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2015 POST-CONSTRUCTION STANDARDS PLAN

A GUIDANCE DOCUMENT ON STORM WATER POST-CONSTRUCTION DESIGN MEASURES FOR DEVELOPERS AND PLAN CHECKERS

JUNE 30, 2015

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INTRODUCTION AND REGULATORY REQUIREMENTS

1 Introduction and Regulatory Requirements

This Post-Construction Standards Plan was prepared for the County of Stanislaus Stormwater Program to guide project proponents and municipal plan checkers through the various site design requirements of the Phase II Municipal Separate Storm Water Sewer System (MS4) Permit. This introductory section describes the purpose of the plan; a background summary of the Federal and State regulations; the regional collaborative approach taken by many Central Valley municipalities; an overview of the post-construction site design requirements; and, finally, the roles and responsibilities of the plan checker and project proponent.

1.1 PURPOSE OF THE PLAN

According to the California State Water Resource Control Board (Water Board), urban storm water runoff is listed as the primary source of impairment for ten percent of all rivers, lakes and reservoirs, and seventeen percent of all estuaries in California.[1] While these numbers may not seem significantly large, considering that urban areas cover only six percent of the land mass of California[2], the impact that runoff from urban areas has on California's surface waters is disproportionally large. When the Water Board uses the term "urbanization", it is referring to the development of land through which the imperviousness percentage increases; meaning that buildings and hardscapes prevent water from infiltrating into the ground, thereby, causing it to flow off of the property. Increased urbanization through new development and redevelopment has been shown to cause more frequent storm water discharge events, higher peak flow velocities, and larger volumes of storm water runoff. These conditions, if not properly managed, can affect water quality by mobilizing greater and more frequent loads of pollutants such as sediment, organic material, trash, nutrients, pathogens, heavy metals, and other toxic substances. These conditions also over tax existing natural and man-made drainage systems, causing accelerated erosion of channels and deposition of sediment and pollutants in estuaries, deltas, and basins. High volumes and velocity of stormwater flow can cause flooding and deterioration of waterways that would have otherwise been adequate to handle the expected runoff. This has a direct impact on municipalities by causing them to perform increased maintenance on existing systems and to develop new

Figure 1 - Channels, streams, and drainage ways are over taxed by increases in runoff caused by increased development and impervious surfaces.

[1] Fact Sheet of the Phase II MS4 Permit, Order No. 2013-0001-DWQ, p. 33 - 34

[2] U.S. Department of Agriculture, 2009

drainage systems with higher capacities. Urbanization and the resulting runoff can also impact the State's ability to realize the full potential of the beneficial uses of its surface waters.

Low Impact Development – A sustainable practice that benefits water supply and contributes to water quality protection. Unlike traditional storm water management, which collects and conveys storm water runoff through storm drains, pipes, or other conveyances to a centralized storm water facility, Low Impact Development (LID) takes a different approach by using site design and storm water management to maintain the site's pre-development runoff rates and volumes. The goal of LID is to mimic a site's predevelopment hydrology by using design techniques that infiltrate, filter, store, evaporate, and retain runoff close to the source of rainfall. LID has been a proven approach in other parts of the country and is seen in California as an alternative to conventional storm water management.
Source: Phase II MS4 Permit Glossary

The purpose of this document is to provide developers and municipal plan checkers with information to meet the State Water Board's requirements for mitigating the negative impact of increases in storm water runoff caused by new development and redevelopment. This document accomplishes this goal through the incorporation of Low Impact Development standards and hydromodification management techniques. Low Impact Development (LID) mitigates excessive runoff by the use of control measures that utilize evapo-transpiration, infiltration, capture / reuse, and biotreatment to mimic the runoff of a natural environment. Hydromodification techniques are used to design development sites so that post-construction runoff flow rates do not exceed those of the pre-construction conditions.

Using this document, developers will be equipped to provide a submittal package to the municipality as a part of its permitting or plan check process to adequately demonstrate how the project will meet the LID and hydromodification requirements.

Plan checkers will be able to use this document to objectively and sufficiently condition discretionary projects with the required post-construction storm water design requirements.

1.2 FEDERAL AND STATE REGULATORY REQUIREMENTS

The Federal Clean Water Act of 1972 is the impetus behind the regulations to manage storm water discharges from new development and redevelopment projects. The Clean Water Act delegates authority to the States to issue National Pollutant Discharge Elimination System (NPDES) permits for discharges of storm water from construction, industrial, and municipal entities to Waters of the United States. Large and medium size municipalities were issued individual municipal NPDES permits in the first phase (Phase I) of the process. Subsequently, small municipalities identified by the State of California were required to obtain permit coverage under the Phase II General NPDES Permit for Municipal Separate Storm Sewer Systems (MS4s). These Phase II MS4s (municipalities) are required to implement various storm water management programs, one of which is to require certain new development and applicable redevelopment projects to incorporate post-construction storm water control measures into their design that include LID and hydromodification techniques. The County of Stanislaus Stormwater Program is one of the municipalities specified in the current Phase II MS4 Permit that must comply with these post-construction

requirements, which are contained in Section E.12 of Order No. 2013-0001-DWQ. (Refer to Appendix 3 for a copy of Section E.12 of the Phase II MS4 Permit.)

1.3 REGIONAL APPROACH AND MUNICIPAL COLLABORATION

The post-construction requirements are not new with this version of the Phase II MS4 Permit. The previous version of the permit also contained LID and post-construction requirements. For many years, Phase I MS4s have been requiring new development and redevelopment projects to include post-construction design measures into site designs. Even projects located outside of an MS4 must now incorporate post-construction and LID measures into their designs as required by the State's Construction General Permit. However, as this area of storm water management has grown to maturity, post-construction requirements and programs have changed significantly and there can be dramatic differences between the control measures required in two neighboring municipalities. This, obviously, can cause confusion for developers. With the issuance of the current Phase II MS4 Permit and the requirement for municipalities to revise their post-construction standards to meet the Section E.12 permit requirements, an opportunity arose for many Phase II MS4s to work together to develop a consistent Post-Construction Standards Plan. Collaboration on this task not only shares the cost of development with other MS4s, but also provides a standardized plan that developers will encounter in 17 different Central Valley municipalities. Another benefit of collaboration is that it allows for the regional training of plan checkers, saving time and costs for each municipality. Refer to Appendix 10 for a list of the collaborating Central Valley municipalities.

1.4 OVERVIEW OF THE POST-CONSTRUCTION REQUIREMENTS

The Phase II MS4 Permit requires the County of Stanislaus Stormwater Program to condition certain small projects to implement one or more **Site Design Measures** that "treat" storm water runoff using methods to evapo-transpire, infiltrate, harvest and reuse, or biotreat. After proponents of small projects select the Site Design Measure(s), they are required to quantify the runoff reduction achieved through the implementation of these measures by using the State Water Board's Post-Construction Calculator (which can be downloaded following the information provided in Appendix 5).

Proponents of larger projects are required to implement into their design and on-going activities specific **Source Control Measures** to minimize the impact of pollutant-generating activities. For example, if the project includes a permanent trash enclosure in its design, it will be required to follow the California Storm Water Quality Association's (CASQA) design standard SD-32; meaning, that among other requirements, the trash enclosure must have a wall or screen

Hydromodification - Modification of hydrologic pathways (precipitation, surface runoff, infiltration, groundwater flow, return flow, surface-water storage, groundwater storage, evaporation and transpiration) that results in negative impacts to watershed health and functions.

Source Control - Land use or site planning practices, or structural or nonstructural measures, that aim to prevent runoff pollution by reducing the potential for contact with rainfall runoff at the source of pollution. Source control BMPs minimize the contact between pollutants and urban runoff.

Source: Phase II MS4 Permit Glossary

around it and a rain-proof covering or container lids. This larger project will also be required to incorporate into its design specific **Low Impact Development (LID) Standards** such as concentrating development on portions of the site with less permeable soils and preserving areas that can promote infiltration. As with the smaller project, the larger project must implement one or more **Site Design Measures** to "treat" storm water, such as with permeable pavement or a green roof. But in the case of a larger project, the Site Design Measure(s) must be sized following one of two specified hydraulic sizing criteria. In addition, the project will be required to incorporate **Hydromodification Management Measures** that slow and minimize the amount of runoff so that, ideally, and where possible, there is no net increase of the post-construction runoff flow rate compared to the pre-construction value for a 2-year, 24-hour storm event. The project proponent or subsequent property owner is required to maintain these storm water control measures in an effective condition in perpetuity.

1.5 ROLE OF THE MUNICIPAL PLAN CHECKER

The Phase II MS4 Permit states that the municipality "shall require these post-construction standards to be applied to applicable new and redevelopment regulated projects, both private development requiring municipal permits and public projects, to the extent allowable by applicable law." Therefore, the role of the municipal plan checker is to verify that applicable projects have been properly conditioned with the post-construction standards. The plan checker will be responsible for performing the following tasks:

- Since LID is integral to the project design, post-construction submittal requirements shall be communicated early in the development process with the issuance of land use permits or conditions of approval. Example comment: "Project will be subject to the requirements contained in the County of Stanislaus Post Construction Standards Plan. All required Post Construction submittal documents shall be received and approved by the County of Stanislaus prior to the issuance of any Grading or Building Permit."
- Perform an initial review of the submitted post-construction package including the completed Post-Construction Project Worksheet (included in Appendix 8) and the Operation and Maintenance Plan and Certificate of Responsibility (Appendix 9).
- Transmit the package to the municipality's in-house or contracted engineering staff for review of design and calculations.
- Communicate to the project proponent any required changes or modifications and request a re-submittal of information.
- Review the adequacy of the submitted Operation and Maintenance Plan for the proposed post-construction design measures and make sure that the signed Certificate of Responsibility has been received.
- Condition the project with the proposed and approved post-construction design measures.

- Maintain records of all submitted post-construction design information and plans for a minimum of 5 years.
- Enter information about Regulated Projects into the Accela database so that they can be tracked by the County for annual verification that the storm water treatment measures and hydromodification measures are being maintained in an effective condition.

1.6 ROLE OF THE PROJECT PROPONENT

The Phase II MS4 Permit and the County of Stanislaus Stormwater Program require project proponents to incorporate post-construction measures into the project design that reduce the volume of and mitigate pollutants in storm water runoff. The role of the project proponent is to select design measures that are appropriate for the project and will adequately meet the goals of this Post-Construction Standards Plan. The project proponent will be responsible for performing the following tasks:

- Selecting, sizing, and engineering site design measures, source control measures, and hydromodification management techniques that are adequate in meeting the requirements of this plan.
- Providing to the municipal plan checker the required submittal package, supporting information, maps, drawings, and calculations, including plans and calculations that have been stamped by a certified and / or licensed professional.
- Providing an Operation and Maintenance Plan and an owner- signed Certificate of Responsibility to the plan checker for the on-going maintenance of the post-construction design measures.
- Providing any additional requested information to the plan checker.
- Verifying that approved site design measures and source control measures are constructed as specified on the approved plans. The project engineer or other licensed professional must submit a signed and stamped statement of completion to the County prior to final closure of Building Permit.

2 Applicability

For the purposes of this Post-Construction Standards Plan, all development projects fall into one of three possible categories: (1.) small, (2) regulated, or (3) not applicable. If a project does not qualify as either small or regulated, then the Post Construction Standards Plan is considered to be not applicable.

2.1 SMALL PROJECTS 2,500 TO 5,000 FT^2

Small projects are defined as those that create and/or replace between 2,500 ft^2 and 5,000 ft^2 of impervious surface. This includes projects that have no net increase in the impervious footprint. Single family homes that create and / or replace 2,500 ft^2 or more of impervious surface and are not part of a larger plan of development are considered to be small projects. Small projects would include, but not be limited to, the following:

Figure 2 - A single family home that creates and / or replaces 2,500 ft^2 or more is a small project.

- New construction that creates between 2,500 ft^2 and 5,000 ft^2 of impervious surface;
- A demolition of a small project site and the redevelopment of that site if more than 2,500 ft^2 of impervious surface is replaced or created;
- The replacement of a 2,500 ft^2 or greater parking lot;
- The construction of a new parking lot that is greater than 2,500 ft^2 but less than 5,000 ft^2; and
- A roadway or sidewalk project that is creating or replacing between 2,500 ft^2 and 5,000 ft^2 of impervious surface.

Linear utility projects (LUPs) are not subject to the small project Site Design Measures.

2.2 REGULATED PROJECTS >5,000 FT^2

For the purposes of this Post-Construction Standards Plan, a "Regulated Project" is one that will create and / or replace 5,000 ft^2 or more of impervious surface. Regulated Projects include new and redevelopment projects on public or private land that fall under the planning and permitting authority of the municipality. Redevelopment is defined as any land-disturbing activity that results in the creation, addition, or replacement of exterior impervious surface areas on a site on which some previous development has occurred. Redevelopment

Impervious Surface - A surface covering or pavement of a developed parcel of land that prevents the land's natural ability to absorb and infiltrate rainfall/storm water. Impervious surfaces include, but are not limited to; roof tops, walkways, patios, driveways, parking lots, storage areas, impervious concrete and asphalt, and any other continuous watertight pavement or covering. Landscaped soil and pervious pavement, including pavers with pervious openings and seams, underlain with pervious soil or pervious storage material, such as a gravel layer sufficient to hold the specified volume of rainfall runoff are not impervious surfaces.

Source: Phase II MS4 Permit Glossary

projects do not include pavement grinding and resurfacing of existing roadways; construction of new sidewalks, pedestrian ramps, or bike lanes on existing roadways; or routine replacement of damaged pavement for short, non-contiguous sections of roadway.

Regulated Projects do not include the following:

- Detached single family homes that are not a part of a larger plan of development (they are considered to be a "small project" even if they exceed 5,000 ft^2 of impervious surface);
- Projects that are exclusively interior remodels;
- Routine maintenance or repair such as exterior wall surface replacement, pavement grinding and resurfacing within the existing footprint, and roofing replacement or repair;
- Projects consisting solely of sidewalks or bicycle lanes built as part of new streets or roads and built to direct storm water runoff to adjacent vegetated areas;
- Projects consisting solely of impervious trails built to direct storm water runoff to adjacent non-erodible permeable areas;
- Projects consisting solely of sidewalks, bicycle lanes, or trails constructed with permeable surfaces;
- Replacement of damaged pavement, such as pothole repair, or the replacement of short, non-contiguous sections of roadways; and
- Trenching, excavation, and resurfacing associated with Linear Utility Projects (LUPs) unless it has a discrete location that has 5,000 ft^2 or more of newly constructed contiguous impervious surface such as a pump station or maintenance facility. In such cases, only the discrete location is subject to this Post-Construction Standards Plan.

Please note that some of the above-listed projects may still be classified as "small projects" even if they are exempt from being a Regulated Project.

2.2.1 The 50% Rule

If a redevelopment project results in an increase of ***more than*** 50 percent of the impervious surface of a previously existing development, runoff from the entire project, consisting of all existing, new, and / or replaced impervious surfaces, must be included in the selection and sizing of site design measures, LID design standards, and hydromodification management measures to the extent feasible. However, if the redevelopment project results in an increase of ***less than*** 50 percent of the impervious surface, only runoff from the new and /or replaced impervious surface must be included in the selection and sizing of site design measures, LID design standards, and hydromodification management measures.

For street and road widening projects that include additional traffic lanes, where the addition of traffic lanes results in an alteration of ***more than*** 50 percent of the impervious surface,

roadways must include post-construction design measures and be appropriately sized.

runoff from the entire project must be included in the selection and sizing of site design measures, LID design standards, and hydromodification management measures. However, if the addition of traffic lanes results in an alteration of ***less than*** 50 percent of the impervious surface, only the runoff from the new and / or replaced impervious surface is required to be included in the selection and sizing of site design measures, LID design standards, and hydromodification management measures. Road project area will be defined as the total length of the project (soil disturbed area) times the width of the project.

2.2.2 Effective Date of Applicability

This Post-Construction Standards Plan becomes effective on July 1, 2015. Until that date, all projects must comply with the existing and previously-adopted post-construction requirements of the County of Stanislaus Stormwater Program, which includes complying with the design requirements contained in Attachment 4 of the previous Phase II MS4 Permit (Order 2003-0005-DWQ).

After July 1, 2015, this Post-Construction Standards Plan will apply to all applicable public and private new and redevelopment "Small" and "Regulated Projects". Any discretionary projects that have been deemed complete prior to July 1, 2015 and have unexpired vesting tentative maps only need to comply with the municipality's post-construction requirements that were in effect at the time of the map approval. Capital improvement projects or municipal-owned projects, for which their governing body or designee approved the initiation of the project design prior to July 1, 2015, will need only to comply with the post-construction requirements that were in place at that time.

3 The Submittal and Review Process

Projects applicable to this Post-Construction Standards Plan may originate from different sources. They may be private non-discretionary or discretionary projects, or they may be municipally-owned projects. The following sections describe how applicable projects are detected by the municipality and appropriately conditioned with post-construction design requirements. This section also summarizes the submittal requirements for each type of project.

3.1 MINISTERIAL (NON-DISCRETIONARY BUILDING PERMIT) PROJECTS

Projects that are ministerial or non-discretionary projects are those that are not required to pass through the plan check process and can be issued a building permit over the counter. Typically, these projects will either not be applicable to this Post-Construction Standards Plan or be considered "small" projects as defined in Section 2.1. Specific submittal requirements for small projects are identified in Section 4 of this plan. In general, proponents of non-discretionary small projects will need to submit, at the permit counter, information about the project, the selected design measures, and a printout copy of the project's State Water Board Post-Construction Calculator.

If a ministerial project is found to be a "Regulated Project" as defined in Section 2.2, the requirement to include site design measures, source control measures, LID design standards, and hydromodification management techniques will necessitate that it pass through the plan check process and, thus, it will become a discretionary project, with respect to this Post-Construction Standards Plan.

3.2 DISCRETIONARY (PLAN CHECK) PROJECTS

Discretionary projects are those that are required to pass through the plan check process and be conditioned with site-specific requirements. Discretionary projects have the potential to be classified as "small", "regulated", or "not applicable" to this Post-Construction Standards Plan. In general, proponents of discretionary projects must submit to the plan checker information about the project, which may include: the project's applicability status to the Post-Construction Standards Plan, site design plans and specifications, a completed Post-Construction Project Worksheet, an O&M Plan and an owner- signed Certificate of Responsibility. The plan checker will review the post-construction submittal package for completeness and will direct it to the Development Services engineering reviewers. Once comments are received from the Development Services engineering reviewers, the project proponent will be notified by the plan checker of any required modifications or of the approval of the proposed post-construction design measures. Regulated Projects will be entered into the Accela database or spreadsheet to be tracked by the municipality for annual verification that the storm water treatment measures and hydromodification measures are being maintained by the owner in an effective condition.

3.3 CAPITAL IMPROVEMENT / MUNICIPALLY-OWNED PROJECTS

Public projects, capital improvement projects (CIPs), or other municipally-owned projects typically do not pass through the plan check process, but must also be reviewed for applicability of the post-construction requirements. The following process will be implemented by the County of Stanislaus Stormwater Program in conditioning and reviewing projects for the post-construction requirements of the municipality's Phase II MS4 Permit.

1. The municipal department sponsoring the CIP project will review and evaluate the project's applicability to the post-construction requirements and make a determination as to whether the proposed project is a "small" project as defined in Section 2.1, a "regulated" project as defined in Section 2.2, or is exempt from the post-construction requirements.
2. The sponsoring department will submit to the Development Services Division a completed Post-Construction Project Worksheet (included in Appendix 8) which will identify information about the project and the selection of the required post-construction design measures, including the sizing and design criteria for the selected site design measures, source control measures, LID design standards, and hydromodification management techniques.
3. The Development Services Division will review the Post Construction Worksheet submittal and coordinate with the sponsoring department to develop an operation and maintenance plan for the post-construction treatment and hydromodification measures.
4. The municipality will maintain records of all project-related post-construction design information and plans for a minimum of 5 years.
5. Regulated Projects will be entered into a database or spreadsheet to be tracked by the municipality for annual verification that the storm water treatment measures and hydromodification measures are being maintained in an effective condition.

4 Requirements for Small Projects (2,500 to 5,000 ft^2)

The following is a 3-step process required by the County of Stanislaus Stormwater Program for small projects as defined in Section 2.1.

4.1 SELECT SITE DESIGN MEASURES

The first step is for the project proponent to select and implement into the project's design one or more of the following **Site Design Measures**:

Stream Setbacks and Buffers – are vegetated areas (including trees, shrubs, riparian habitat, or herbaceous vegetation) that exist or are established to protect a stream system, lake, reservoir, or estuary. The County requires a minimum land development setback / buffer of 100' from any water body. These areas provide a buffer between the development and the water body to filter out pollutants carried by storm water, provide stabilization of erodible banks, opportunities to infiltrate storm water prior to discharging, and help slow peak flows. The C*alifornia Storm Water Quality Association's (CASQA) Best Management Handbook (BMP) for New Development and Redevelopment* has a specification sheet (TC-31) for Vegetated Buffer Strips that contains useful information applicable to stream setbacks and buffers. It can be downloaded at:

www.casqa.org/sites/default/files/BMPHandbooks/tc-31_from_newdevelopmentredevelopment_handbook.pdf

Soil Quality Improvement and Maintenance – is accomplished through the addition of soil amendments and the creation of a healthy microbial community. Soils with a high organic content are less likely to erode and they provide nutrients needed to maintain healthy plants. This, in turn, means that landscaping will require less fertilizers and pesticides. Soils with a high organic content or covered with a compost layer will retain moisture, requiring less irrigation. Engineered soils allow water to infiltrate and be stored below grade providing LID and hydromodification benefits. The United States Department of Agriculture's Natural Resources Conservation Service (NRCS) has a publication called the *Urban Soil Primer* which is an excellent resource in helping developers

understand how healthy soils improve water quality. This resource can be downloaded at:

www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052835.pdf

Tree Planting and Preservation – includes the preservation of existing trees and the establishment of new ones. Both evergreens and deciduous trees can be utilized. Trees are beneficial to water quality in that they help stabilize erodible soil, dissipate the energy of falling rain, and help slow peak flow rates of stormwater runoff.

Rooftop and Impervious Area Disconnection – are roof drains and hardscapes that do not discharge directly to a storm drain inlet but are directed, instead, to permeable areas or rain water collection and harvesting mechanisms. Water, in excess of the permeable area's infiltration capacity or the capacity of the collection / harvesting system, can be directed to a storm drainage system. CASQA has a BMP specification sheet (SD-11) that provides information about designing roof runoff controls. It can be downloaded at:

www.casqa.org/sites/default/files/BMPHandbooks/sd-11.pdf

Porous Pavement – allows runoff to pass through and infiltrate the underlying soils. Porous pavement systems are typically designed with a subsurface drainage and storage system that consists of a bed of rock and piped collection system below the porous pavement. Where soils have high infiltration rates, water is allowed to drain directly into the soil. Where infiltration rates are less than desirable, a sub-surface gravity collection system conveys excess water to a storm water outfall or storm water sewer system. Porous pavement includes porous asphalt and concrete, porous pavers and bricks, cobbles, reinforced grass pavement, and gravel covered surfaces.

Green Roofs – are an engineered vegetative layer grown on a roof that allow a certain amount of runoff reduction by infiltration, storage, and

REQUIREMENTS FOR SMALL PROJECTS (2,500 TO 5,000 FT2)

evapo-transpiration. In 2010, the United States Environmental Protection Agency (USEPA) published a document titled: *Design Guidelines and Maintenance Manual for Green Roofs in the Semi-Arid and Arid West.* This guidance document can be downloaded at:

http://www2.epa.gov/sites/production/files/documents/GreenRoofsSemiAridAridWest.pdf

Vegetated Swales – are a vegetated, open-channel management practice designed specifically to treat and attenuate storm water runoff through infiltration, biotreatment, and evapo-transpiration. If they are designed with engineered soils, greater storage and infiltration can be achieved. CASQA has a BMP specification sheet (TC-30) that provides information about designing vegetated swales. It can be downloaded at:

www.casqa.org/sites/default/files/BMPHandbooks/TC-30.pdf

Rain Barrels and Cisterns – are systems that collect and store storm water runoff from a roof or other impervious surfaces. Collected water is saved and reused for irrigation or other purposes. In 2008, the USEPA published a document titled: *Managing Wet Weather with Green Infrastructure Municipal Handbook: Rainwater Harvesting Policies*. This guidance document can be downloaded at:

http://water.epa.gov/infrastructure/greeninfrastructure/upload/gi_munichandbook_harvesting.pdf

The City of San Diego published a Rain Water Harvesting Guide, which can be downloaded at:

http://www.sandiego.gov/water/pdf/conservation/rainwaterguide.pdf

REQUIREMENTS FOR SMALL PROJECTS (2,500 TO 5,000 FT2)

4.2 QUANTIFY THE RUNOFF REDUCTION

The second step for the small project proponent is to quantify and submit the runoff reduction resulting from the implementation of the selected Site Design Measure(s). The Phase II MS4 Permit does not set any goals or minimum amounts of runoff reduction. Therefore, this step is only informational. To accomplish this quantification of runoff reduction, the project proponent is required to utilize the State Water Board's Post-Construction Calculator which is available on the Water Board's SMARTS website or the State's Microsoft Excel™ version of the calculator. The Water Board has created an instructional video on how to populate and use the Post-Construction Calculator. Information to access the calculator is included in Appendix 5 of this document.

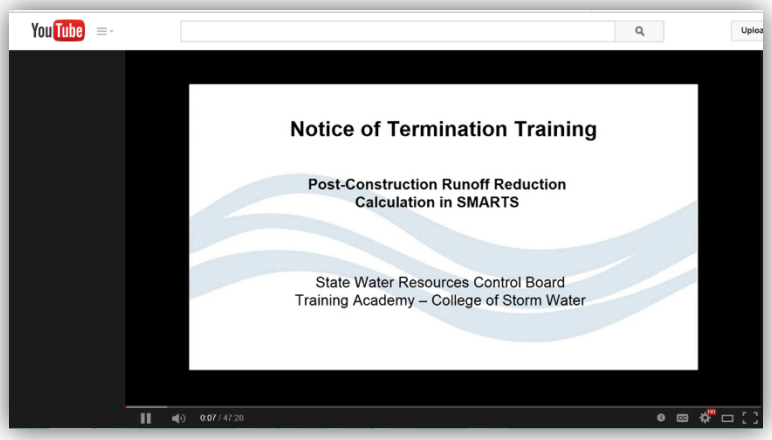
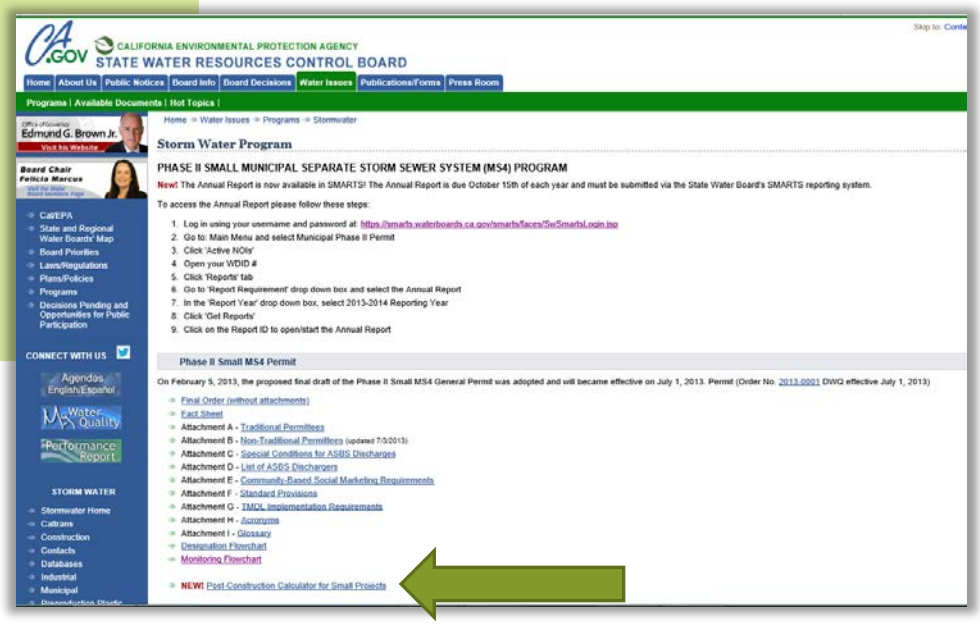


Figure 4 - The Water Board created this 47-minute video that describes how to use the Post-Construction Calculator on SMARTS. It will also help with the Excel version. Although the video was created for the Construction General Permit, it also applies to the Post-Construction Standards Plan. It can be accessed at:

https://www.youtube.com/watch?v=W3nj4pj8WHY&feature=youtu.be

Post-Construction Calculator for Small Projects

The Water Board has created a Microsoft Excel version of the calculator that can now be downloaded from the State Water Board's website at the following link: http://www.swrcb.ca.gov/water_issues/programs/stormwater/phase_ii_municipal.shtml



REQUIREMENTS FOR SMALL PROJECTS (2,500 TO 5,000 FT2)

4.3 PREPARE THE SUBMITTAL

The third and final step for the "small" project proponent is to compile the information required for the submittal package. . For all small project submittals, this includes the following items:

- A completed Post-Construction Worksheet (obtained from Appendix 8).
- Site plans showing the selected Site Design Measure(s) (identified in Section 4.1). The plans must be stamped by a California Civil Professional Engineer if any of the following Site Design Measures were selected: rooftop and impervious area disconnection, porous pavement, or rain cisterns. The plans must be stamped by a California Structural Professional Engineer if a green roof was selected or if there is a significant structural aspect to the rain cisterns and collection system. The plans must be stamped by a California Licensed Landscape Architect if any of the following Site Design Measures were selected: stream setbacks and buffers, or soil quality improvement. Site Plans for vegetated swales must be stamped by either a California Civil Professional Engineer or a California Licensed Landscape Architect. The Site Design Measure(s) must be clearly called out on the submitted plans with appropriate details.
- A printout of the project's results page from the Water Board's SMARTS or Microsoft Excel™ Post-Construction Calculator.

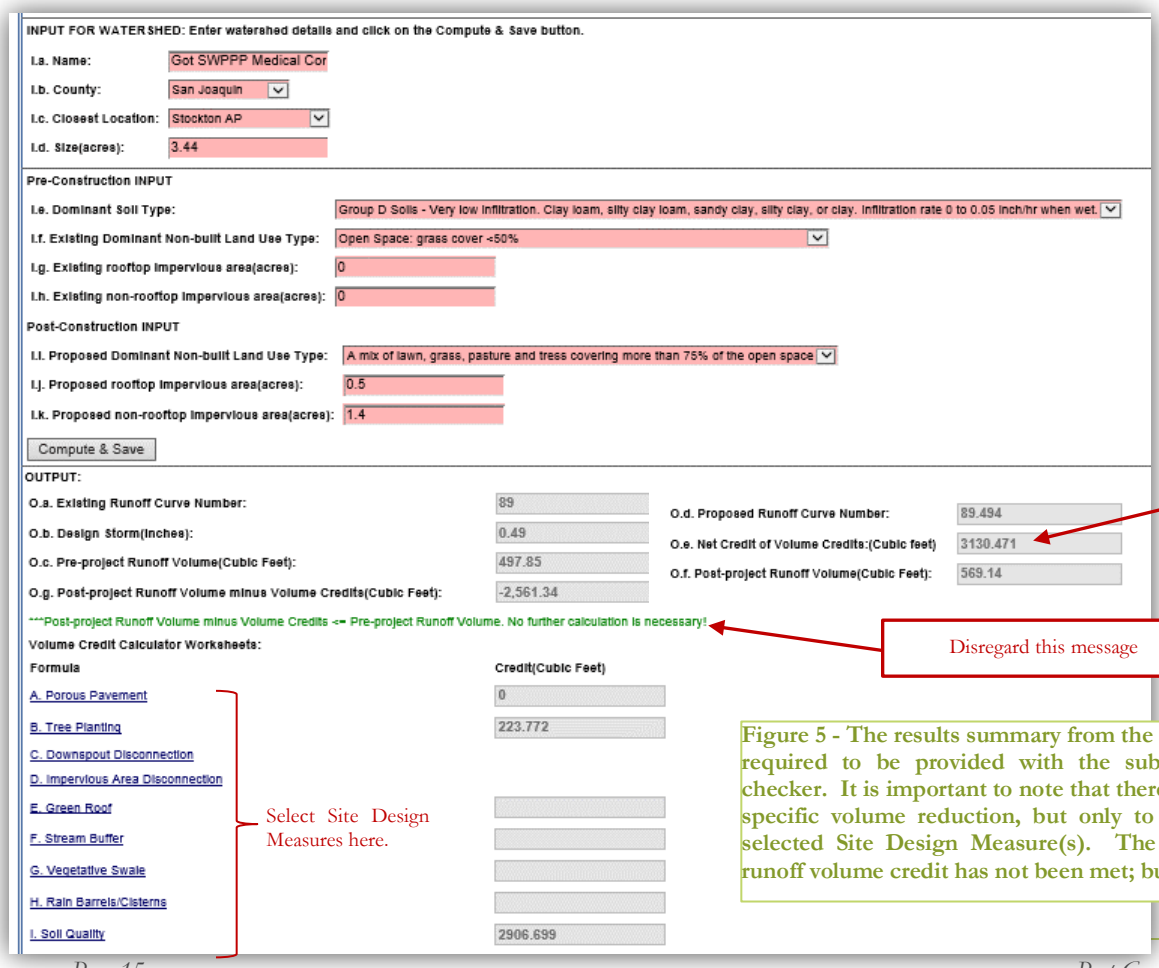


Figure 5 - The results summary from the Post-Construction Calculator is required to be provided with the submittal to the municipal plan checker. It is important to note that there is no requirement to meet any specific volume reduction, but only to quantify the reduction of the selected Site Design Measure(s). The calculator may state that the runoff volume credit has not been met; but, disregard any such message.

5 Requirements for Regulated Projects

The following is a 6-step process required by the County of Stanislaus Stormwater Program for Regulated Projects as defined in Section 2.2.

5.1 SPECIFY DRAINAGE MANAGEMENT AREAS

Regulated Projects are required to provide a map or diagram that divides the development into discrete Drainage Management Areas (DMAs). These are areas of the project where the nature of the development is distinct from the other portions of the development and, therefore, require a unique approach to mitigating storm water runoff. A separate DMA would also be necessary for portions of the project where post-construction design measures are dedicated to that portion only and operate independently from the other DMAs. Some projects will have multiple DMAs while other projects may have only one DMA.

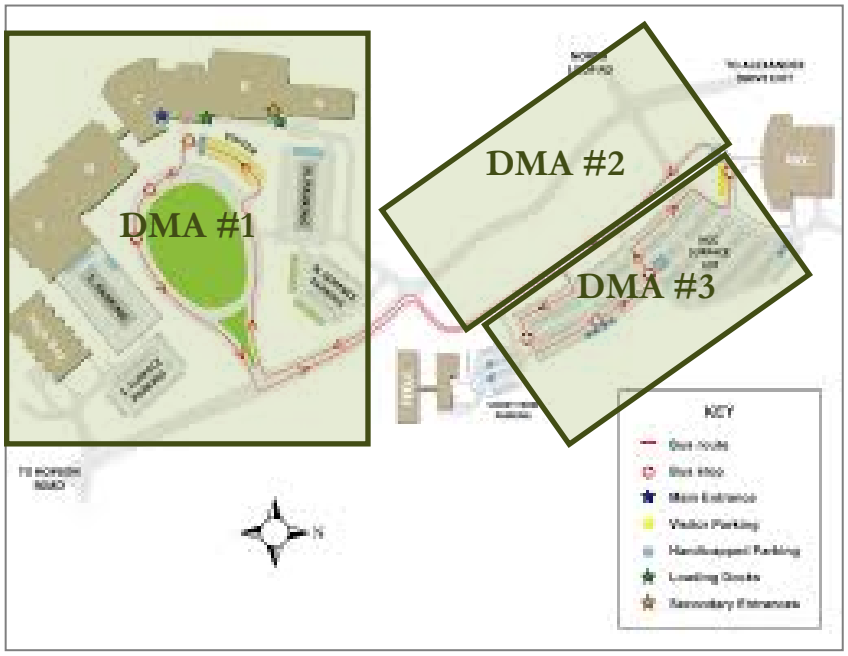


Figure 6 - Regulated Projects must submit a map with the boundaries of the various DMAs depicted.

5.2 IDENTIFY APPLICABLE SOURCE CONTROLS

The project proponent is required to identify potential sources of pollutants and to include into the design appropriate Best Management Practices / Source Controls. If a proposed Regulated Project has any of the potential pollutant-generating activities or sources identified in Table 1, it must be designed and operated consistent with the recommendations provided in the appropriate CASQA Storm Water BMP Handbook. A link is provided in Table 1 to each BMP specification. The CASQA Handbooks can be accessed in their entirety at www.CASQA.org . There is an annual subscription to access the Commercial / Industrial Handbook and the Construction Handbook. At the date of this edition of the Post-Construction Standards Plan, CASQA was still offering free access to their BMP Handbooks for Municipal Operations and New Development and Redevelopment.

REQUIREMENTS FOR REGULATED PROJECTS

TABLE 1 – LIST OF SOURCE CONTROLS

Activity / Pollutant Source	CASQA BMP Handbook Link	Activity or Design-based Control Measure
Accidental spills or leaks	SC-11	Activity
Interior floor drains	SC-10	Activity and Design (connection of interior floor drains to the storm drainage system is prohibited)
Parking / storage areas and maintenance	SC-43	Activity
Indoor and structural pest control	SC-35	Activity
Landscape / outdoor pesticide use	SD-10 BG-40	Activity
Pools, spas, ponds, decorative fountains, and other water features	BG-63 SC-72	Activity and Design
Restaurants, grocery stores, and other food service operations	BG-30	Activity
Refuse areas	SC-34 SD-32	Activity and Design
Industrial processes	SD-35 SD-36	Design
Outdoor storage of equipment or materials	SC-32 SD-34	Activity and Design
Vehicle and equipment cleaning	SC-21 SD-33 BG-65	Activity and Design
Vehicle and equipment repair and maintenance	SC-22 BG-21	Activity
Fuel dispensing areas	SC-20 SD-30 BG-22	Activity and Design
Loading docks	SC-30 SD-31	Activity and Design
Fire sprinkler test water	SC-41	Activity
Drain or wash water from boiler drain lines, condensate drain lines, rooftop equipment, drainage sumps, and other sources	SC-10 SC-41	Activity
Unauthorized non-storm water discharges	SC-10	Activity
Building and grounds maintenance	SC-41	Activity

REQUIREMENTS FOR REGULATED PROJECTS

5.3 INCORPORATE LOW IMPACT DEVELOPMENT DESIGN STANDARDS

The project proponent must demonstrate that each DMA has been designed to accomplish the LID Standards listed in Table 2.

TABLE 2 – LID STANDARDS
1. Define the development envelope and any protected areas, identifying the areas that are most suitable for development and areas to be left undisturbed.
2. Concentrate development on portions of the site with less permeable soils and preserve areas that can promote infiltration.
3. Limit overall impervious coverage of the site with paving and roofs.
4. Set back development a minimum of 100' from creeks, wetlands, and riparian habitats.
5. Preserve significant trees.
6. Conform the site layout along natural landforms.
7. Avoid excessive grading and disturbance of vegetation and soils.
8. Replicate the site's natural drainage patterns.
9. Detain and retain runoff throughout the site.

In completing the Post-Construction Project Worksheet (included in Appendix 8), the project proponent will be required to demonstrate that each DMA has addressed the nine LID Standards listed in Table 2. This demonstration can be completed through a combination of narrative description, calculations, supporting information, and / or site plans and diagrams. The municipal plan checker will review the project proponent's response to each of the nine LID Standards and may challenge unsubstantiated statements, request additional information, or request that the design be revised to meet the objective of one or more of these LID Standards.

5.4 SELECT AND SIZE SITE DESIGN AND TREATMENT CONTROL MEASURES

As with small projects, Regulated Projects must also select one or more Site Design Measures (also called "facilities" in the Phase II MS4 Permit) that infiltrate, evapo-transpire, harvest and reuse, or biotreat storm water runoff. Regulated Projects are required to reduce the amount of runoff by sizing each "facility" (Site Design or Treatment Control Measure) to one of two hydraulic design criteria specified in the Phase II MS4 Permit. This section of the plan discusses how project proponents can select, size and configure their Site Design and Treatment Control Measures.

5.4.1 List of Site Design Measures and Associated Sizing Criteria

Many of the Site Design Measures are described in Section 4.1 of this Post-Construction Standards Plan. Table 3 lists these Site Design Measures along with other possible Treatment Control Measures that

infiltrate, evapo-transpire, harvest and reuse, or biotreat storm water runoff. The project proponent will need to select one or more of these control measures for each DMA. For each measure listed in Table 3, the appropriate hydraulic sizing criteria and specification reference is also provided.

TABLE 3 – SITE DESIGN AND TREATMENT CONTROL MEASURES

Site Design or Treatment Control Measure	Description	CASQA Specification	Sizing Criteria
Stream setbacks and vegetated buffers *(Site Design Measure)*	*Preservation of a green strip or vegetated buffer between the development and the discharge point through which storm water runoff passes.*	TC-10	Flow
Soil quality improvement *(Site Design Measure)*	*Commonly used in conjunction with landscaping, bioretention, or storm water gardens. Also known as "engineered soils", through which storm water can infiltrate. This provides additional on-site storage and reduces peak flow rates.*	TC-40	Volume
Tree planting and preservation *(Site Design Measure)*	*Incorporated into the site's landscaping. Trees reduce the energy of falling rain and help to reduce peak flow rates.*	SD-10	SMARTS Calculator
Porous pavement *(Site Design Measure)*	*Porous asphalt, concrete, or pavers; cobbles or rock covered surfaces; typically with at least 18" of drainage rock below the porous surface covering to store and infiltrate storm water.*	SD-20	Volume
Green roofs *(Site Design Measure)*	*Plants and growing media permanently installed on a rooftop to allow a certain amount of storm water infiltration and storage.*	TC-40	Volume
Vegetated swales *(Site Design Measure)*	*Storm water conveyance swales that are vegetated to stabilize the swale and prevent erosion. Vegetated swales improve water quality by providing filtration and bio-uptake of pollutants and by promoting sedimentation of suspended particles. Often, vegetative swales are used in conjunction with "soil quality improvement" to provide greater infiltration and / or with retention or detention basins.*	TC-30	Flow
Rain harvesting and reuse *(Site Design Measure)*	*Large scale or small scale capture, collection and re-use of storm water runoff. Includes rain barrels used at downspouts and large cisterns and collection systems.*	TC-12	Volume
Bioretention and rain gardens *(Treatment Control Measure)*	*Depressed landscaped areas to which storm water runoff flows. These rain gardens are designed with engineered soils so that they facilitate infiltration and storage of storm water.*	TC-32	Volume
Infiltration trench, Flow-through Planter, or Tree Wells *(Treatment Control Measure)*	*Similar in concept to a French drain or a leach field, in which storm water runoff is able to drain to a trench or pit that has been filled with rock. It provides underground storage of the water until it can infiltrate into the soils*	TC-10	Volume and Flow
Retention and detention basins *(Treatment Control Measure)*	*Aboveground storage of storm water runoff in a basin that allows it to infiltrate into soils and / or be stored and released at a slower flow rate. Impounded water must be infiltrated or discharged within 72 hours to avoid vector breeding problems.*	TC-11 TC-12 TC-22 TC-40	Volume

A single control measure or a combination of two or more of the control measures specified in Table 3 can be used to meet the hydraulic sizing criteria for each DMA. An example of a control measure combination would be a site using engineered soils below a vegetated swale and using a rain harvesting / collection system for roof drains that are in the same DMA. Information for on-line publicly available design references and guidance for many of the above-listed control measures are provided in Appendix 7.

5.4.2 Volumetric Criteria

The Phase II MS4 Permit requires the municipality to condition applicable new development and redevelopment projects to require "facilities" designed to evapo-transpire, infiltrate, harvest/use, and biotreat storm water ***and that are designated on Table 3 as a volume-based control measure*** to meet at least one of the following volumetric hydraulic sizing design criteria:

- The maximized capture storm water volume for the tributary area, on the basis of historical rainfall records, determined using the formula and volume capture coefficients in the *Urban Runoff Quality Management, WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87 (1998)* pages 175-178 (that is, approximately the 85th percentile 24-hour storm runoff event); ***or***
- The volume of annual runoff required to achieve 80 percent or more capture, determined in accordance with the methodology in Section 5 of *CASQA's Stormwater Best Management Practice Handbook, New Development and Redevelopment (2003)*, using local rainfall data.

As a part of this Post-Construction Standards Plan, the County of Stanislaus Stormwater Program is providing the project proponent with a Microsoft Excel™ worksheet that calculates the volumetric criteria. (Refer to Appendix 6 for instructions to download and use the worksheet). In this worksheet, capture volumes can be calculated using both of the above-referenced volumetric criteria methods. Both methods are described in Section 5 of the *2003 Edition of the CASQA Stormwater Best Management Practice Handbook for New Development and Redevelopment*. Section 5 of the handbook can be accessed and downloaded at the following web link:

www.casqa.org/sites/default/files/BMPHandbooks/BMP_NewDevRedev_Section_5.pdf

The project proponent can select either method to size the Site Design and Treatment Control Measures that require volumetric sizing as specified in Table 3. ***To satisfy the plan check requirements one or more of these control measures must be used for each DMA and sized for the total runoff area of the DMA.***

The State Water Board's Post-Construction Calculator (refer to Appendix 5) provides a discharge credit for trees by allowing an area of 218 ft^2 for each evergreen tree and 109 ft^2 for each deciduous tree. If trees are included within the DMA boundary, the project proponent may take the total area within the DMA (number of trees multiplied by the allowed area credit) multiplied by the "P" value (converted from inches to feet) as shown on Volumetric Sizing Tool in Appendix 6. This will provide a volume reduction in cubic

feet which may be used in meeting the overall volumetric criteria for the DMA and has been built into the Volumetric Sizing Tool.

5.4.3 Flow-Based Criteria

The Phase II MS4 Permit requires the municipality to condition applicable new development and redevelopment projects to require "facilities" designed to evapo-transpire, infiltrate, harvest/use, and biotreat storm water ***and that are designated on Table 3 as a flow-based control measure*** to meet at least one of the following flow-based hydraulic sizing design criteria:

- The flow of runoff produced from a rain event equal to at least 0.2 inches per hour intensity; ***or***
- The flow of runoff produced from a rain event equal to at least 2 times the 85th percentile hourly rainfall intensity as determined from local rainfall records. Local rainfall records are provided in Appendix D of the *CASQA Stormwater Best Management Practice Handbook for New Development and Redevelopment* for Fresno, Sacramento, and Redding, California.[3] Table 4 below provides the 85th percentile hourly rainfall intensities for these Central Valley locations as reported in the CASAQ BMP Handbook.

TABLE 4 - RAINFALL INTENSITIES AND FLOW-BASED DESIGN VALUES

Central Valley Weather Station	85th Percentile Rainfall Intensity (inches/hour)	Flow-Based Design Value (2 x 85th Percentile Intensity in inches/hour)
Fresno – Yosemite International Airport (3257)	0.090	0.180
Sacramento – 5 ESE (7633)	0.093	0.186
Redding – Municipal Airport (7304)	0.130	0.260

The project proponent can select either method to size the Site Design and Treatment Control Measures that require flow-based sizing as specified in Table 3. ***To satisfy the plan check requirements one or more of these control measures must be used for each DMA and sized for the total runoff area of the DMA.***

5.4.4 Allowed Variations and Exceptions

Site Design and Treatment Control Measures that infiltrate or bioretain storm water into the subsurface may be altered in their design as specified on Table 5.

[3] www.casqa.org/sites/default/files/BMPHandbooks/BMP_NewDevRedev_Appendix_D.pdf

TABLE 5 – ALLOWED DESIGN VARIATIONS

Condition	Allowed Variation
Facilities located within 10 feet of structures or other potential geotechnical hazards established by the geotechnical expert for the project	May incorporate an impervious cutoff wall between the bioretention / infiltration facility and the structure or other geotechnical hazard
Facilities with documented high concentrations of pollutants in underlying soil or groundwater; facilities located where infiltration could contribute to a geotechnical hazard; and facilities located on elevated plazas or other structures	May incorporate an impervious liner and may locate the underdrain discharge at the bottom of the subsurface drainage/storage layer (this configuration is commonly known as a "flow-through planter")
Facilities located in areas of high groundwater, highly infiltrative soils or where connection of underdrain to a surface drain or to a subsurface storm drain are infeasible	May omit the underdrain
Facilities serving high-risk areas such as fueling stations, truck stops, auto repairs, and heavy industrial sites	Are required to provide additional treatment to address pollutants of concern prior to the flow reaching the infiltration facility

If the project proponent demonstrates that the use of bioretention or infiltration control measures are infeasible at the site, other types of treatment such as tree-box biofilters, compost filters, or in-vault media filters may be utilized for the following types of projects:

1. Projects creating or replacing an acre or less of impervious area, and located in a designated pedestrian-oriented commercial district (i.e., smart growth projects), where at least 85% of the entire project site is covered by existing permanent structures;
2. Facilities receiving runoff solely from existing (pre-project) impervious areas; and
3. Historic sites, structures or landscapes that cannot alter their original configuration in order to maintain their historic integrity.

If any of these alternate non-infiltrating treatment control measures are utilized, they must meet the following performance criteria:

- Sized to treat the volumetric criteria specified in Section 5.4.2 or the flow-based criteria in Section 5.4.3 as appropriate to the type of treatment control measure selected.
- Selected to effectively remove pollutants of concern associated with the new development.

The project proponent is required to support the demonstration of infeasibility of using bioretention or infiltration control measures at the project site and the selection of the alternate non-infiltration treatment control measure(s) through the opinion of a qualified expert such as a California licensed Professional Civil Engineer, a California licensed Professional Geologist, a California licensed Geotechnical Engineer, and/or an EnviroCert International, Inc. Certified Professional in Storm Water Quality (CPSWQ). If an alternate non-infiltrating treatment control measure is proposed, a technical report, stamped and signed by any of the above-referenced professionals , demonstrating infeasibility of bioretention or infiltration and the selection and sizing of the alternate treatment control measure must be submitted with the Post-Construction Project Worksheet (Appendix 8).

5.4.5 Municipality-Specific Design Requirements

All storm water post construction facilities and treatment control measures designed in accordance with these Standards are required to maintain a minimum 10' separation between the floor elevation of the facility and high groundwater.

5.5 INCORPORATE HYDROMODIFICATION MANAGEMENT MEASURES

Storm water runoff that is not addressed with Site Design Measures must be treated with Treatment Control Measures (both of which are identified in Table 3) designed to infiltrate, evapo-transpire, and/or bioretain runoff. For example: If the DMA will utilize trees and a storm water capture, collection, and reuse system, **only the net runoff**, after factoring in the credit for the trees and for the amount captured / recycled, is subject to treatment control requirements. Treatment "facilities" must comply with the following design parameters:

1. Sized to treat the volumetric criteria specified in Section 5.4.2 or the flow-based criteria in Section 5.4.3 as appropriate to the type of treatment control measure selected;
2. Maximum surface loading rate of the infiltration facility of 5 inches per hour, based on the runoff rates calculated for the DMA;
3. Minimum surface reservoir volume equal to surface area of the infiltration facility times a depth of 6 inches;
4. Minimum planting medium depth of 18 inches. The planting medium must sustain a minimum infiltration rate of 5 inches per hour throughout the life of the project and must maximize runoff retention and pollutant removal. A mixture of sand (60%-70%) meeting the specifications of American Society for Testing and Materials (ASTM) C33 and compost (30%-40%) may be used.
5. Subsurface drainage/storage layer (typically gravel) with an area equal to the surface area and having a minimum depth of 12 inches;
6. Underdrain with discharge elevation at top of the gravel layer;
7. No compaction of soils beneath the treatment control "facility"; or if the soils have previously been compacted, they must be ripped and loosened;

8. No liners or other barriers to potentially interfere with infiltration; and
9. Appropriate plant palette for the specified soil mix and maximum available water use.
10. Facility designed to maintain a minimum 10' separation between the floor elevation of facility and high groundwater..

Alternatives to the above-listed ten design parameters for treatment "facilities" are allowed if **all** of the following equivalent effectiveness features are demonstrated:

- Equal or greater amount of runoff infiltrated or evapo-transpired;
- Equal or lower pollutant concentrations in runoff that is discharged after biotreatment / infiltration;
- Equal or greater protection against shock loadings and spills; and
- Equal or greater accessibility and ease of inspection and maintenance.

Regulated projects that create and / or replace one acre or more of impervious surface must incorporate Site Design and Treatment Control Measures (from Table 3) that prevent the post-project runoff from exceeding the pre-project runoff rate for a 2-year, 24-hour storm event. The exceptions are projects that do not increase impervious surface area over the pre-project conditions. The 2-year, 24-hour values for a few selected Central Valley locations are shown in Table 6. The 2-year, 24-hour storm event volumes for all of Northern California are included on an isopluvial map included on the last tab of the Volumetric Post-Construction BMP Sizing Tool (which can be downloaded following the instructions in Appendix 6).

TABLE 6 – 2-YEAR, 24-HOUR STORM TOTALS FOR SELECTED LOCATIONS

Location	2-Year 24-Hour Design Value
City of Redding	4.0 inches
Yuba City	2.25 inches
City of West Sacramento	2.25 inches
City of Lodi	1.8 inches
City of Modesto	1.4 inches
City of Oakdale	1.55 inches
City of Merced	1.55 inches

5.6 PREPARE THE SUBMITTAL

The sixth and final step for Regulated Projects is to compile the information required to be submitted to the plan checker. This includes the following items:

- A completed project Post-Construction Worksheet (obtain from Appendix 8).

REQUIREMENTS FOR REGULATED PROJECTS

- A separate site plan for each DMA. If there are multiple DMAs, submit a key map showing the location of the DMAs in relationship to one another and the entire site. Each DMA site plan is required to show the following information:
  - ✓ DMA name and boundary;
  - ✓ The selected Site Design and Treatment Control Measures (identified in Table 3);
  - ✓ The total DMA drainage area in square feet;
  - ✓ The pre-development peak flow rate at the point(s) of discharge;
  - ✓ The predicted post-development peak flow rate at the point(s) of discharge;
  - ✓ Areas of existing impervious surfaces (pre-development);
  - ✓ Proposed areas of impervious surfaces (post-development);
  - ✓ Setbacks from creeks, wetlands, and riparian habitats;
  - ✓ Existing topography and drainage patterns (pre-development);
  - ✓ Proposed topography and drainage patterns (post-development);
  - ✓ Soil types, soil type boundaries within the DMA, and their Hydrologic Soil Group Classification rating (A, B, C, or D); and
  - ✓ Trees, vegetation, and sensitive environmental areas to be protected and preserved.

  Each plan must be stamped by a qualified licensed professional. The plans must be stamped by a California Civil Professional Engineer if any of the following control measures were selected: rooftop and impervious area disconnection, porous pavement, rain cisterns, bioretention or rain gardens, infiltration trenches, or retention or detention basins. The plans must be stamped by a California Structural Professional Engineer if a green roof was selected or if there is a significant structural aspect to the rain cisterns and collection system. The plans must be stamped by a California licensed Landscape Architect if any of the following Site Design Measures were selected: stream setbacks and buffers, or soil quality improvement. Site plans containing vegetated swales, bioretention or rain gardens must be stamped by either a California Civil Professional Engineer or a California Licensed Landscape Architect. The selected Site Design and Treatment Control Measure(s) must be clearly called out on the submitted plans

Soil types and Hydrologic Soil Groups (HSGs) can be identified using the USDA's online Web Soil Survey. The online tool uses aerial maps to select the area of interest. To access this online reference, go to:

http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

TABLE 7 – HYDROLOGIC SOIL GROUPS

Group A	Low runoff potential, high infiltration rates
Group B	Moderately low runoff potential, good infiltration rates
Group C	Moderately high runoff potential, low infiltration rates
Group D	High runoff potential, poor infiltration

For more information on the HSG classifications, go to:
http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17757.wba

REQUIREMENTS FOR REGULATED PROJECTS

- Design drawings for the proposed Treatment Control Measures showing a plan view, elevation view, and subsurface cross-sections. Sufficient detail and specifications should be included in these drawings to provide for adequate plan check review and for the construction of the treatment "facility". Each design drawing must be stamped by a qualified licensed professional. The drawings must be stamped by a California Civil Professional Engineer if any of the following control measures were selected: rooftop and impervious area disconnection, porous pavement, rain cisterns, bioretention or rain gardens, infiltration trench, or retention or detention basins. The drawings must be stamped by a California Structural Professional Engineer if a green roof was selected or if there is a significant structural aspect to the rain cisterns and collection system. The drawings must be stamped by a California licensed Landscape Architect if any of the following Site Design Measures were selected: stream setbacks and buffers or soil quality improvement. Plans containing vegetated swales, bioretention or rain gardens must be stamped by either a California Civil Professional Engineer or a California Licensed Landscape Architect..
- A print out of the results page from the MS Excel™ Volumetric BMP Sizing Tool for each DMA including control measure(s) that meet the required volumetric sizing criteria. (Refer to Appendix 6 for information to download the tool.)
- Calculations stamped by the appropriate licensed professional (as described above) for each DMA and any control measure(s) that require flow-based sizing criteria.
- An Operation and Maintenance Plan and owner-signed and notarized Statement of Responsibility for all proposed treatment control measures. (Refer to Section 6).

6 Operation and Maintenance of Post-Construction Measures

Owners of development projects utilizing post-construction treatment control measures (as identified on Table 3) are required to maintain the control measures so that they operate effectively and as designed, in perpetuity. To that effect, the project proponent must submit an Operation & Maintenance (O&M) Plan and an owner-signed and notarized Statement of Responsibility during the plan check process and prior to the issuance of any Grading or Building Permit.

6.1 LONG TERM PLAN FOR CONDUCTING REGULAR MAINTENANCE OF CONTROL MEASURES

Owners of development projects utilizing any post-construction treatment control measures are required to prepare a written plan for conducting regular inspections and maintenance of the installed treatment facilities. The proposed O&M activities should be commensurate with the maintenance measures identified in the CASQA BMP specifications. (Refer to the hyperlinked references in Table 3.) The O&M Plan is required to identify the following information:

- Property name and address;
- Name of the DMA(s) and Treatment Control Measure(s);
- Property owner's contact information including name, mailing address, telephone number, and email address;
- Contact information for any contracted or delegated inspectors and maintenance personnel;
- Minimum inspection frequency by the property owner or their designee;
- Conditions that require maintenance or repair of the Treatment Control Measure; and
- Preventative maintenance tasks, their frequency, and person / agency designated to perform them.

The project proponent is required to use the form provided in Appendix 9 for the O&M Plan submittal.

OPERATION AND MAINTENANCE OF POST-CONSTRUCTION MEASURES

6.2 STATEMENT OF RESPONSIBILITY

On the O&M Plan form (included in Appendix 9) is a Statement of Responsibility that must be completed, signed and notarized by the property owner or the owner's duly authorized representative. The completed Statement of Responsibility must be submitted during the plan check process. The statement indicates the current property owner's acceptance of responsibility for the on-going operation, inspection, and maintenance of the treatment control measures until the property and / or responsibility is legally transferred to another entity (such as the new property owner or a maintenance district). It is the responsibility of the current owner to notify the new owner or responsible party of their on-going O&M obligations. The storm water municipal code for the County of Stanislaus Stormwater Program provides the municipality with the legal authority to require any property owner to properly maintain installed on-site storm water treatment control measures.

6.3 SELF-CERTIFICATION ANNUAL REPORTS

Each year the County of Stanislaus Stormwater Program will mail to owners of installed Treatment Control Measures an O&M self-certification form. This form is required by Stanislaus County Code to be completed annually by the owner of the property to certify that the O&M program (described in Section 6.1) is being implemented and that the Treatment Control Measure(s) is/are in an effective operational condition. The property owner will have up to 60 days to complete and return the annual O&M self-certification form. If reports are not received within the 60-day period, the County of Stanislaus Stormwater Program will perform the inspection and assessment; and the property owner will be billed as described in the Stanislaus County Code. .

7 Municipal-Specific Information

7.1 CONTACT INFORMATION

The County of Stanislaus Stormwater Program is subject to the State Water Board's Phase II MS4 Permit and is required to condition applicable new development and redevelopment projects with the requirements contained in this Post-Construction Standards Plan. This plan was prepared as a part of a collaborative effort with other California Central Valley municipalities which are listed in Appendix 10. Although the plan is similar in content with these collaborating municipalities, it has been customized by the County of Stanislaus Stormwater Program to meet hydrologic, topographic, and geophysical conditions; local zoning and building standards; and organizational requirements specific to this municipality.

For more information on the requirements of this plan or to obtain additional guidance on how to meet the conditions of this plan, please contact:

County of Stanislaus Stormwater Program
1010 Tenth Street, Suite 4200, Modesto, CA 95354
(209) 525-7538

For more information about the County of Stanislaus Stormwater Program or to download a copy of this Post-Construction Standards Plan or related-forms and tools, go to:

http://www.stancounty.com/publicworks/storm/index.shtm

7.2 THE PLAN CHECK PROCESS

To obtain current information on the plan check process, such as the number of improvement plans required, forms to be used, plan review and turnaround times or plan check fees, please contact the County of Stanislaus Development Services Division at (209) 525-4311.

7.3 STANISLAUS COUNTY CODE AND APPEALS

Stanislaus County Code Title 14, Chapter 14.14, Stormwater Management & Discharge Control can be accessed on our website at: www.stancounty.com

APPENDIX 1 - GLOSSARY

Glossary for the Post-Construction Standards Plan[4]

Capital Improvement Project (CIP) – A public project that is owned by the municipality. It is not subject to the plan check process but is subject to the Post-Construction Standards Plan and Section E.12 of the Phase II MS4 Permit. (Definition provided by the document publisher.)

Detached Single-family Home Project - The building of one single new house or the addition and/or replacement of impervious surface associated with one single existing house, which is not part of a larger plan of development.

Discretionary Project – A project that is subject to the municipal plan check process and discretionary review and conditioning.

Facility – For the purpose of this Post-Construction Development Standards Plan, facility refers to a Site Design Control or Treatment Control Measure and does not refer to a property, parcel, industrial plant, or place of business. (Definition provided by the document publisher.)

Hydromodification - Modification of hydrologic pathways (precipitation, surface runoff, infiltration, groundwater flow, return flow, surface-water storage, groundwater storage, evaporation and transpiration) that results in negative impacts to watershed health and functions.

Impervious Surface - A surface covering or pavement of a developed parcel of land that prevents the land's natural ability to absorb and infiltrate rainfall/storm water. Impervious surfaces include, but are not limited to; roof tops, walkways, patios, driveways, parking lots, storage areas, impervious concrete and asphalt, and any other continuous watertight pavement or covering. Landscaped soil and pervious pavement, including pavers with pervious openings and seams, underlain with pervious soil or pervious storage material, such as a gravel layer sufficient to hold the specified volume of rainfall runoff are not impervious surfaces.

Industrial Development - Development or redevelopment of property to be used for industrial purposes, such as factories, manufacturing buildings, and research and development parks.

Linear Underground/Overhead Projects (LUPs) - Include, but are not limited to, any conveyance, pipe, or pipeline for the transportation of any gaseous, liquid (including water and wastewater for domestic municipal services), liquescent, or slurry substance; any cable line or wire for the transmission of electrical energy; any cable line or wire for communications (e.g., telephone, telegraph, radio, or television messages); and associated ancillary facilities. Construction activities associated with LUPs include, but are not limited to, (a) those activities necessary for the installation of underground and overhead linear facilities (e.g., conduits, substructures, pipelines, towers, poles, cables, wires, connectors, switching, regulating and transforming equipment, and associated ancillary facilities); and include, but are not limited to, (b) underground utility mark-out, potholing, concrete and asphalt cutting and removal, trenching, excavation, boring and drilling, access road and pole/tower pad and cable/wire pull station, substation construction, substructure installation, construction of tower footings and/or foundations, pole and tower installations, pipeline installations, welding, concrete and/ or pavement repair or replacement, and stockpile/borrow locations.

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[4] Definitions (unless otherwise specified) are from the Phase II MS4 NPDES General Permit, Order No. 2013-0001-DWQ, Attachment I; www.swrcb.ca.gov/water_issues/programs/stormwater/docs/phsii2012_5th/att_i_glossary_final.pdf

Low Impact Development – A sustainable practice that benefits water supply and contributes to water quality protection. Unlike traditional storm water management, which collects and conveys storm water runoff through storm drains, pipes, or other conveyances to a centralized storm water facility, Low Impact Development (LID) takes a different approach by using site design and storm water management to maintain the site's pre-development runoff rates and volumes. The goal of LID is to mimic a site's predevelopment hydrology by using design techniques that infiltrate, filter, store, evaporate, and detain runoff close to the source of rainfall. .

Ministerial Project – A project that is non-discretionary and consists of a grading or building permit that is issued "over-the-counter" without a plan check review process. (Definition provided by the document publisher.)

Municipal Separate Storm Sewer System (MS4) - The regulatory definition of an MS4 (40 CFR 122.26(b)(8)) is "a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains): (i) Owned or operated by a state, city, town, borough, county, parish, district, association, or other public body (created to or pursuant to state law) including special districts under state law such as a sewer district, flood control district or drainage district, or similar entity under section 208 of the Clean Water Act that discharges into waters of the United States. (ii) Designed or used for collecting or conveying storm water; (iii) Which is not a combined sewer; and (iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2." In practical terms, operators of MS4s can include municipalities and local sewer districts, state and federal departments of transportation, public universities, public hospitals, military bases, and correctional facilities.

National Pollutant Discharge Elimination System (NPDES) - A national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 402, 318, and 405 of the CWA.

New Development - New Development means land disturbing activities; structural development, including construction or installation of a building or structure, creation of impervious surfaces; and land subdivision on an area that has not been previously developed.

Non-Discretionary Project – A project that is not subject to the municipal plan check process; also known as a ministerial project. (Definition provided by the document publisher.)

Pervious Pavement - Pavement that stores and infiltrates rainfall at a rate that exceeds conventional pavement.

Pollutants of Concern - Pollutants of concern found in urban runoff include sediments, non-sediment solids, nutrients, pathogens, oxygen-demanding substances, petroleum hydrocarbons, heavy metals, floatables, polycyclic aromatic hydrocarbons (PAHs), trash, and pesticides and herbicides.

Redevelopment - Land-disturbing activity that results in the creation, addition, or replacement of exterior impervious surface area on a site on which some past development has occurred. Redevelopment does not include trenching, excavation and resurfacing associated with LUPs; pavement grinding and resurfacing of existing roadways; construction of new sidewalks, pedestrian ramps, or bike lanes on existing roadways; or routine replacement of damaged pavement such as pothole repair or replacement of short, non-contiguous sections of roadway.

Regulated Project – Refers to projects subject to the new and redevelopment standards in Section E.12c. of the Phase II MS4 Permit and includes projects that create and / or replace 5,000 ft^2 or more of impervious surface.

Residential Housing Subdivision - Any property development of multiple single-family homes or of dwelling units intended for multiple families/households (e.g., apartments, condominiums, and town homes).

Riparian Areas – Plant communities contiguous to and affected by surface and subsurface hydrologic features of perennial or intermittent water bodies. Riparian areas have one or both of the following characteristics: 1) distinctively different vegetative species than adjacent areas, and 2) species similar to adjacent areas but exhibiting more vigorous or robust growth forms. Riparian areas are usually transitional between wetland and upland.

Small Project – Projects that create and / or replace between 2,500 and 5,000 ft^2 of impervious surface and detached single family home projects that create and / or replace more than 2,500 ft^2 and that are not part of a larger common plan. (Definition provided by the document publisher.)

Smart Growth Projects – Projects that produce multiple-benefits such as economic, social and environmental benefits. Smart growth projects commonly include high density development projects that result in a reduction of runoff volume per capita as a result of reduced impervious surface.

Source Control - Land use or site planning practices, or structural or nonstructural measures, that aim to prevent runoff pollution by reducing the potential for contact with rainfall runoff at the source of pollution. Source control BMPs minimize the contact between pollutants and urban runoff.

Surface Drainage - Any above-ground runoff (sheet, shallow, concentrated, and open channel) that flows into the storm drain system.

Storm Drain System - The basic infrastructure in a municipal separate storm sewer system that collects and conveys storm water runoff to a treatment facility or receiving water body.

Storm Water – Storm water is generated when precipitation from rain and snowmelt events flows over land or impervious surfaces and does not percolate into the ground. As storm water flows over the land or impervious surfaces, it accumulates debris, chemicals, sediment or other pollutants that could adversely affect water quality if the storm water is discharged untreated.

Storm Water Treatment System - Any engineered system designed to remove pollutants from storm water runoff by settling, filtration, biological degradation, plant uptake, media absorption/adsorption or other physical, biological, or chemical process. This includes landscape-based systems such as grassy swales and bioretention units as well as proprietary systems.

Structural Controls - Any structural facility designed and constructed to mitigate the adverse impacts of storm water and urban runoff pollution.

Treatment - Any method, technique, or process designed to remove pollutants and/or solids from polluted storm water runoff, wastewater, or effluent.

APPENDIX 2 - ACRONYMS

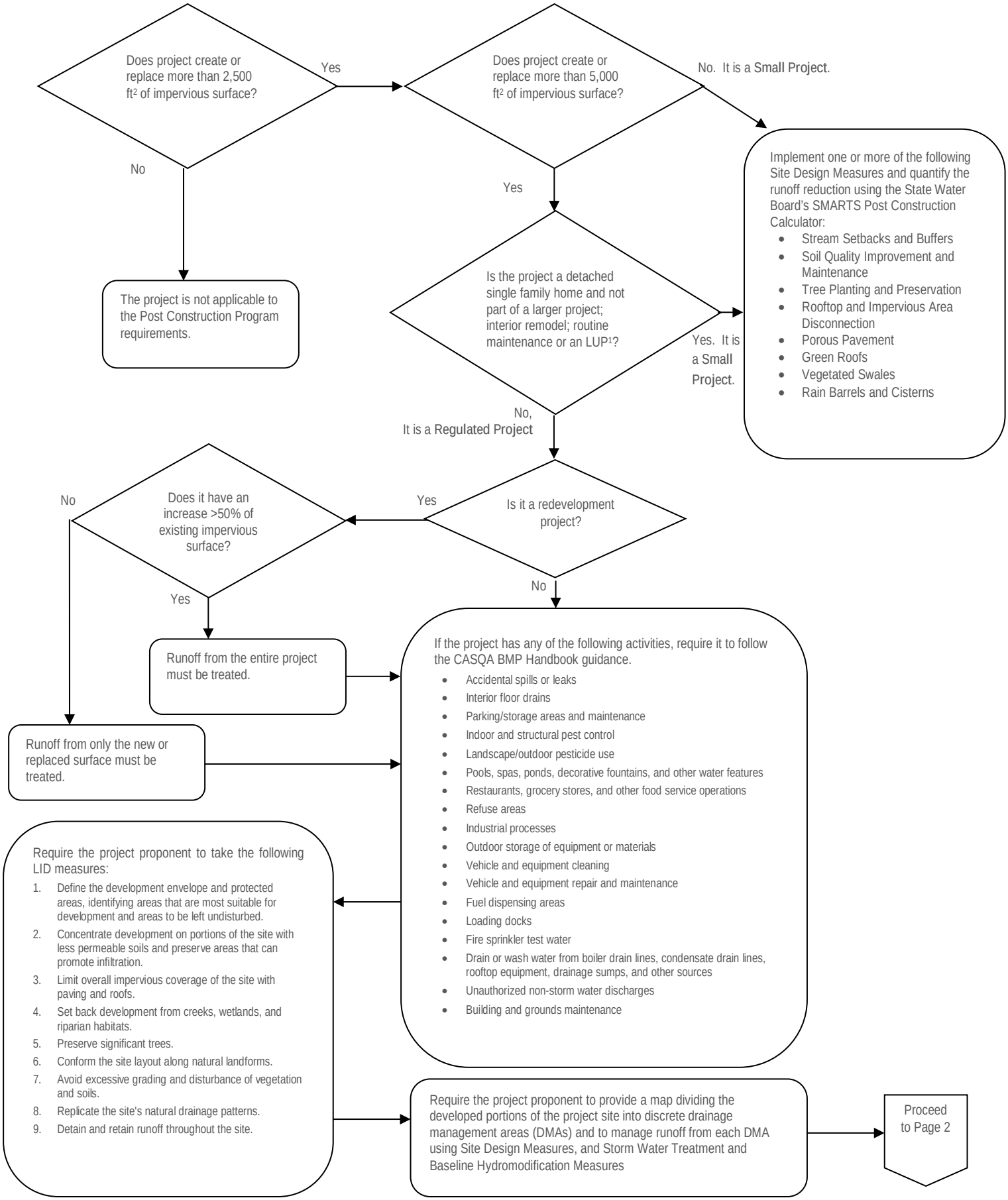
Acronyms of the Post-Construction Standards Plan

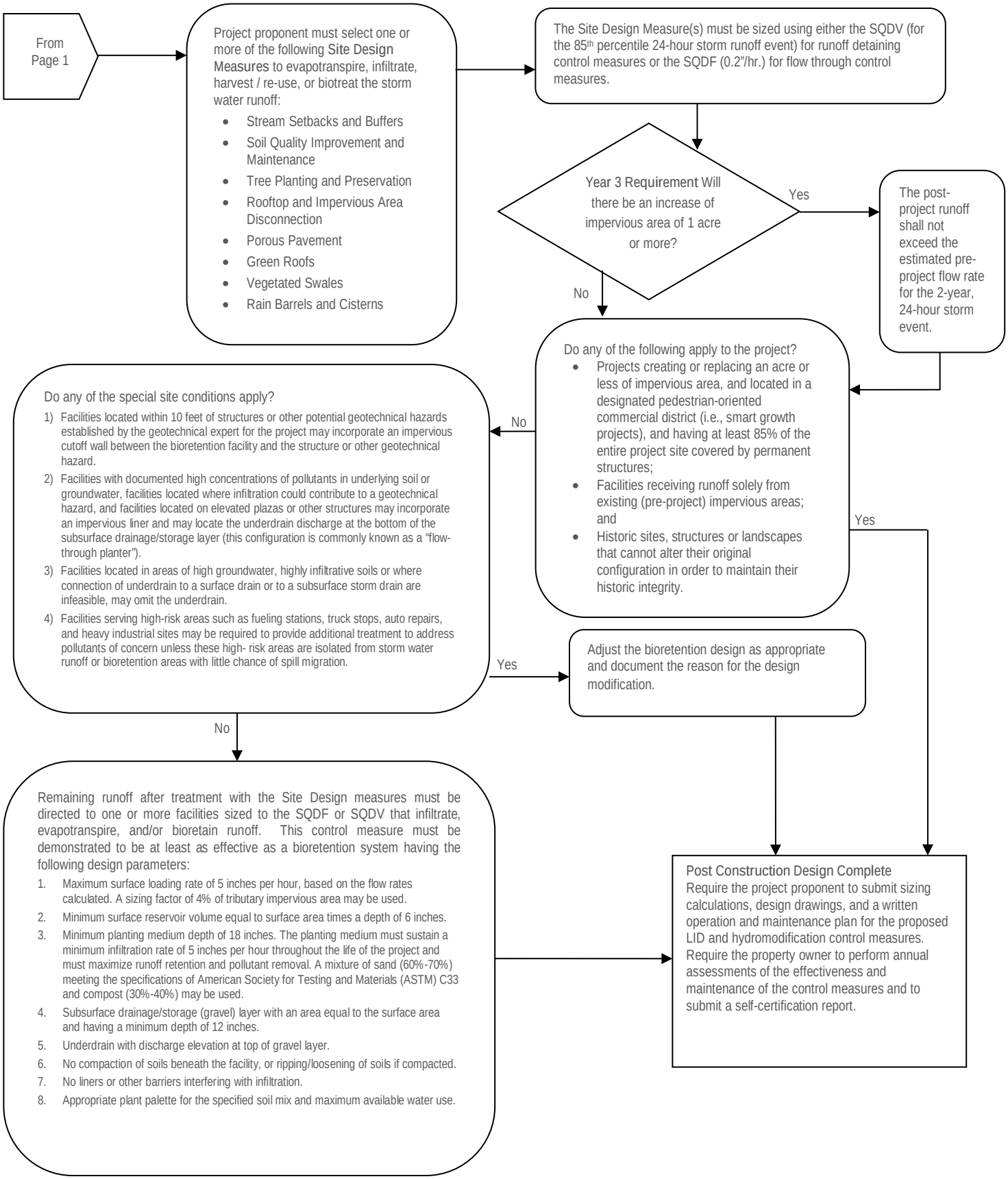
ASTM	American Society for Testing and Materials
BMP	Best Management Practice
CASQA	California Storm Water Quality Association (www.CASQA.org)
CPSWQ	Certified Professional in Storm Water Quality
CIP	Capital Improvement Project
CWA	Clean Water Act
DMA	Drainage Management Area
HSG	Hydrologic Soil Group
LID	Low Impact Development
LUPs	Linear Utility Projects
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
O&M	Operation and Maintenance
PE	Professional Engineer
SMARTS	Storm Water Multi-Application, Reporting, and Tracking System (https://smarts.waterboards.ca.gov/smarts/faces/SwSmartsLogin.jsp)
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency

APPENDIX 3 – SECTION E.12 OF THE PHASE II MS4 PERMIT

[Insert pdf pages of Section E.12 from the Phase II MS4 Permit here.]

APPENDIX 4 – POST-CONSTRUCTION MANAGEMENT FLOW CHART

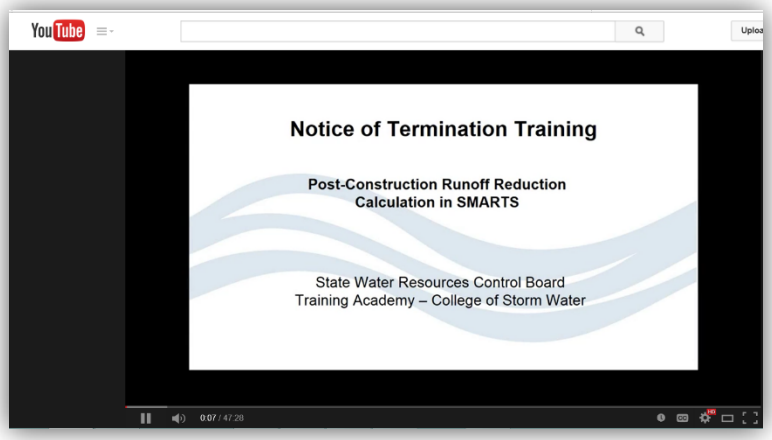

Does project create or replace more than 2,500 ft² of impervious surface?
Yes
No
The project is not applicable to the Post Construction Program requirements.
Does project create or replace more than 5,000 ft² of impervious surface?
No. It is a Small Project.
Yes
Is the project a detached single family home and not part of a larger project; interior remodel; routine maintenance or an LUP[1]?
Yes. It is a Small Project.
Implement one or more of the following Site Design Measures and quantify the runoff reduction using the State Water Board's SMARTS Post Construction Calculator:
Stream Setbacks and Buffers
Soil Quality Improvement and Maintenance
Tree Planting and Preservation
Rooftop and Impervious Area Disconnection
Porous Pavement
Green Roofs
Vegetated Swales
Rain Barrels and Cisterns
No, It is a Regulated Project
Is it a redevelopment project?
Yes
No
Does it have an increase >50% of existing impervious surface?
No
Yes
Runoff from the entire project must be treated.
Runoff from only the new or replaced surface must be treated.
If the project has any of the following activities, require it to follow the CASQA BMP Handbook guidance.
Accidental spills or leaks
Interior floor drains
Parking/storage areas and maintenance
Indoor and structural pest control
Landscape/outdoor pesticide use
Pools, spas, ponds, decorative fountains, and other water features
Restaurants, grocery stores, and other food service operations
Refuse areas
Industrial processes
Outdoor storage of equipment or materials
Vehicle and equipment cleaning
Vehicle and equipment repair and maintenance
Fuel dispensing areas
Loading docks
Fire sprinkler test water
Drain or wash water from boiler drain lines, condensate drain lines, rooftop equipment, drainage sumps, and other sources
Unauthorized non-storm water discharges
Building and grounds maintenance
Require the project proponent to take the following LID measures:
1. Define the development envelope and protected areas, identifying areas that are most suitable for development and areas to be left undisturbed.
2. Concentrate development on portions of the site with less permeable soils and preserve areas that can promote infiltration.
3. Limit overall impervious coverage of the site with paving and roofs.
4. Set back development from creeks, wetlands, and riparian habitats.
5. Preserve significant trees.
6. Conform the site layout along natural landforms.
7. Avoid excessive grading and disturbance of vegetation and soils.
8. Replicate the site's natural drainage patterns.
9. Detain and retain runoff throughout the site.
Require the project proponent to provide a map dividing the developed portions of the project site into discrete drainage management areas (DMAs) and to manage runoff from each DMA using Site Design Measures, and Storm Water Treatment and Baseline Hydromodification Measures
Proceed to Page 2


From Page 1
Project proponent must select one or more of the following Site Design Measures to evapotranspire, infiltrate, harvest / re-use, or biotreat the storm water runoff:
• Stream Setbacks and Buffers
• Soil Quality Improvement and Maintenance
• Tree Planting and Preservation
• Rooftop and Impervious Area Disconnection
• Porous Pavement
• Green Roofs
• Vegetated Swales
• Rain Barrels and Cisterns
The Site Design Measure(s) must be sized using either the SQDV (for the 85th percentile 24-hour storm runoff event) for runoff detaining control measures or the SQDF (0.2"/hr.) for flow through control measures.
Year 3 Requirement Will there be an increase of impervious area of 1 acre or more?
Yes
The post-project runoff shall not exceed the estimated pre-project flow rate for the 2-year, 24-hour storm event.
No
Do any of the following apply to the project?
• Projects creating or replacing an acre or less of impervious area, and located in a designated pedestrian-oriented commercial district (i.e., smart growth projects), and having at least 85% of the entire project site covered by permanent structures;
• Facilities receiving runoff solely from existing (pre-project) impervious areas; and
• Historic sites, structures or landscapes that cannot alter their original configuration in order to maintain their historic integrity.
No
Yes
Do any of the special site conditions apply?
1) Facilities located within 10 feet of structures or other potential geotechnical hazards established by the geotechnical expert for the project may incorporate an impervious cutoff wall between the bioretention facility and the structure or other geotechnical hazard.
2) Facilities with documented high concentrations of pollutants in underlying soil or groundwater, facilities located where infiltration could contribute to a geotechnical hazard, and facilities located on elevated plazas or other structures may incorporate an impervious liner and may locate the underdrain discharge at the bottom of the subsurface drainage/storage layer (this configuration is commonly known as a "flow-through planter").
3) Facilities located in areas of high groundwater, highly infiltrative soils or where connection of underdrain to a surface drain or to a subsurface storm drain are infeasible, may omit the underdrain.
4) Facilities serving high-risk areas such as fueling stations, truck stops, auto repairs, and heavy industrial sites may be required to provide additional treatment to address pollutants of concern unless these high- risk areas are isolated from storm water runoff or bioretention areas with little chance of spill migration.
Yes
Adjust the bioretention design as appropriate and document the reason for the design modification.
No
Remaining runoff after treatment with the Site Design measures must be directed to one or more facilities sized to the SQDF or SQDV that infiltrate, evapotranspire, and/or bioretain runoff. This control measure must be demonstrated to be at least as effective as a bioretention system having the following design parameters:
1. Maximum surface loading rate of 5 inches per hour, based on the flow rates calculated. A sizing factor of 4% of tributary impervious area may be used.
2. Minimum surface reservoir volume equal to surface area times a depth of 6 inches.
3. Minimum planting medium depth of 18 inches. The planting medium must sustain a minimum infiltration rate of 5 inches per hour throughout the life of the project and must maximize runoff retention and pollutant removal. A mixture of sand (60%-70%) meeting the specifications of American Society for Testing and Materials (ASTM) C33 and compost (30%-40%) may be used.
4. Subsurface drainage/storage (gravel) layer with an area equal to the surface area and having a minimum depth of 12 inches.
5. Underdrain with discharge elevation at top of gravel layer.
6. No compaction of soils beneath the facility, or ripping/loosening of soils if compacted.
7. No liners or other barriers interfering with infiltration.
8. Appropriate plant palette for the specified soil mix and maximum available water use.
Post Construction Design Complete
Require the project proponent to submit sizing calculations, design drawings, and a written operation and maintenance plan for the proposed LID and hydromodification control measures. Require the property owner to perform annual assessments of the effectiveness and maintenance of the control measures and to submit a self-certification report.

APPENDIX 5 – STATE OF CALIFORNIA POST-CONSTRUCTION CALCULATOR

Instructions on the Download and Use of the State of California's Post-Construction Calculator

The Post-Construction Calculator is available on the Water Board's SMARTS website. Designers can also use the State's Microsoft Excel™ version of the calculator. The Water Board has created an instructional video to populate and use the Post-Construction Calculator.

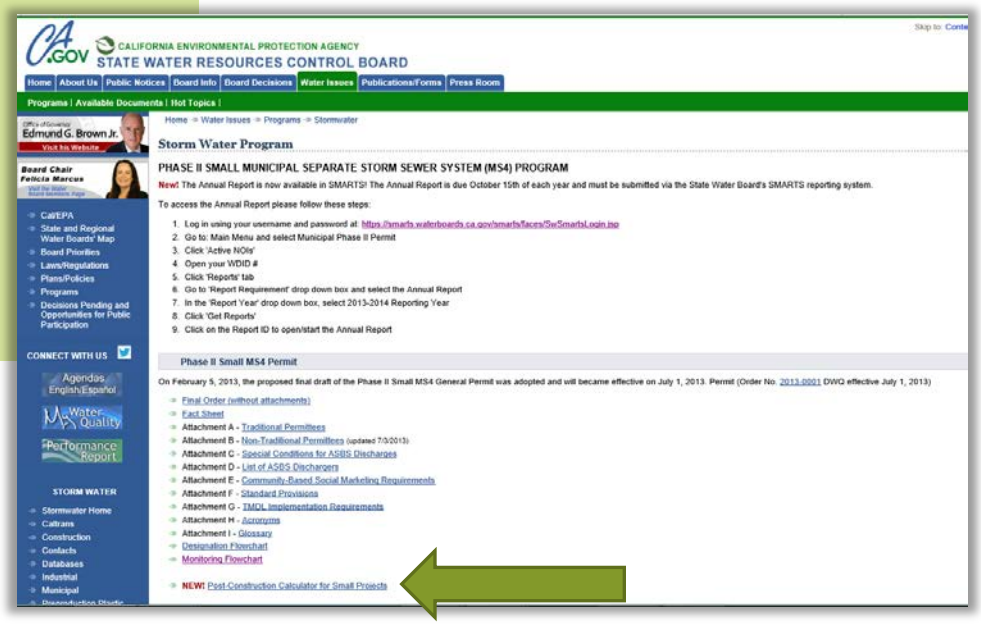


The Water Board created this 47-minute video that describes how to use the Post-Construction Calculator on SMARTS. It will also help with the Excel version. Although the video was created for the Construction General Permit, it also applies to the Post-Construction Standards Plan. It can be accessed at:

https://www.youtube.com/watch?v=W3nj4pj8WHY&feature=youtu.be

Post-Construction Calculator for Small Projects

The Water Board has created a Microsoft Excel version of the calculator that can now be downloaded from the State Water Board's website at the following link: http://www.swrcb.ca.gov/water_issues/programs/stormwater/phase_ii_municipal.shtml



APPENDIX 6 – VOLUMETRIC SIZING TOOL FOR TREATMENT CONTROLS

Instructions on the Download and Use of the Volumetric Sizing Tool for Treatment Control Measures

The Phase II MS4 Permit requires the municipality to condition applicable new development and redevelopment projects to require facilities designed to *evapo-transpire, infiltrate, harvest/use, and biotreat* storm water to meet at least one of the following hydraulic sizing design criteria:

Volumetric Criteria:

- The maximized capture storm water volume for the tributary area, on the basis of historical rainfall records, determined using the formula and volume capture coefficients in Urban Runoff Quality Management, WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87 (1998) pages 175-178 (that is, approximately the 85th percentile 24-hour storm runoff event); or
- The volume of annual runoff required to achieve 80 percent or more capture, determined in accordance with the methodology in Section 5 of the CASQA's Stormwater Best Management Practice Handbook, New Development and Redevelopment (2003), using local rainfall data.

A Microsoft Excel™ worksheet has been created to assist the project proponent to calculate the capture volumes using both of these volumetric criteria methods. Both methods are described in Section 5 of the 2003 edition of the *CASQA Stormwater Best Management Practice Handbook for New Development and Redevelopment*. Section 5 of the handbook can be accessed and downloaded for free at the following web link:

www.casqa.org/sites/default/files/BMPHandbooks/BMP_NewDevRedev_Section_5.pdf

The Volumetric Sizing Tool Worksheet can be downloaded from:

http://download.wgr-sw.com/documents/5515c2539b167-Appendix 6 Volumetric BMP Sizing Tool.zip

Instructions:

1. Start by entering the data on the "Volume Calculation" tab in the white boxes. It may be necessary to split up the project site into discrete drainage management areas (DMAs) where different "treatment" methods will be used. An example of this would be a medical complex where runoff from the parking lot is infiltrated through the use of porous pavement and bioswales; runoff from the building roofs is discharged into rain gardens built into the landscaping; and a large undeveloped vegetated area has been graded to serve as a retention area. In this case, it would be appropriate to have at least three different DMAs. Complete a separate worksheet for each DMA. Provide a name for each DMA and, in Step 1, enter the total area (in square feet) for the DMA.
2. Calculate the percentage of the DMA that will be impervious to storm water when the project is completed (i.e. hardscapes such as building, asphalt, concrete, etc.) and enter it into the white box in Step 2. Also enter the number of existing and planned trees in the DMA, distinguishing between the number of evergreen and the number of deciduous varieties.
3. In Step 3, using Google Earth and the map on the worksheet's "State Map" tab, determine the distance along the blue line from the Sacramento weather station. Indicate if the project is relatively north or south of Sacramento. If the project is due east or west of the blue line,

measure the distance from the perpendicular intercept of the blue line and the Sacramento weather station. If the project is immediately east or west of the Sacramento weather station, the distance would be zero. This does not have to be exact and is a rough determination of the position of the project relative to the latitude of the Sacramento weather station and the other available weather stations. Rain amounts are relatively higher north of Sacramento and relatively lower south of Sacramento. The CASQA volumetric determination method (referenced above) only includes three relevant weather stations in the Central Valley, which are Redding, Sacramento, and Fresno.

4. Using the information presented under the "Runoff Coefficients" worksheet tab, determine the average runoff coefficient for the DMA and enter it into the white box in Step 4. Document how the average coefficient was determined.

5. In Step 5, the capture volumes using both methods allowed by the Phase II MS4 Permit are presented. The project proponent has the option of using either one. Select the option that will be used.

6. Please note that this sizing tool is only valid for projects located within the California Central Valley from Shasta County in the north to Fresno County in the south. Projects located in the Sierras, Bay Area, coastal mountains, or along the coast cannot use this tool. Projects south of Fresno County cannot use this tool without it being altered.

7. For assistance with this tool, contact John Teravskis of WGR Southwest, Inc. at jteravskis@wgr-sw.com or at (209) 334-5363 x.110.

APPENDIX 7 – DESIGN STANDARD REFERENCES

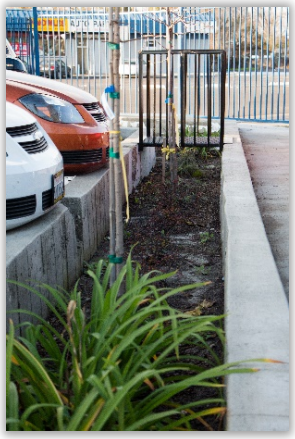
The following are some online design references for Design Standards and Treatment Controls:

Porous Pavement:

- Caltrans Pervious Pavement Design Guidance, August 2014 www.dot.ca.gov/hq/oppd/stormwtr/bmp/DG-Pervious-Pvm_082114.pdf
- Caltrans Pervious Pavement Specifications and Design Tool: www.dot.ca.gov/hq/oppd/stormwtr/pervious.htm
- USEPA Guidance Website on Porous Asphalt Pavement: http://water.epa.gov/polwaste/npdes/swbmp/Porous-Asphalt-Pavement.cfm
- Pennsylvania Storm Water Best Management Practices Manual on Pervious Pavement: www.stormwaterpa.org/assets/media/BMP_manual/chapter_6/Chapter_6-4-1.pdf
- University of New Hampshire Stormwater Center: Design Specifications for Porous Asphalt Pavement and Infiltration Beds: www.unh.edu/unhsc/sites/unh.edu.unhsc/files/pubs_specs_info/unhsc_pa_spec_10_09.pdf
- National Asphalt Pavement Association's Porous Asphalt Pavements for Storm Water Management Guide Book (Downloadable – cost $30) http://store.asphaltpavement.org/index.php?productID=759
- Bay Area Stormwater Management Agencies Association and City of Berkeley: Pervious Pavement - Storm Water Control for Small Projects www.ci.berkeley.ca.us/uploadedFiles/Online_Service_Center/Planning/Stormwater%20Fact%20Sheet_BASMAA_Pervious_Paving.pdf
- Santa Clara Valley Urban Runoff Pollution Prevention Program: Chapter 6 Technical Guidance for Stormwater Treatment and Site Design Measures www.scvurppp-w2k.com/permit_c3_docs/c3_handbook_2012/Chapter_6-Tech_Guidance_Stormwater_Treatment_Site_Design_Measures_2012.pdf

Rain Gardens:

- Bay Area Stormwater Management Agencies Association and Alameda County: Rain Gardens - Storm Water Control for Small Projects http://alamedaca.gov/sites/default/files/department-files/2013-04-29/11_-_rain_garden_fact_sheet.pdf
- Low Impact Development Center (www.lowimpactdevelopment.org/)
  Links for Guidance on the Design and Construction of a Rain Garden:
  www.lowimpactdevelopment.org/raingarden_design/links.htm#top
  Reference and Guidance Downloads:
  www.lowimpactdevelopment.org/raingarden_design/download.htm



Flow-through Planters:

- San Mateo Countywide Water Pollution Prevention Program: C.3 Technical Guidance, 6.2 Flow-Through Planter www.flowstobay.org/files/newdevelopment/C3techguide/12sec6.2Flowthru.pdf
- Stormwater Planters (draft version), Derek C. Godwin, Marissa Sowles, and Desiree Tullos, Oregon Sea Grant Extension; Maria Cahill, Green Girl Land Development Solutions. http://extension.oregonstate.edu/watershed/sites/default/files/stormwater_planters.pdf
  Santa Clara Valley Urban Runoff Pollution Prevention Program: Chapter 6 Technical Guidance for Stormwater Treatment and Site Design Measures www.scvurppp-w2k.com/permit_c3_docs/c3_handbook_2012/Chapter_6-Tech_Guidance_Stormwater_Treatment_Site_Design_Measures_2012.pdf

Infiltration Trenches and Tree Wells:

- USEPA Storm Water Technology Fact Sheet: Infiltration Trench (EPA 832-F-99-019, September 1999) http://water.epa.gov/scitech/wastetech/upload/2002_06_28_mtb_infltrenc.pdf
- Santa Clara Valley Urban Runoff Pollution Prevention Program: Chapter 6 Technical Guidance for Stormwater Treatment and Site Design Measures www.scvurppp-w2k.com/permit_c3_docs/c3_handbook_2012/Chapter_6-Tech_Guidance_Stormwater_Treatment_Site_Design_Measures_2012.pdf
- Minnesota Urban Small Sites BMP Manual: Infiltration Trenches http://www.sccd.org/Infiltration%20Trenches.pdf
- USEPA Stormwater to Street Trees: Engineering Urban Forests for Stormwater Management; (EPA 841-B-13-001, September 2013) http://water.epa.gov/polwaste/green/upload/stormwater2streettrees.pdf

Bioswales, Vegetated Buffers & Swales:

- Caltrans Biofiltration Swale Design Guidance; California Department of Transportation; CTSW-TM-07-172-05, January 2009 www.dot.ca.gov/hq/LandArch/ec/stormwater/guidance/DG-BioSwale-Final02-011309.pdf & www.dot.ca.gov/hq/LandArch/ec/stormwater/biofiltration_swales.htm
- Biofilters (Bioswales, Vegetative Buffers, & Constructed Wetlands) for Storm Water Discharge Pollution Removal; State of Oregon, Department of Environmental Quality, Dennis Jurries, PE; January 2003

www.deq.state.or.us/wq/stormwater/docs/nwr/biofilters.pdf

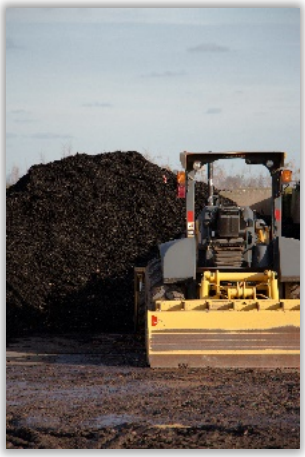
- Design Manual: Biological Filtration Canal (Bioswale); Dayna Yocum, Bren School of Environmental Science and Management, University of California, Santa Barbara http://fiesta.bren.ucsb.edu/~chiapas2/Water%20Management_files/Bioswales-1.pdf
- Santa Clara Valley Urban Runoff Pollution Prevention Program: Chapter 6 Technical Guidance for Stormwater Treatment and Site Design Measures www.scvurppp-w2k.com/permit_c3_docs/c3_handbook_2012/Chapter_6-Tech_Guidance_Stormwater_Treatment_Site_Design_Measures_2012.pdf
- USEPA Storm Water Technology Fact Sheet: Vegetated Swales (EPA 832-F-99-006, September 1999) http://water.epa.gov/scitech/wastetech/upload/2002_06_28_mtb_vegswale.pdf

Rain Water Harvesting and Reuse:

- USEPA Managing Wet Weather with Green Infrastructure Municipal Handbook: Rainwater Harvesting Policies; Christopher Kloss, Low Impact Development Center, December 2008 (EPA-833-F-08-010) http://water.epa.gov/infrastructure/greeninfrastructure/upload/gi_munichandbook_harvesting.pdf
- The City of San Diego Rain Water Harvesting Guide www.sandiego.gov/water/pdf/conservation/rainwaterguide.pdf
- Santa Clara Valley Urban Runoff Pollution Prevention Program: Chapter 6 Technical Guidance for Stormwater Treatment and Site Design Measures www.scvurppp-w2k.com/permit_c3_docs/c3_handbook_2012/Chapter_6-Tech_Guidance_Stormwater_Treatment_Site_Design_Measures_2012.pdf

Green Roofs:

- USEPA Design Guidelines and Maintenance Manual for Green Roofs in the Semi-Arid and Arid West; Leila Tolderlund, University of Colorado Denver, November 2010 http://www2.epa.gov/sites/production/files/documents/GreenRoofsSemiAridAridWest.pdf
- City of Berkeley Office of Energy and Sustainable Development webpage: www.ci.berkeley.ca.us/greenroofs/
- City of Watsonville Green Roof Design Criteria webpage: http://cityofwatsonville.org/public-works-utilities/urban-greening-plan/green-roof-design (contains a link to a downloadable 30-page Green Roof Design Criteria Plan published in March 2012)
- Green Roofs for Healthy Cities (private organization) webpage: www.greenroofs.org/ Training, certifications, design manuals, and other resources available for designing green roofs.



Soil Quality Improvement and Compost:

- United States Department of Agriculture's Natural Resources Conservation Service (NRCS) Urban Soil Primer www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052835.pdf
- US Composting Council Fact Sheets and Reports; http://compostingcouncil.org/factsheets-and-free-reports/
- Department of Land, Air and Water Resources at UC Davis and the U.S. Forest Service's Center for Urban Forest Research Report on Engineered Soil, Trees and Stormwater Runoff: the UC Davis Parking Lot Project www.fs.fed.us/psw/programs/uesd/uep/products/psw_cufr686_UCDParkingLot.pdf
- USEPA Stormwater to Street Trees: Engineering Urban Forests for Stormwater Management; (EPA 841-B-13-001, September 2013) http://water.epa.gov/polwaste/green/upload/stormwater2streettrees.pdf

APPENDIX 8 – POST-CONSTRUCTION PROJECT WORKSHEET

POST-CONSTRUCTION WORKSHEET FOR THE COUNTY OF STANISLAUS STORMWATER PROGRAM

PROJECT SUMMARY SHEET

Project Owner Information:

Project Owner Name:					
Name of Contact Person:					
Mailing Street Address:					
City:		State:		Zip:	
Telephone:		Email:			

Project Information:

Project Name:					
Name of Contact Person:					
Project Address:					
City:		State:		Zip:	
Anticipated construction start date:		Ending date:			
Project size (ft²):		Subject to the Construction General Permit? (Yes / No)			
Information of the Post-Construction Standards Plan Preparer:					
Name of Organization:					
Name of Contact Person:					
Mailing Street Address:					
City:		State:		Zip:	
Telephone:		Email:			
Project Applicability:					
Type of Project: (Check one)		Small Project (2,500 to 5,000 ft² or detached single family home)			
		Regulated Project (5,000 ft²)			
		Not applicable to the Post-Construction Standards Plan (*provide reason in the space below*)			
Is this a redevelopment project? (Yes / No)		Will the project result in an increase of more than 50% of the impervious surface? (Yes / No)			
Has the project or the vesting map received approval from the municipality? (Yes, No, or N/A)		Date of project or vesting map approval:			
Describe the nature and scope of the construction project:					
Number of Drainage Management Areas (DMAs):					

POST-CONSTRUCTION WORKSHEET FOR THE COUNTY OF STANISLAUS STORMWATER PROGRAM

SMALL PROJECT SUBMITTAL SHEET

Project Information:

Project Name:	
Project Owner Name:	
Project Address:	

Selection of Site Design Measures:

Select one or more of the following Site Design Measures (as identified in Section 4.1 of the Post-Construction Standards Plan) which will be incorporated into the project's design.

Site Design Measures	*Selected? (Yes / No)*
Stream Setbacks and Buffers	
Soil Quality Improvement and Maintenance	
Tree Planting and Preservation	
Rooftop and Impervious Area Disconnection	
Porous Pavement	
Green Roofs	
Vegetated Swales	
Rain Barrels and Cisterns	

Post-Construction Calculator Information:

Enter the following data from the State's Post-Construction Calculator:

Pre-project Runoff Volume (ft^3)	
Post-project Runoff Volume (ft^3)	
Net Credit of Volume Credits (ft^3)	

Small Project Submittal Requirements:

The following must be submitted for Small Projects to the plan checker:

- Completed pages 1 and 2 of this Post-Construction Worksheet.
- Site plans showing the selected Site Design Measure(s) (identified in Section 4.1). The plans must be stamped by a California Civil Professional Engineer if any of the following Site Design Measures were selected: rooftop and impervious area disconnection, porous pavement, or rain cisterns. The plans must be stamped by a California Structural Professional Engineer if a green roof was selected or if there is a significant structural aspect to the rain cisterns and collection system. The plans must be stamped by a California Licensed Landscape Architect if any of the following Site Design Measures were selected: stream setbacks and buffers or soil quality improvement. Plans containing vegetated swales must be stamped by either a California Professional Civil Engineer or a California Licensed Landscape Architect. The Site Design Measure(s) must be clearly called out on the submitted plans.
- A printout of the results page from the Water Board's SMARTS or Microsoft Excel™ Post-Construction Calculator.

POST-CONSTRUCTION WORKSHEET FOR THE COUNTY OF STANISLAUS STORMWATER PROGRAM

REGULATED PROJECT DMA SUBMITTAL SHEET

Drainage Management Area (DMA) & Project Information:

*A **separate** Regulated Project DMA Submittal Sheet is required to be completed and submitted for each DMA. Refer to Section 5.1 of the Post-Construction Standards Plan for more information about DMAs.*

Project Name:	
Project Owner Name:	
Project Address:	
Name of the DMA:	
DMA area (ft^2)	

Selection of Applicable Source Controls:

*Indicate which of the following activities or pollutant sources are included in **this DMA** of the new development or redevelopment. For more information about required Source Control refer to Section 5.2.*

Site Design Measures	*(Yes / No)*
Accidental spills or leaks	
Interior floor drains	
Parking / storage areas and maintenance	
Indoor and structural pest control	
Landscape / outdoor pesticide use	
Pools, spas, ponds, decorative fountains, and other water features	
Restaurants, grocery stores, and other food service operations	
Refuse areas	
Industrial processes	
Outdoor storage of equipment or materials	
Vehicle and equipment cleaning	
Vehicle and equipment repair and maintenance	
Fuel dispensing areas	
Loading docks	
Fire sprinkler test water	
Drain or wash water from boiler drain lines, condensate drain lines, rooftop equipment, drainage sumps, and other sources	
Unauthorized non-storm water discharges	
Building and grounds maintenance	

Hydrologic Soil Group and Soil Type Information:

*Enter information concerning the soil types **within this DMA**. For more information, refer to Table 7 of the Post-Construction Standards Plan.*

Soil Type Name	HSG Group (A, B, C, or D)

Low Impact Development (LID) Design Requirements:

Please describe how the project is meeting each of the following LID design requirements. Provide your response in the text box following each requirement or provide responses on a separate sheet.

1. Define the areas of the project that are to be left undisturbed or protected from soil disturbance. Identify sensitive environmental receptors such as water bodies, stream buffers, existing trees, riparian areas, and habitat areas.

2. How is the project concentrating development on portions of the site with less permeable soils and preserving areas that can promote infiltration?

3. How is the project limiting the overall impervious coverage of the site consisting of paving and roofs?

4. If applicable, what is the development setback from creeks, wetlands, and riparian habitats? The County of Stanislaus requires a minimum setback of 100'.

5. List and describe the trees that will be preserved.

6. Describe how the new development or redevelopment site layout will conform to natural landforms.

7. Describe how the project is avoiding excessive grading and disturbance of vegetation and soils.

8. Describe how the new development or redevelopment is replicating the site's natural drainage patterns.

9. Describe how the project will detain and retain runoff through the new development and redevelopment site.

Pre- and Post-Development Project Hydrology Information:

*Provide the following hydrology information for **this DMA**.*

Pre-development Conditions:

Percent Impervious	
Average runoff coefficient for this DMA	
Peak flow rate (ft^3/sec) for this DMA using the 2-year 24-hour design value discussed in Section 5.5.	

Post-development Conditions:

Percent Impervious	
Average runoff coefficient for this DMA	
Peak flow rate (ft^3/sec) for this DMA using the 2-year 24-hour design value discussed in Section 5.5.	

Selection of Site Design and Treatment Control Measures:

*Indicate which Site Design and Treatment Control Measures will be used for **this DMA**. For more information, refer to Table 3. Provide calculations and design drawings for the selected measures per the submittal requirements describe in Section 5.6.*

Site Design or Treatment Control Measure	Sizing Criteria	Selected? (Yes / No)	Enter the Calculated Design Capture Volume or Flow Rate for the Selected Measure
Stream setbacks and vegetated buffers *(Site Design Measure)*	Flow		
Soil quality improvement *(Site Design Measure)*	Volume		
Tree planting and preservation *(Site Design Measure)*	SMARTS Calculator		
Porous pavement *(Site Design Measure)*	Volume		
Green roofs *(Site Design Measure)*	Volume		
Vegetated swales *(Site Design Measure)*	Flow		
Rain harvesting and reuse *(Site Design Measure)*	Volume		
Bioretention and rain gardens *(Treatment Control Measure)*	Volume		
Infiltration trench, Flow-through Planter, or Tree Wells *(Treatment Control Measure)*	Volume and Flow		
Retention and detention basins *(Treatment Control Measure)*	Volume		

Variations and Exceptions:

*Identify any applicable variations or exceptions for **this DMA**.*

Condition	Allowed Variation	Applicable to this DMA? If so, explain.
Facilities located within 10 feet of structures or other potential geotechnical hazards established by the geotechnical expert for the project	May incorporate an impervious cutoff wall between the bioretention / infiltration facility and the structure or other geotechnical hazard	
Facilities with documented high concentrations of pollutants in underlying soil or groundwater, facilities located where infiltration could contribute to a geotechnical hazard, and facilities located on elevated plazas or other structures	May incorporate an impervious liner and may locate the underdrain discharge at the bottom of the subsurface drainage/storage layer (this configuration is commonly known as a "flow-through planter")	
Facilities located in areas of high groundwater, highly infiltrative soils or where connection of underdrain to a surface drain or to a subsurface storm drain are infeasible	May omit the underdrain	
Facilities serving high-risk areas such as fueling stations, truck stops, auto repairs, and heavy industrial sites	Are required to provide additional treatment to address pollutants of concern prior to the flow reaching the infiltration facility	

*If infiltration is not feasible for **this DMA**, please provide an explanation of the infeasibility and a description of the alternate non-infiltrating treatment control measure(s) that will be used in accordance with the development requirements in Section 5.4.4.*

Regulated Project Submittal Requirements:

The following items must be submitted to the plan checker for Regulated Projects:

- The completed Post-Construction Worksheet including page 1 and, for each DMA, pages 3 – 10.
- A separate site plan for each DMA must be submitted. If there are multiple DMAs, a key map showing the location of each DMAs in relationship to one another and the entire site must be submitted. Each DMA site plan is required to show the following information:
  - ✓ DMA name and boundary;
  - ✓ The selected Site Design and Treatment Control Measures (identified in Table 3);
  - ✓ The total drainage area in square feet of the DMA;
  - ✓ The pre-development peak flow rate at the point(s) of discharge;
  - ✓ The predicted post-development peak flow rate at the point(s) of discharge;
  - ✓ Areas of existing impervious surfaces (pre-development);
  - ✓ Proposed areas of impervious surfaces (post-development);
  - ✓ Setbacks from creeks, wetlands, and riparian habitats;
  - ✓ Existing topography and drainage patterns (pre-development);
  - ✓ Proposed topography and drainage patterns (post-development);
  - ✓ Soil types, soil type boundaries within the DMA, and their Hydrologic Soil Group Classification rating (A, B, C, or D); and
  - ✓ Trees, vegetation, and sensitive environmental areas to be protected and preserved.

  Each plan must be stamped by a qualified licensed professional. The plans must be stamped by a California Civil Professional Engineer if any of the following control measures were selected: rooftop and impervious area disconnection, porous pavement, rain cisterns, infiltration trench, or retention or detention basins. The plans must be stamped by a California Structural Professional Engineer if a green roof was selected or if there is a significant structural aspect to the rain cisterns and collection system. The plans must be stamped by a California licensed Landscape Architect if any of the following Site Design Measures were selected: stream setbacks and buffers or soil quality improvement. Plans containing vegetated swales, bioretention or rain gardens must be stamped by either a California Civil Professional Engineer or a California Licensed Landscape Architect. The selected Site Design and Treatment Control Measure(s) must be clearly called out on the submitted plans.
- Design drawings for the proposed Treatment Control Measures showing a plan view, elevation view, and subsurface cross-sections must be submitted. Sufficient detail and specifications should be included in these drawings to provide for adequate plan check review and for the construction of the treatment "facility". Each design drawing must be stamped by a qualified licensed professional. The drawings must be stamped by a California Civil Professional Engineer if any of the following control measures were selected: rooftop and impervious area disconnection, porous pavement, rain cisterns, infiltration trench, or retention or detention basins. The drawings must be stamped by a California Structural Professional Engineer if a green roof was selected or if there is a significant structural aspect to the rain cisterns and collection system. The drawings must be stamped by a California licensed Landscape Architect if any of the following Site Design Measures were selected: stream setbacks and buffers or soil quality improvement. Design drawings for vegetated swales, bioretention and rain gardens must be stamped by a California Civil Professional Engineer or a California Licensed Landscape Architect.

- A print out of the results page from the MS Excel™ Volumetric BMP Sizing Tool for each DMA and control measure that requires the volumetric sizing criteria must be submitted. (Refer to Appendix 6 for instructions to download the tool.)
- Calculations stamped by the appropriate licensed individual (as described above) for each DMA and control measure that requires flow-based sizing criteria.
- An Operation and Maintenance Plan and Property Owner-signed and notarized Statement of Responsibility for the proposed treatment control measures (refer to Section 6 and Appendix 9).

APPENDIX 9 – O&M PLAN AND CERTIFICATE OF RESPONSIBILITY FORM

To obtain a current copy of Stanislaus County's O & M Plan and Statement of Responsibility go to:

http://www.stancounty.com/publicworks/pdf/o-m-statement-of-responsibility.pdf

APPENDIX 10 – LIST OF COLLABORATING MUNICIPALITIES

Collaborating Phase II MS4s:

Cities

City of Atwater

City of Ceres

City of Shasta Lake

City of Escalon

City of Lathrop

City of Merced

City of Oakdale

City of Redding

City of Ripon

City of Riverbank

City of Turlock

City of West Sacramento

Counties

Shasta County

Stanislaus County

Yuba County

Non-Traditional MS4s

Tracy Unified School District