of pervious paving. These areas are considered “self-treating” because infiltration and natural processes that occur in these areas remove pollutants from stormwater. As long as the self-treating areas do **not receive runoff from impervious areas** on the site, your drainage design may direct the runoff from self-treating areas directly to the storm drain system or other receiving water.

More information on site design techniques, including self-treating and self-retaining areas is provided in Chapter 4. In addition, the Urban Runoff Program's "Developments Protecting Water Quality: A Guidebook of Site Design Examples" contains numerous photographs of examples of site design measures installed in the Santa Clara Valley².

Step 4: Incorporate Source Control Measures

Pollutants are generated by many common activities that will occur after construction is completed. Each local jurisdiction has specific pollutant source control requirements for projects that include landscaping, swimming pools, vehicle washing areas, trash/recycling areas, and other sources of pollutants. The SCVURPPP **Model Source Control Measures List** is provided in Appendix H for reference (note that local lists may vary.) The list is divided in two parts: Structural Source Controls and Operational Source Controls. The two types of source controls are described as follows:

- **Structural Source Controls** - Structural source controls are permanent features that are designed and constructed as part of a project to keep pollutants from coming in contact with stormwater runoff, such as sanitary sewer connections for restaurant wash areas.
- **Operational Source Controls** – Operational source controls are “good housekeeping” activities that must be conducted routinely during the operations phase of the project – such as cleaning spills with dry methods, parking lot sweeping and maintaining “No Dumping” messages on drain inlets.

Source control measures are permanent structures or operational activities that aim to **prevent runoff pollution** by reducing the potential for contact between the pollutant source and the stormwater runoff.



Figure 3-6: A turf block fire lane in Mountain View.

Your project will need to incorporate the applicable source controls for any project activity that is included in the local source control lists. The following methods may be used to accomplish this.

- **Review structural source controls** in the SCVURPPP Model List or the local list and compare this list to your site plan and intended facility uses after construction. Identify any areas on the site that require structural source controls. Remember that some activities

² The document can be found at this web link:
http://www.sevurppp-w2k.com/nd_wp.shtml#sitedesignguidebook

may not have been sited yet. For example, the Model List includes a requirement for enclosing and roofing refuse storage areas. If a project designer was unaware of this requirement, it may not be shown on the project plans.

- ***Incorporate into project drawings*** all applicable structural source controls.
- ***Review the operational source controls*** to determine which are applicable to the proposed uses of the site.
- ***Document applicable source controls*** on the C.3 Data Form and in notes on the site plan or in the Stormwater Management Plan. One way to do this is to prepare and submit a table listing the potential sources of pollutants, the structural source control measures, and any operational source control measures that apply to the project. Table 3-2 is an example Table of Source Controls.

Table 3-2 Example Table of Stormwater Source Controls		
Potential Source of Pollutants	Structural Source Controls	Operational Source Controls
Litter, pesticides, motor oil or other on-site pollutants	On-site storm drains shall be clearly marked with the words “No Dumping! Flows to Bay” (or applicable water body) per the municipality’s specifications.	All on-site storm drain inlets shall be cleaned at least once a year immediately prior to the rainy season.
Refuse areas	New buildings (such as food service facilities and/or multi-family residential complexes or subdivisions) shall provide a covered or enclosed area for dumpsters and food waste and recycling containers that drains to the sanitary sewer. The area shall be designed to prevent water run-on to the area and runoff from the area.	The refuse area shall be kept clean and free of trash.

You will need to indicate which source control measures you have incorporated into your project on page three of the C.3 Data Form. This checklist, which is shown in Figure 3-7, is not exhaustive; see Appendix H and check with the local jurisdiction for all the source control measures that will need to be incorporated.

<u>Source Controls</u>	
<input type="checkbox"/>	Alternative building materials?
<input type="checkbox"/>	Wash area/racks, drain to sanitary sewer
<input type="checkbox"/>	Covered dumpster area, drain to sanitary sewer
<input type="checkbox"/>	Sanitary sewer connection or accessible cleanout for swimming pool/spa/fountain
<input type="checkbox"/>	Beneficial landscaping (minimize irrigation, runoff, pesticides and fertilizers; promotes treatment)
<input type="checkbox"/>	Outdoor material storage protection
<input type="checkbox"/>	Covers, drains for loading docks, maintenance bays, fueling areas
<input type="checkbox"/>	Maintenance (pavement sweeping, catch basin cleaning, good housekeeping)
<input type="checkbox"/>	Storm drain labeling
<input type="checkbox"/>	Other _____

Figure 3-7: Excerpt from C.3 Data Form (Source Controls)

Step 5: Determine Drainage Management Areas on Site

Review information on the existing and proposed site drainage network and connections to drainage offsite, which was collected in Step 1. Based on site topography, divide the site into Drainage Management Areas (DMA), each of which will drain to its own stormwater treatment area. A rooftop may be considered a DMA on its own, or it may be part of a larger DMA. Selecting appropriate locations for treatment and HM measures involves a number of important factors, including the following:

- **Design for gravity flow.** Treatment/HM measures should be designed so that drainage into and out of the treatment measure is by gravity flow. This promotes effective, low-maintenance operation and helps avoid mosquito problems. Pumped systems should not be used for new and redevelopment projects as these sites should be implementing, and have every opportunity to implement, the goal of Provision C.3.c. to its full extent by mimicking a site's predevelopment hydrology and treating stormwater runoff close to its source. Pumped systems may be necessary for retrofit projects (particularly in the public right-of-way or those subject to the 50% rule) but should be considered the last resort, as they are more expensive, require more maintenance, are difficult to inspect, can introduce sources of underground standing water that promotes mosquito production, and have greater potential for failure. If pump systems are used in a project design, a dual pump or back-up system should be included to reduce the chance of failure, along with an alarm system to notify the proper owner or operator of a failure. Proper maintenance and inspection methods should also be developed and shared with the responsible party/municipality to help facilitate compliance with Provision C.3.h of the MRP..

- ***Incorporate treatment measures in the landscape design.*** Almost every project includes landscaped areas. Most zoning districts require a certain amount of landscaping or open space, and some require landscaped setbacks or buffers. It may be possible to locate some or all of your project's treatment/HM measures within required landscape areas.
- ***Plan for maintenance access and equipment.*** Stormwater treatment measures will need to be accessible to the largest piece of equipment that will be needed for maintenance. For example, bioretention areas need access for vegetation maintenance. Large extended detention basins need to have a perimeter access road accessible by heavy vehicles for sediment removal and controlling emergent vegetation. Underground treatment measures and media filters require access for periodic cleanout (by vactor truck) and media replacement. All treatment measures should allow access by maintenance workers, inspectors from the local municipality, and staff from the Santa Clara County Vector Control District. If the property will be subdivided, be sure to locate shared treatment measures in a common, accessible area – not on a private lots.



Figure 3-8: This landscaped area in San José also functions as a stormwater treatment area.

Step 6: Select Treatment and HM Measures

There are many different types of treatment measures, each with particular advantages and disadvantages, and new innovative solutions continue to be developed. **Chapter 6** provides technical guidance for specific types of stormwater treatment measures that may be used in the Santa Clara Valley. While other treatment measures may be acceptable, they may add complexity to the review and permitting of your project.

Beginning **December 1, 2011**, stormwater treatment requirements must be met using LID treatment measures, either onsite or offsite at a regional facility. LID treatment measures include infiltration, evapotranspiration, rainwater harvesting and use, and biotreatment (landscape-based treatment measures such as bioretention and flow-through planters). Some landscape-based measures that have been used for stormwater treatment in the past, such as vegetated swales, are not considered LID treatment measures (unless they are designed to function as biotreatment areas). In addition, vault-based systems such as media filters and hydrodynamic separators are not acceptable treatment measures unless they are part of a treatment train. Media filters and proprietary high-rate tree well filters may be allowed for certain types of urban infill, high density or transit-oriented development projects if the projects qualify for LID treatment reduction credits.

LID treatment reduction credits can be applied to urban infill, high density, or transit-oriented development projects that meet specific criteria for “Special Projects” included in Appendix J. Contact municipal staff to determine whether your project meets the criteria to be considered a Special Project. If so, you may be able to use certain non-LID treatment measures for treating runoff from portions of your site for which LID treatment is infeasible. The Special Projects Checklist in Appendix J will help you determine the amount of LID treatment reduction credits that can be applied to your project. The checklist will need to be completed and submitted with your application.

Other general factors to consider when selecting stormwater treatment measures are describe below:

- **Need for hydromodification management.** If your project needs to meet both treatment and HM requirements, consider whether stormwater control measures can be designed to meet both treatment and HM needs. HM detention requirements are likely to exceed the volume required for water quality treatment, and may also need to be coordinated with separate requirements for flood control detention.
- **Size of the project site.** Some treatment measures, such as flow-through planters and tree well filters, are especially suited for very small, urban sites. Bioretention areas may be suitable for many urban settings because of their flexibility in fitting into whatever sizes and shapes of pervious areas are available. For larger sites that can be divided into separate drainage areas, a variety of smaller stormwater treatment measures may be dispersed throughout the site.
- **Soil suitability.** Soils are classified into four hydrologic soil groups – A, B, C, and D – with the soils in each group having similar runoff potential under similar storm and cover conditions. Group A (sandy) soils generally have the lowest runoff potential and the highest infiltration rates. Group D soils (clay loam, sandy clay and clay) have the greatest runoff potential and lowest infiltration rates. Treatment measures that rely primarily on **infiltration**, such as infiltration trenches, may be unsuitable for use in Group D soils as well as some Group C (silty loam) soils. Bioretention areas installed in Group C and D soils typically require underdrains.
- **Site slope.** Landscape-based treatment measures need to be carefully selected and designed when used on steep slopes, because infiltration of stormwater runoff can cause geotechnical instability. Depending on site conditions, it may be possible to design **bioretention areas** using terraces or check dams for projects on sites with some slope constraints.
- **Maintenance requirements.** The amount of maintenance that a stormwater treatment measure will require should be considered when selecting treatment measures. You will need to prepare and submit a **maintenance plan** for stormwater treatment measures with the planning and/or building permit application. Chapter 8 provides information regarding the maintenance requirements for various treatment measures.
- **Potential for mosquito problems.** The mosquito control guidance provided in Appendix F needs to be implemented for all stormwater treatment measures, with special consideration given to treatment measures that may have standing water for long periods of time. This includes some types of media filters that incorporate a permanent pool of water, and extended detention basins or subsurface infiltration systems (vault type) that may take a long time to drain.

- **Potential for groundwater contamination.** If considering an infiltration device, such as an infiltration trench, infiltration basin, or dry well, review the infiltration device guidelines presented in Appendix A to protect groundwater from potential contamination by pollutants in stormwater runoff.

You will indicate which treatment methods and HM methods you have incorporated into the design of your project on page three of the C.3 Data Form, as indicated in Figure 3-9:

<p><u>LID Treatment Systems</u></p> <p><input type="checkbox"/> Rainwater harvest and use (e.g., cistern or rain barrel sized for C.3.d. treatment)</p> <p><input type="checkbox"/> Infiltration basin</p> <p><input type="checkbox"/> Infiltration trench</p> <p><input type="checkbox"/> Exfiltration trench</p> <p><input type="checkbox"/> Underground detention and infiltration system (e.g. pervious pavement drain rock, large diameter conduit)</p> <p><input type="checkbox"/> Bioretention area</p> <p><input type="checkbox"/> Flow-through planter</p> <p><input type="checkbox"/> Tree box with biotreatment soil</p> <p><input type="checkbox"/> Other _____</p>	<p><u>Other Treatment Systems</u></p> <p><input type="checkbox"/> Proprietary tree box filter⁴</p> <p><input type="checkbox"/> Media filter (sand, compost, or proprietary media)</p> <p><input type="checkbox"/> Vegetated filter strip</p> <p><input type="checkbox"/> Dry detention basin</p> <p><input type="checkbox"/> Other _____</p>
<p><u>Flow Duration Controls for Hydromodification Management (HM)</u></p>	
<p><input type="checkbox"/> Detention basin <input type="checkbox"/> Underground tank or vault <input type="checkbox"/> Bioretention with outlet control <input type="checkbox"/> Other _____</p>	

Figure 3-9: Excerpt from C.3 Data Form (Treatment and HM Controls)

Step 7: Preliminary Design of Treatment and HM Measures

Perform preliminary design of the stormwater treatment measures you have selected using the hydraulic sizing criteria in Section 5.1 and the technical guidance for specific types of treatment measures in Chapter 6. You may be required to complete the sizing worksheets in Appendix B or provide similar documentation of the sizing calculations.

Drawings and details need to be included to illustrate the proposed design and sizing information based on runoff calculations. As indicated in Figure 3-10, you will also need to indicate in the C.3 Data Form which hydraulic sizing criteria were used when designing the treatment measures:

7. Treatment System Sizing for Projects with Treatment Systems		
Indicate the hydraulic sizing criteria used and provide the calculated design flow or volume:		
Treatment System Component	Hydraulic Sizing Criteria Used ³	Design Flow or Volume (cfs or cu.ft.)

³Key: 1a: Volume – WEF Method
 1b: Volume – CASQA BMP Handbook Method
 2a: Flow – Factored Flood Flow Method
 2b: Flow – CASQA BMP Handbook Method
 2c: Flow – Uniform Intensity Method
 3: Combination Flow and Volume Design Basis

Figure 3-10: Excerpt from C.3 Data Form (Hydraulic Sizing Criteria)

Design of HM measures is described in Chapter 7. The technical guidance in this handbook promotes the use of the **Bay Area Hydrology Model (BAHM)**, a tool for sizing HM measures, developed by the Urban Runoff Program in cooperation with the Clean Water Program (Alameda County) and the San Mateo Countywide Stormwater Pollution Prevention Program. The BAHM has been approved by the Regional Water Board as an acceptable tool for ensuring that HM measure sizing is in compliance with the MRP. The BAHM may be downloaded at www.bayareahydrology.com.

Step 8: Specify Soils and Consider Planting Palettes for Treatment Measures

A specialized, biotreatment soil mix must be used with landscape-based treatment measures in order to ensure the appropriate infiltration rate for proper filtering of pollutants and the viability of the plants. MRP Provision C.3.c.i(2)(c)(ii) requires biotreatment soils with a minimum infiltration rate of 5 inches per hour, and a biotreatment measure surface area no smaller than what is required to accommodate a 5 inches/hour stormwater runoff surface loading rate. For more information on the appropriate soil mix for your treatment measure, refer to the regional soil specifications for use in stormwater biotreatment measures included in Appendix C.

The selection of appropriate plant materials is an important part of designing an effective landscape-based stormwater treatment measure. Plants need to be hardy, low-maintenance,

and tolerant of saturated soils. Natives or drought tolerant plants that can survive long periods with little or no rainfall will **help reduce irrigation requirements**, although irrigation is typically required for the establishment period. Appendix D provides guidance regarding the selection of plant materials for landscape-based treatment measures.

Step 9: Coordinate Stormwater Management Plan with Other Project Elements

When submitting the C.3 stormwater drawings with the permit submittal, the stormwater site design, source control, treatment and HM measures must be shown on a separate Stormwater Management Plan sheet. Check with the local municipality about its specific requirements for text descriptions that may need to accompany the Stormwater Management Plan sheet. In addition to the Stormwater Management Plan, there are a number of issues that must be carefully coordinated with other aspects of the project design. Some typical coordination considerations are listed below.

- ***Balance of Cut and Fill.*** When calculating the overall project balance of cut and fill, be sure to include the excavation of stormwater treatment measures.
- ***Soil Compaction during Construction.*** Compaction for building pads, remedial areas and from construction traffic can severely restrict the infiltration capacity of soils at your site. In the construction staging plan, protect and limit operation in those portions of the site that will accommodate self-treating areas or stormwater treatment measures that rely on infiltration.
- ***Building Drainage.*** Building codes require that drainage from roofs and other impervious areas be directed away from the building. The codes also specify minimum sizes and slopes for roof leaders and drain piping. Any stormwater measure located in close proximity to the building, or that may affect building foundations, must be designed to meet the minimum building code requirements.
- ***Control of Elevations.*** Getting runoff to flow from impervious surfaces to landscaped surfaces may require greater attention to slopes and elevations in grading and landscaping plans. For example:
 - ***Provide Adequate Change in Elevation between the pavement and vegetated areas.*** The landscaped area needs to be low enough so that runoff will flow into it even after the turf or other vegetation has grown up. If adequate slope is not provided, runoff will tend to pond on the edge of the paved surface.
 - ***Prevent Erosion.*** There is potential for erosion to occur at points where the stormwater runoff flows from impervious areas into landscape-based treatment measures. Include erosion controls, such as cobbles or splash blocks, in the project plans.
 - ***Provide for Differential Settlement.*** While the soil in landscaped-based stormwater treatment measures and self-treating areas must be left loose and uncompacted, concrete structures (such as inlets and outlets) must be supported on a firm foundation (compacted per specifications from the Geotechnical Engineer). Otherwise they may settle more than the surrounding ground, creating depressions that can hold standing water and contribute to nuisances such as mosquito breeding.
- ***Drainage Plans.*** The local building or engineering department may require a drainage plan, which typically focuses on preventing street flooding during a 10-year storm and demonstrating that flooding from 100-year storms can be managed below the elevation of

habitable structures. To meet the drainage plan requirements, it may be necessary to include **high flow bypasses** in the design of stormwater treatment measures, in order to route high flows directly to the storm drain system. More information on high flow bypasses is provided in Chapter 5. Check with your local jurisdiction regarding the need to prepare a drainage plan, and when it is required to be submitted.

- **Signage for Traffic and Parking.** If your project includes depressed landscaped areas next to parking lots, driveways or roadways, it may be necessary to include bollards, striping or signs to guide traffic, especially if curbs are flush with the pavement. Traffic striping may not be practical for some permeable pavements such as crushed aggregate and unit pavers. In these areas, signs and bollards may be needed to help direct traffic.
- **Existing and Proposed Utilities.** Landscaped treatment facilities like bioretention areas often end up being the locations for street lights, backflow preventers, fire hydrants, mail boxes, and utility boxes. These features reduce the bioretention area below the proposed sizing (above and below ground), obstruct flow, and reduce infiltration due to soil compaction for the stability of the utilities. Utilities in these areas should be restricted or prohibited unless they can accommodate the issues listed above.

Step 10: Prepare a Preliminary Maintenance Plan

A stormwater treatment measure maintenance plan describes how stormwater treatment measures will be maintained after construction is completed during the life of the project. The C.3 Data Form you will complete and turn in with your permit submittal requires the property owner’s name and the contact information for the party responsible for proper operation and maintenance (see Figure 3-11). **Check with your local jurisdiction** regarding when a complete maintenance plan is required for your project.

9. Operation & Maintenance Information	
A. Property Owner’s Name	_____
B. Responsible Party for Stormwater Treatment/Hydromodification Control O&M:	
a. Name:	_____
b. Address:	_____
c. Phone/E-mail:	_____

Figure 3-11: Excerpt from C.3 Data Form (O&M Information)

A preliminary maintenance plan identifies the **proposed maintenance activities**, and the intervals at which they will be conducted, for each stormwater treatment measure included in the project. As part of the permit submittal, applicants may also need to provide additional information that will be included in a maintenance agreement between the local municipality and the property owner. Chapter 8 provides more information about stormwater treatment measure operation and maintenance. Maintenance plan templates for various types of stormwater treatment measures are included in Appendix G.

Step 11: Submit Permit Application

Assemble all the items listed in Table 3-1 that municipal staff indicates are required for your project, complete the C.3 Data Form and include them as attachments to the Stormwater Management Plan that you will submit with the permit application.

3.3 Preparing for Construction

Projects that disturb one acre or more of land require coverage under the State's Construction General Permit. To obtain coverage, you must file a Notice of Intent (NOI) and prepare a Stormwater Pollution Prevention Plan (SWPPP). Details on SWPPP development can be found at: www.swrcb.ca.gov/water_issues/programs/stormwater/construction.shtml and the CASQA Construction BMP Handbook Portal (subscription required). The local municipality will not issue a grading permit until it has received a waste discharge identification number (WDID) demonstrating you have coverage under the Construction General Permit. Some municipalities also require a copy of the SWPPP. Information is collected on the C.3 Data Form (see Figure 3-12) to determine whether coverage under this General Permit is needed.

<p>3. State Construction General Permit Applicability:</p> <p>a. Is #2.b. equal to 1 acre or more?</p> <p><input type="checkbox"/> Yes, applicant must obtain coverage under the State Construction General Permit (i.e., file a Notice of Intent and prepare a Stormwater Pollution Prevention Plan) (see www.swrcb.ca.gov/water_issues/programs/stormwater/construction.shtml for details).</p> <p><input type="checkbox"/> No, applicant does not need coverage under the State Construction General Permit.</p>

Figure 3-12: Excerpt from C.3 Data Form (Construction General Permit Applicability)

If your project will disturb less than one acre of land (including material storage and contractor areas), it does not need Construction General Permit coverage, but you will likely need to prepare an erosion and sediment control plan to comply with local erosion control ordinances. Check with your local jurisdiction to determine the requirements.

3.4 Simple Instructions for Small Sites

Some developers of smaller projects may be less familiar with requirements to incorporate stormwater treatment measures. If you are a qualified engineer, architect or landscape architect, you may be able to prepare the entire C.3 submittal yourself. If not, you will probably need to hire a **qualified civil engineer, architect or landscape architect** to prepare the submittal – or at least some of the more technical aspects of the submittal. Some tips for smaller projects are provided below:

- **Review submittal checklists with municipal staff.** You will need to include in your permit application submittal some of the items that are listed in the Table 3-1 checklist. Not every item in the checklist is required for every project. Consult with municipal staff and refer to web resources to determine submittal requirements.

- **Maximize the use of site design measures.** The less impervious surface area on the site, the smaller your stormwater treatment measures will need to be. Chapter 4 lists many strategies for reducing impervious surfaces, and it offers guidance for using self-treating areas (for example, lawns, areas paved with turf block, or green roofs) to further **reduce the size** of treatment measures. In some cases, you may be able to reduce the amount of impervious surface below the size threshold for C.3 applicability and eliminate the need for stormwater treatment measures. Note that, beginning **December 1, 2012**, projects that create and/or replace at least 2,500 but less than 10,000 square feet of impervious surface are required to incorporate one of six site design measures. Guidance on implementing these requirements is included in Appendix K..
- **Use LID treatment measures.** For small sites subject to treatment requirements, LID treatment measures must be used, except for projects that may receive LID treatment reduction credits as a Special Project (described in Appendix J). Chapter 6 includes technical guidance for LID treatment measures such as flow-through planters, tree well filters, and green roofs, which are suitable for **small sites in densely developed areas**. Bioretention areas also lend themselves well to small sites, as they can fit into whatever space may be available on the property.
- **Consider using the simplified sizing method.** Chapter 5 includes a simplified sizing method for flow-through planters and bioretention areas. The simplified sizing calculations may result in treatment measures that are conservatively large. If space is at a premium, it may be cost-effective to hire a civil engineer with experience sizing stormwater treatment measures and use the more detailed sizing calculations, in order to potentially reduce the amount of land needed for stormwater treatment.
- **Use the planting guidance.** Appendix D provides guidance for selecting appropriate plantings for landscape-based stormwater treatment measures. Municipal staff will check to confirm that the plants included in your design meet the criteria in this handbook.