Cities of Cloverdale, Cotati, Healdsburg, Rohnert Park, Santa Rosa, Sebastopol, and Ukiah, County of Sonoma, Sonoma Water and Town of Windsor

May 2017 (Revised Dec 2020)

Storm Water Low Impact Development Technical Design Manual

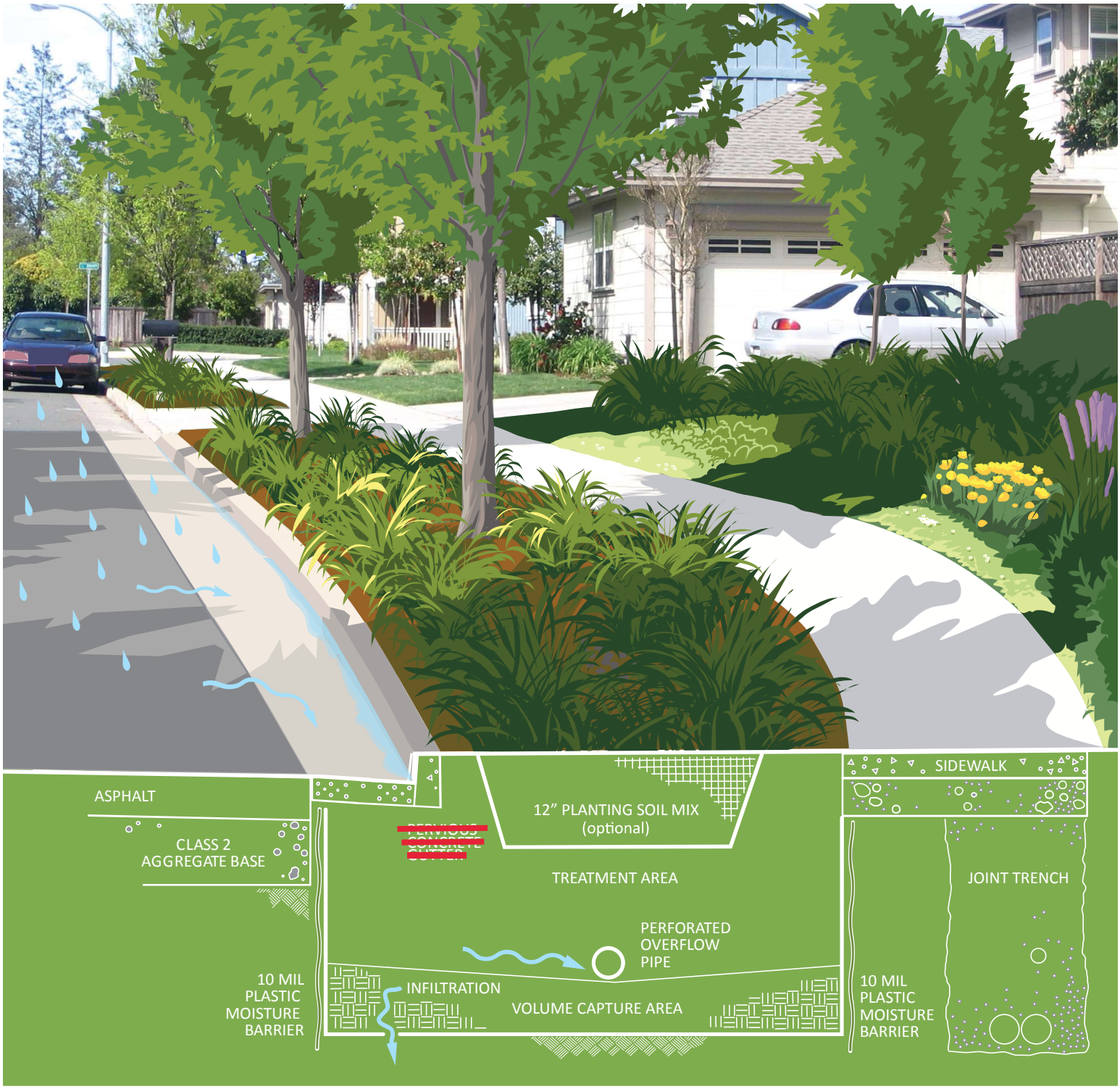


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ACRONYMS, ABBREVIATIONS AND DEFINITIONS

APN: Assessor's Parcel Number.

BEST MANAGEMENT PRACTICE (BMP): A program, technology, process, citing criteria, operational method, or engineered system which when implemented prevents, controls, removes, or reduces pollution.

C-FACTOR: Representation of a surface's ability to produce runoff. Surfaces that produce higher quantities of runoff are represented by higher C-Factors (such as impervious surfaces.)

CC&Rs : Conditions, Covenants and Restrictions.

CURVE NUMBER (CN): CN is based on soils, plant cover, amount of impervious area, interception, and surface storage. CN is an empirical parameter used in hydrology for predicting runoff or infiltration from rainfall.

COPERMITTEES: Local Government Agencies (County of Sonoma, City of Cloverdale, City of Cotati, City of Healdsburg, City of Rohnert Park, City of Santa Rosa, City of Sebastopol, Sonoma Water, City of Ukiah, and the Town of Windsor) regulated under a common NPDES MS4 Storm Water Permit issued by the North Coast Regional Water Quality Control Board.

DELTA VOLUME CAPTURE: The capture and retention of the increase in volume of runoff due to development generated by 1.0" of rain over a 24-hour period. See Chapter 6 for formulas and further description.

DISCRETIONARY PROJECT: A project which requires the exercise of judgment or deliberation when a public agency or body decides to approve or disapprove a particular activity.

FULL-DEPTH RECLAMATION: The Asphalt Recycling and Reclaiming Association defines full-depth reclamation (FDR) as "a reclamation technique in which full flexible pavement section and a predetermined portion of the underlying materials are uniformly crushed, pulverized, or blended, resulting in a stabilized base course."

GOVERNING AGENCY: The agency which has approval authority related to storm water over the proposed project.

HILLSIDE: Property either located in an area having known erosive soil conditions, where the development will result in grading on any slope that is 10% or greater or an area designated by the municipality under a General Plan or ordinance as a "hillside area".

HYDROMODIFICATION: Altering the drainage patterns (away from their natural state) of a site and the flows, beds or banks of rivers, streams, or creeks, including ephemeral washes, which results in hydro-geomorphic or habitat changes. Hydromodification is the term used to describe the changes that occur in a waterway as the result of changes in the contributing watershed.

When a site is developed and the amount of impervious area is increased, runoff generated will reach the waterway sooner, at higher velocities, and at higher volumes than it had in the previously undeveloped condition. Additionally, the total time that the creek receives flow will be shortened. These changes in flow patterns cause negative impacts such as erosion of creek banks, sediment scour, and reduced base flow. These impacts in turn affect wildlife and riparian habitat, damage property, and alter flood conditions.

HYDROMODIFICATION CONTROL: As defined for the purposes of this manual, hydromodification control Best Management Practices (BMPs) are BMPs that meet the definition of a LID BMP and are required to capture and retain 100% of the volume of runoff generated by 1.0" of rain over a 24-hour period for project sites increasing or replacing one acre or more of impervious surface. See Chapter 6 for formulas and further description. Note: It is possible that a Project that increases or replaces less than one acre of impervious surface may be required to implement hydromodification controls if required by the Clean Water Act Section 401 permit issued by the Regional Water Quality Control Board.

IMPERVIOUS SURFACE: For the purposes of this Manual, impervious surface is defined as areas that have been modified such that storm water percolation into underlying soils is reduced or prohibited. Typical examples of impervious surfaces include concrete, asphalt, and roof tops. Additional examples include engineering practices such as compaction or lime treatment. Gravel placed as part of the proposed project is considered to be impervious unless documentation is provided to verify that it is pervious. Existing gravel on a project site prior to the proposed project is considered to be pervious unless documentation is provided that demonstrates that it is impervious.

LOW IMPACT DEVELOPMENT (LID): LID is a design strategy with the goal of replicating the pre-development hydrologic function of the site through the use of design techniques. Hydrologic functions include rainwater storage, infiltration, and groundwater recharge. LID design techniques seek to maintain the volume and frequency of discharges through the use of integrated small-scale storm water retention and detention areas, reduction of impervious surfaces, and the lengthening of flow paths. All these LID design elements increase infiltration and decrease runoff velocity and volume.

LOW IMPACT DEVELOPMENT (LID) BMPs: Permanent storm water BMPs that treat or retain storm water through a soil filter media and/or vegetation and/or retain storm water runoff on-site through infiltration or evapotranspiration. LID BMPs are permanent, typically small scale (although large scale is acceptable), planted features that aim to mimic the hydrologic function of the pre-development site by capturing, treating, and infiltrating storm water as close to the source as possible. At plant maturity, at least 50% of a BMP must be vegetated for the BMP to be considered a LID BMP per the BMP Selection Table (see Appendix B). Alternatively, a BMP

can be considered to be a LID BMP if the Hydromodification Control BMP design criteria is met and at least one vegetated a water quality BMP or Runoff Reduction Measure is utilized to provide water quality treatment prior to discharge to the volume capture BMP.

MINISTERIAL PROJECT: A project where the agency or body merely has to determine whether there has been conformity with applicable statues, ordinances, or regulations.

MS4 PERMIT: Municipal Separate Storm Sewer Systems Permit.

NCRWQCB: North Coast Regional Water Quality Control Board. This design manual is covered under the North Coast Regional Area (Region 1).

NPDES: National Pollutant Discharge Elimination System.

PERVIOUS SURFACE: For the purposes of this manual, pervious surfaces are areas that allow for storm water infiltration into the underlying soil as would occur in the undeveloped location in an unaltered condition.

POLLUTION PREVENTION: Design approaches and/or site construction/maintenance practices that minimize or prevent pollution from entering storm water runoff and impacting storm water quality.

PRE-DEVELOPED CONDITION: Describes the project site prior to the proposed development.

PRETREATMENT: As it relates to this LID Manual, pretreatment is defined as an additional treatment step and/or BMP that is designed to remove a specific pollutant or pollutants of concern before the runoff reaches the main LID BMP.

RECONSTRUCTION: The removal and replacement of paving material or building material down to exposed or disturbed soil (subgrade).

REDEVELOPMENT: Land-disturbing activity that results in the creation, addition, or reconstruction of impervious surface area on an already developed site. Redevelopment includes, but is not limited to, the following: the expansion of a building footprint; addition or replacement of a structure; reconstruction of impervious surface that is not a part of a routine maintenance activity. It does not include routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of facility, nor does it include emergency construction activities required to immediately protect public health and safety. Minor changes to line or grade of 0.20 feet or less shall be considered as maintaining original line and grade.

ROUTINE MAINTENANCE ACTIVITIES: Routine maintenance activities are activities that are conducted to maintain original line and grade, hydraulic capacity, and original purpose of facilities. Routine maintenance activities include activities such as overlays and/or resurfacing

of existing roads or parking lots, road pavement structural section rehabilitation (FDR)[1], as well as trenching and patching activities and reroofing activities. For activity to be considered "routine maintenance" it must not change existing lines and grades or hydraulic capacity. Minor changes to line or grade of 0.20 feet or less shall be considered as maintaining original line and grade. Replacement of existing pedestrian ramps to maintain compliance with current Americans with Disabilities Act Requirements shall be regarded as routine maintenance.

SITE: For the purposes of this manual, the site includes any and all areas of improvements associated with the project. The site includes public improvements, frontages, utility services, and any offsite improvements.

STORM WATER: Flow generated by rainfall.

STORM WATER POLLUTION PREVENTION PLAN (SWPPP): A plan to identify and implement site specific, construction related BMPs to reduce or eliminate pollutants (particular pH and turbidity) in storm water discharge from construction sites. The Statewide Construction Activity NPDES General Permit requires the preparation of a SWPPP for projects that disturb one acre or more of soil. SWPPP's are submitted to the State Water Resources Control Board (SWRCB) and are not covered in this Manual.

STRUCTURAL BMP: Any manufactured facility, structural mechanism, or apparatus designed and constructed to mitigate the adverse impacts of storm water runoff pollution (e.g. canopy, structural enclosure). The category may include both treatment control BMPs and source control BMPs.

STORM WATER LOW IMPACT DEVELOPMENT SUBMITTAL (SWLIDS): The deliverable report that satisfies the project specific MS4 permit requirements as described in this Manual.

STORM WATER LID DETERMINATION WORKSHEET: A worksheet to determine if a project will need to incorporate permanent Storm Water Best Management Practices (BMPs) and submit a SWLIDS as required by the NPDES MS4 Permit Order No. R1-2015-0030.

[1] FDR maintenance activities are exempt as long as it is not part of a larger development or redevelopment project; does not change pre-project drainage patterns; and does not expand the footprint of the road.

SUBGRADE: That portion of roadway on which pavement surfacing, aggregate base, subbase or a layer of any other material is placed (also known as the grading plane or the point at which soil would be exposed and/or disturbed).

SWRCB: State Water Resources Control Board**.**

TRASH AMENDMENT: An amendment to the State Water Resources Control Board's *Water Quality Control Plan for Ocean Waters* and the *Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California* that establishes a trash discharge prohibition and includes a strategy to provide "full capture" of trash from stormwater through the use of existing and reissued NPDES permit provisions, such as the MS4 permit. The Trash Amendment requires that all debris particles 5 millimeters or greater in size must be trapped to meet the full capture standard.

TRASH CAPTURE: Capture of all trash and debris 100 microns (0.0039 inches) in diameter (for LID BMPs) and larger.

TREATMENT BMPs: An engineered system that is designed to remove pollutants from storm water using physical, chemical, or biological processes before the storm water is discharged to the storm drain system. Examples of treatment controls include: vegetated swales, extended detention basins, vegetated buffer strips, Bioretention areas, and media filters.

TREATMENT TRAIN: Using a variety of BMPs, both practices and constructed features, in series in order to achieve improved storm water quality.

TRIBUTARY AREA: The physical area that drains to a specific BMP or drainage feature.

U.S. EPA: United States Environmental Protection Agency.

100% VOLUME CAPTURE: For the purposes of this manual, 100% volume capture is the capture and retention of 100% of the volume of runoff generated by 1.0" of rain over a 24-hour period. See Chapter 6 for formulas and further description.

WETLANDS: Areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, and bogs. For official determination whether or not an area is classified as a wetland pursuant to Section 404 of the Federal Clean Water Act, contact the United States Army Corps of Engineers.

CHAPTER 1: INTRODUCTION

INTRODUCTION



Creeks and riparian habitat areas are a beautiful aspect of our community and home to a wide range of aquatic and terrestrial species such as; fish, otters, ducks, hummingbirds, egrets, and frogs. Our local creeks drain to the river and ocean and their water quality is important for our generation and future generations.

Development of land typically increases impervious surface and decreases infiltration. Storm water, or runoff generated from rain, that is not absorbed into the ground accumulates debris, chemicals and other polluting substances harmful to water quality. Polluted storm water entering creeks is a significant concern to plant and animal life that inhabit the waterways and ultimately public health as well. Additionally, land development typically increases the flow rate and decreases the duration of runoff from land causing hydromodification in creeks, which contributes to erosion, flooding, loss of habitat, and decreased aquatic biological diversity.

The intent of this manual is to provide design guidance to mitigate negative water quality impacts due to development.

BACKGROUND

The Federal Water Pollution Control Act of 1948 was the first major U.S. law to address water pollution. Growing public awareness and concern for controlling water pollution led to sweeping amendments in 1972. As amended in 1972, the law became commonly known as the Clean Water Act. Congress subsequently authorized the National Pollution Discharge Elimination System (NPDES), which regulates municipal storm water discharges through the issuance of Municipal Separate Storm Sewer System (MS4) permits.



The North Coast Regional Water Quality Control Board (NCRWQCB) issues the NPDES Municipal Separate Storm Sewer Systems (MS4) Permit (Permit) requiring Governing Agencies to implement a myriad of programs to prevent pollution, improve and protect storm water quality, reduce storm water runoff, and enhance the ecologic vitality of local creeks and waterways. The Permit also requires that

the Governing Agencies regulate new development and retrofit projects within their jurisdiction.

The original CoPermittees (City of Santa Rosa, County of Sonoma and Sonoma County Water Agency) received their first NPDES storm water permit in 1997 which has been renewed approximately every five years. The most recent permit update took effect January 6, 2016 and required that the previous version of this LID Technical Design Manual (LID Manual) be revised to meet the new permit requirements. Additionally, the City of Cloverdale, City of Cotati, City of Healdsburg, City of Rohnert Park, City of Sebastopol, City of Ukiah, and Town of Windsor have been added to the County of Sonoma, Sonoma County Water Agency, and City of Santa Rosa as CoPermittees.

Each CoPermittees is responsible for applying these Permit requirements in conformance with this LID Manual, at a minimum, to new development, retrofit projects, and applicable infrastructure improvement projects within their jurisdiction.

PURPOSE OF THIS LID MANUAL

The Storm Water Low Impact Development Technical Design Manual (LID Manual) provides technical guidance for project designs that require the implementation of permanent storm water Best Management Practices (BMPs). This Manual supersedes both the 2005 SUSMP Guidelines and the 2011 version of this LID Manual.



HOW THIS MANUAL RELATES TO OTHER REQUIREMENTS

This Manual is intended to satisfy the specific requirements of "ORDER NO. R1-2015-0030, NPDES NO. CA0025054 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT AND WASTE DISCHARGE REQUIREMENTS FOR DISCHARGES FROM THE MUNICIPAL SEPARATE STORM SEWER SYSTEMS" (Order R1-2015-0030). Additional design requirements imposed by Governing Agencies, such as local grading ordinances, CAL Green, CEQA, 401 permitting, and hydraulic design for flood control still apply as appropriate. Governing Agencies may, at their discretion, determine that designing in accordance with this Manual satisfies other requirements. Additionally, coverage under another regulation may trigger the requirement to design in accordance with this Manual. Please check with the local Governing Agency for specific requirements.

CHAPTER 1: INTRODUCTION

WHAT IS STORM WATER LOW IMPACT DEVELOPMENT (LID)?

For the purposes of this Manual, Low Impact Development (LID) Best Management Practices (BMPs) are defined as permanent storm water BMPs that treat or retain storm water through a soil filter media and/or vegetation and/or retain storm water runoff on-site through infiltration or evapotranspiration.

LID BMPs are permanent, small scale, planted features that aim to mimic the hydrologic function of the predevelopment site by capturing, treating, and infiltrating storm water as close to the source as possible. At plant maturity, at least 50% of a BMP must be vegetated for the BMP to be considered a LID BMP per the BMP Selection Table. If 50% vegetated cover will not be established before the completion of construction, the following shall be supplied as part of the project design submittal approval process in order to be considered a LID BMP: 1) an erosion control plan for the LID BMPs with sufficient measures to provide soil stabilization and treatment until plant maturity (e.g. ground-up, composted mulch on all bare soils with rock inlet protection); and 2) a planting and irrigation plan for the LID BMPs that shall include, by plant genus species and common name, selected plants, maximum spacing, total number of plants to be installed, and a table with mature plant size (canopy). Alternatively, a BMP can be considered to be a LID BMP if the Hydromodification Control BMP design criteria is met and it is paired with one of the Runoff Reduction Measures (Disconnected Roof Drains, Paved Area Disconnection, Interceptor Trees, Buffer Strips and Bovine Terraces) in series as part of a "treatment train."



LID is formally defined as:

"A development site design strategy with a goal of maintaining or reproducing the pre-development hydrologic system through the use of design techniques to create a functionally equivalent hydrologic setting. Hydrologic functions of storage, infiltration, and groundwater recharge, as well as the volume and frequency of discharges are maintained through the use of integrated and distributed small-scale storm water retention and detention areas, reduction of impervious surfaces, and the lengthening of flow paths, and runoff time."

(As defined in Attachment A of Order R1-2015-0030, NPDES Permit No. CA0025054)

CHAPTER 1: INTRODUCTION

The intention of this Manual is to promote the following LID goals:

- Minimize the adverse impacts from storm water runoff on water quality, the biological integrity of receiving waters, and the beneficial uses of water bodies.
- Minimize the percentage of impervious surfaces on land development projects and implement mitigation measures to mimic the pre-development water balance through infiltration, evapotranspiration, and capture and reuse of storm water.
- Minimize pollutant loadings from impervious surfaces such as roof tops, parking lots, and roadways through the use of properly designed, technically appropriate BMPs, including source control BMPs or good housekeeping practices, LID planning and design strategies, and treatment control BMPs.
- Proper selection, design and maintenance of treatment control BMPs, and Hydromodification Control BMPs to address pollutants generated by land development, minimizing post-development surface flows and velocities, assuring long-term functionality of BMPs, and avoiding the breeding of vectors.

REVISION AND AMENDMENT

It is recognized that LID is an emerging field, and that while every effort has been made to ensure that this Manual is complete and accurate, revisions and/or amendments may be necessary. Proposed revisions and/or amendments will be evaluated on a case by case basis and will require review and approval by the NCRWQCB.

CHAPTER 2: PROJECT TRIGGERS

PROJECTS THAT TRIGGER REQUIREMENTS

GEOGRAPHIC AREAS

The requirements set forth in this Storm Water Low Impact Development Technical Design Manual apply to projects within the jurisdiction of City of Santa Rosa, City of Healdsburg, Town of Windsor, City of Cotati, City of Sebastopol, City of Cloverdale, City of Ukiah and City of Rohnert Park as well as the portions of the County of Sonoma as shown in Attachment C of the NPDES MS4 Permit Order No. R1-2015-0030. Although the Sonoma Water is named in the Permit, it does not have land use authority.

This LID Manual does not apply to the areas south of the Russian River/Laguna De Santa Rosa watershed boundary, including portions of Petaluma, Sonoma, and the southern portion of the County of Sonoma as they are outside the jurisdiction of the North Coast Regional Water Quality Control Board and have distinct design requirements**.**

PROJECT TRIGGERS AND EXEMPTIONS

Since Storm Water LID features are designed to mitigate for the permanent impacts caused by impervious surfaces, the total amount of impervious surface must be considered when determining whether or not a project triggers Storm Water LID requirements. This evaluation must include the built-out project condition (including homes, structures, sidewalks, and/or roadways that will be completed under separate building permits) as well as all phases of a phased project. Note that for site tributary areas where no impervious surface will be added or replaced, the installation of BMPs are not required.

IMPERVIOUS SURFACE

An impervious surface is defined as areas that has been modified such that storm water percolation into underlying soils is reduced or prohibited. Examples of impervious surfaces include concrete, asphalt, and roofs. Additional examples include engineering practices such as compaction or lime treatment. Existing gravel on a project site placed prior to the proposed project is considered pervious unless documentation is provided that demonstrates that it is impervious. Gravel placed as part of the proposed project is considered impervious unless documentation is provided to verify that it is pervious.

SITE DETERMINATION

For the purposes of this Manual, the impacts that must be accounted for in the SWLID design includes everything within the project site of all improved parcels *as well as* all off-site or associated public improvements, such as trenching and repaving for utility connections.

CHAPTER 2: PROJECT TRIGGERS

The following flow chart (Figure 1) is provided as guidance in determining which projects trigger permanent water quality Treatment, Delta Volume Capture, and/or Hydromodification Control features which shall require the applicant to submit a SWLIDS report and which projects qualify for exemptions. Final determination is achieved by completing a "Storm Water LID Determination Worksheet", a copy of which is attached in Appendix A as reference.

Note that projects identified as exempt may still be required to implement permanent storm water quality features as a condition of other environmental permit processes.

Figure 1 Footnotes

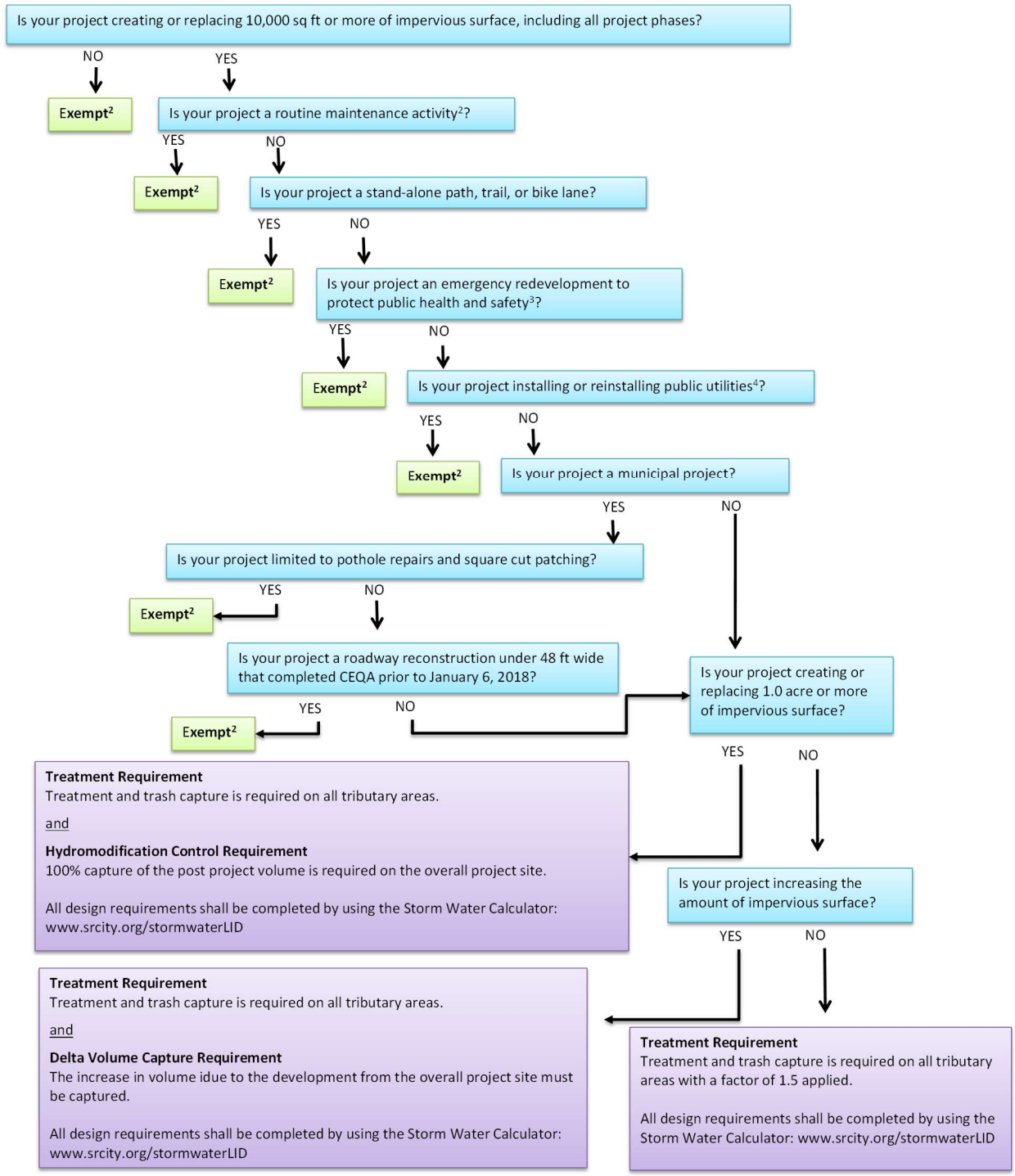
[2] "Routine Maintenance Activity" This exemption includes activities such as overlays, resurfacing, and/or road pavement structural section rehabilitation (e.g. FDR) of existing roads or parking lots as well as trenching and patching activities and reroofing activities. For activity to be routine maintenance it must no change existing lines and grades or hydraulic capacity. Minor changes to line or grade of 0.20 feet or less shall be considered as maintaining original line and grade. Replacement of existing pedestrian ramps to maintain compliance with current Americans with Disabilities Act Requirements shall be regarded as routine maintenance.

[3] The NCRWQCB must agree the activities are needed to protect public health and safety to qualify for this exemption.

[4] Applies to public utilities, such as sewer or water, only. The project must not include any additional street or road development or redevelopment activities beyond the paving activities needed as a result of construction impacts to the existing roadway.

CHAPTER 2: PROJECT TRIGGERS

Figure 1. Project Triggers and Exemptions Flow Chart



Note: Final determination is achieved by completing a "Storm Water LID Determination Worksheet".

CHAPTER 2: PROJECT TRIGGERS

IMPACTS TO BE MITIGATED

The specific level of treatment and/or retention required is *determined on each tributary area* and is different for offsite improvement areas. Design requirements for project sites that propose under 1.0 acre of new and/or replaced impervious surface are outlined in Table 1 on the on the following pages. Design requirements for project sites that propose over 1.0 acre of new and/or replaced impervious surface are outlined in Table 2 on the following pages.

Table 1: Design Requirements for Project Sites Under 1.0 Acre of New and/or Replaced Impervious Surface

	Description of Tributary Area	Design Requirements:	Notes
		All BMPs must meet the design criteria of a LID BMP as defined by this manual.	
1	Tributary area consists of both existing *and* new and/or replaced impervious area.	Existing impervious area: Treatment required. New and/or replaced impervious area: 100% Volume Capture or both Delta Volume Capture and Treatment required.	Order R1-2015-0030 trash capture requirements must be met in all tributary areas.[5]
2	Tributary area consists of new and/or replaced impervious area only.	100% Volume Capture or both Delta Volume Capture and Treatment required.	Order R1-2015-0030 trash capture requirements must be met in all tributary areas.[5]
3	Tributary area consists of existing impervious area only.	No requirements apply.	The project may need to meet the requirements of the Statewide Trash Amendment. Refer to the governing agency.
4	Tributary area consists of off-site improvements or public improvements only.	New and/or replaced impervious area only: 100% Volume Capture or both Delta Volume Capture and Treatment required.	The proposed BMP(s) should be designed to receive the runoff from the improved area whenever possible. If this is not possible, the BMPs required for off-site and/or public improvements may be constructed on-site as a "on-site offset" or the runoff accounted for by oversizing another BMP

[5] The trash capture requirements include compliance with the State Water Board's Amendment to the *Water Quality Control Plan for the Ocean Waters* and Part 1 Trash Provision of the *Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (Trash Amendment). LID BMPs must capture trash 100 microns in diameter and larger.

			within the same project, but in another tributary area. Trash Amendment requirements must be met where applicable.
5	Run-on from outside the project site.	No requirements apply if run-on is bypassed.	If the run-on reaches a BMP it must be either included in the sizing or designed to bypass.

Table 2: Design Requirements for Project Sites Over 1.0 Acre of New and/or Replaced Impervious Surface

	Description of Tributary Area	Design Requirements	Notes
		All BMP must meet the design criteria of a LID BMP as defined by this manual.	
1	Tributary area consists of both existing *and* new and/or replaced impervious area.	100% Volume Capture/Hydromodification Control required.	Order R1-2015-0030 trash capture must be met in all tributary areas.[6]
2	Tributary area consists of new and/or replaced impervious area only.	100% Volume Capture/Hydromodification Control required.	Order R1-2015-0030 trash capture must be met in all tributary areas.[6]
3	Tributary area consists of existing impervious area only.	No requirements apply.	The project may need to meet the requirements of the Statewide Trash Amendment. Refer to the governing agency.
4	Tributary area consists of off-site improvements or public improvements only	New and/or replaced impervious area only: 100% Volume Capture/Hydromodification Control or both Delta Volume Capture and Treatment required.	The proposed BMP should be designed to receive the runoff from the improved area whenever possible. If it is not possible for the BMP to be constructed to intercept the physical runoff at this location, the BMPs required for off-site improvements may be constructed on-site as a "on-site offset" or the runoff accounted for by oversizing another BMP within the same project, but in

[6] The trash capture requirements include compliance with the State Water Board's Amendment to the *Water Quality Control Plan for the Ocean Waters* and Part 1 Trash Provision of the *Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (Trash Amendment). LID BMPs must capture trash 100 microns in diameter and larger.

			another tributary area. Trash Amendment requirements must be met where applicable.
5	Run-on from outside the project site.	No requirements apply if run-on is bypassed.	If the run-on reaches a BMP it must be either included in the sizing or designed to bypass.

CHAPTER 3: SUBMITTAL PROCESS

SUBMITTAL PROCESS

Each step in the process is briefly described below and is discussed in further detail in the following chapters.

STEP 1: REQUIREMENTS

Evaluate your project and complete the *Storm Water LID Determination Worksheet* to determine whether or not the project will need to incorporate permanent LID Storm Water Best Management Practices (BMP's) and submit an Initial and a Final Storm Water Low Impact Development Submittal (SWLIDS) as required by the National Pollutant Discharge Elimination System Municipal Separate Storm Sewer Systems (NPDES MS4) only.

The project may still need to incorporate permanent storm water LID BMP's as required by other regulations and approval agencies, such as but not limited to: California Building Code (CALGreen), North Coast Regional Water Quality Control Board (NCRWQCB) section 401 permit, or State Water Resources Control Board requirements.

STEP 2: CALCULATIONS

Assess your project design and layout. Select the highest priority BMPs applicable to your project by completing the *BMP Selection Table*. Complete sizing calculations for all BMPs using the *Storm Water Calculator*. Integrate these BMPs into your project's design documents. Ensure the applicable requirements (Treatment, Volume Capture, Trash Capture) are met and that all necessary tributary areas are addressed.

Note: In some cases, supplemental calculation and/or supporting documentation must be provided that is not incorporated into the *Storm Water Calculator.* Separate calculations may not be used as a replacement for the *Storm Water Calculator.*

STEP 3: INITIAL SWLIDS

Prepare and submit an Initial SWLIDS with your tentative map or other discretionary approval process. All calculations, design, and submittal requirements must be submitted. Fill out a *Completeness Checklist* and submit with the Initial SWLIDS.

STEP 4: UPDATE CALCULATIONS

This step is conducted with the design of Improvement Plans or other Final Ministerial Submittal. Re-evaluate project design and layout to verify the highest priority BMPs possible are used per the *BMP Selection Table*. Complete updated sizing calculations for all BMPs using

the *Storm Water Calculator*. Ensure the applicable requirements (Treatment, Volume Capture, Trash Capture) are met and that all necessary tributary areas are addressed.

Note: In some cases, supplemental calculation and/or supporting documentation must be provided that is not incorporated into the *Storm Water Calculator.* Separate calculations may not be used as a replacement for the *Storm Water Calculator.*

STEP 5: FINAL SWLIDS

Prepare and submit a Final SWLIDS with your Improvement Plans or other Final Ministerial Submittal. Ensure the applicable requirements (Treatment, Volume Capture, Trash Capture) are met and that all necessary tributary areas are addressed. Fill out a *Completeness Checklist* and submit with the Final SWLIDS.

Final SWLIDS must include a description of necessary maintenance, a maintenance checklist, guidelines, frequency of maintenance activities, and a *Maintenance Declaration* or other legally binding mechanism to assign maintenance responsibility and funding source.

STEP 6: MECHANISM OF MAINTENANCE

Record a *Maintenance Declaration* or other legally binding mechanism to assign maintenance responsibility and funding source before occupancy can be given.

STEP 7: CONSTRUCTION

Construct all BMPs per the approved construction documents. Protect BMPs from runoff and sediment loading during construction. Pay close attention to compaction, specified soil, contamination, planting, irrigation, and fine grading.

STEP 8: INSPECTION AND CERTIFICATION

The Engineer shall complete a final inspection and certify that all BMPs will function per the intent of the approved design. This certification shall be provided to the Governing Agency prior to the issuance of final occupancy.

The current versions of all documents referenced in the steps above and necessary design tools, including the Storm Water Calculator, can be found at www.srcity.org/stormwaterLID or the individual co-permittee websites.

CHAPTER 4: SITE ASSESSMENT

SITE ASSESSMENT

Keep clean water clean! Simple site layout considerations can dramatically affect the amount of storm water that will need to be treated and infiltrated. Storm water from undisturbed areas should be collected before it runs across parking lots or other impervious areas. Flow from impervious areas should be directed into landscapes or natural areas, to allow for infiltration. Impervious areas should be disconnected by breaking them up with landscaping. Hard piped systems should be used only when necessary. Pollutant generating activities should be located indoors or under a rooftop to minimize exposure to storm water. Minimize the use of pesticides, herbicides, fertilizers, and avoid over irrigation in landscape areas so that they don't contribute to runoff to the storm drain system. Implement practices during construction that minimize compaction, vegetation removal, and the need for lime treatment.

SOIL CLASSIFICATION

Sonoma County is largely made up of clay type soils. In order to achieve infiltration (a fundamental aspect of LID) in these soils, BMPs need to be carefully designed. They must allow infiltration to occur to the maximum extent that the native soil will accept. While it is required that the soils on site be classified into their hydrologic soil groups (A, B, C, or D) by a licensed Geotechnical, Soils, or Civil Engineer using one of the following tests, it is *not* necessary to conduct field infiltration or percolation tests on the native soil *unless* the proposed design has the potential to pond water on the surface of the BMP. In this case, field tests and calculations would need to be conducted to ensure that all ponded water will drain within 72 hours to eliminate the concern of attracting vectors such as mosquitos. Field test need to be conducted in the location and depth of the designed BMP.

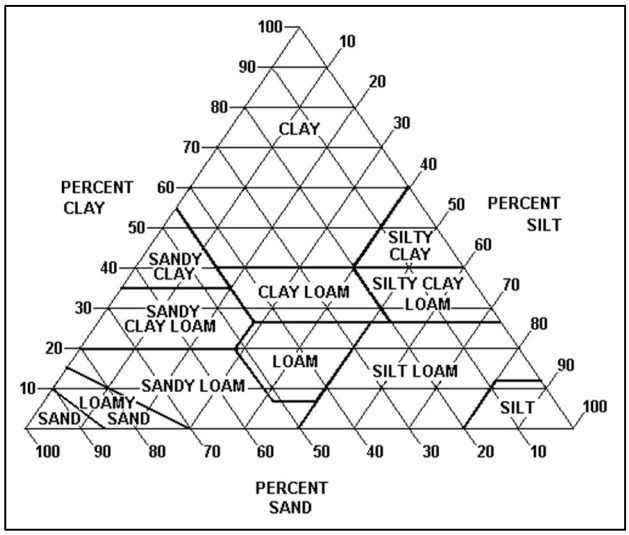
Soil Type Classification Methods:

Initial SWLIDS may be calculated using the soil type maps provided by the USGS if site specific soil evaluation has not yet been completed. These values are considered conservative and are only acceptable for Initial SWLIDS.

In order to identify the site soil type, which is necessary to complete the calculations, the designer can either use the published soil type per the Natural Resource Conservation Service (NRCS) or must use one of the following soil type evolution methods to determine the site specific conditions:

1. ASTM D 422 particle size analysis of soils, including hydrometer, using the following soil texture triangle shown in Figure 2.

Figure 2. Soil Texture Triangle



2. ASTM D 3385 infiltration rate of soils in field using double-ring infiltrometer test.

Areas of higher infiltration rates and low infiltration rates should be considered when locating buildings and open space. Using the soil survey completed by the Natural Resource Conservation Service (NRCS) of the U.S. Department of Agriculture, infiltration rates or particle size analysis, soils can be classified into Hydrologic Soil Groups, see Reference Document D.

DEPTH TO GROUNDWATER

The depth to seasonal high groundwater level shall be evaluated prior to selection of BMPs. If seasonal high groundwater exists less than 2' from the bottom of the selected BMP, a portion of the calculated capacity will be used up by the groundwater. A high water table may limit the use of infiltration based measures.

CONTAMINATION

In areas with known groundwater pollution, infiltration may need to be avoided, as it could contribute to the movement or dispersion of groundwater contamination. The California State Water Resources Control Board (SWRCB) maintains a database of registered contaminated sites through their Geotracker® Program. Registered contaminated sites can be identified in the project vicinity when the site address is typed into search. Mobilization of groundwater contaminants may also be of concern where contamination from natural sources is prevalent (e.g., marine sediments, selenium rich groundwater).

Infiltration on sites with contaminated soils and/or groundwater that could be mobilized or exacerbated by infiltration will require additional review by NCRWQCB and may require offset, either onsite and/or offsite.

SLOPE CONSTRAINTS

The effects of infiltrated storm water on soil properties and slope stability will need to be considered for a number of factors, including: ground subsidence, liquefaction, landslide potential, and distance to load bearing structures such as building foundations, and retaining walls.

These potential issues must be thoroughly reviewed by a licensed Geotechnical, Soils, or Civil Engineer and their recommendations incorporated into the site design.

NATURAL AREAS

Identify existing natural areas on the site and consider ways in which they can be preserved and integrated into the site design. Avoiding sensitive areas such as creeks, heritage trees, and wetlands reduces the need for other permits and reduces the amount of storm water that needs to be treated.

SPECIAL CONSIDERATIONS



POLLUTANTS OF CONCERN

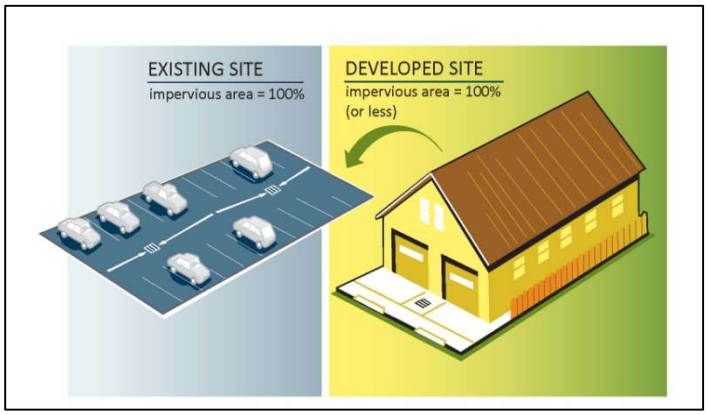
BMPs shall be selected and designed to treat the following pollutants of concern: dissolved and particulate metals, pathogens, nutrients, sediment, hydrocarbons, and trash, fine sediment, and other debris sized 100 microns and larger. This requirement may be met by directing flow and debris into a landscaped based infiltration feature that adequately captures these pollutants. All other pollutants shall be treated to the maximum extent practicable. It may be necessary to select and install multiple BMPs in order to treat all pollutants of concern.

TRASH CAPTURE

Trash is a key pollutant of concern and must be addressed in all tributary areas of the entire project. If the selected LID BMP does not adequately intercept trash as small as 100 microns by

virtue of its design (such as bioretention with curb openings) then an additional treatment BMP, such as capture inserts, baskets, or separators, may need to be used. All trash capture BMPs must be accessible and maintainable to ensure proper operation. The 100 microns requirement set forth by NPDES MS4 Permit Order No. R1-2015-0030, is stricter than the State Water Resource Control Board trash intercept requirement of 5 millimeters and therefore meets the State Water Resource Control Board requirement of 5 millimeters.

PREVIOUSLY DEVELOPED SITES - A SPECIAL CASE



Project sites that have existing impervious cover, such as existing pavement or buildings, in the pre-developed condition are different than projects that start with a fully undeveloped site. Since the volume capture requirement applies to any *increase* in storm water volume generated by the site, the greater the difference between the undeveloped condition and the developed condition, the greater the Delta Volume Capture requirement. Conversely, a site that is 100% impervious prior to development would not require any Delta Volume Capture, provided the final project did not create or replace 1 acre or more of impervious surface.

It should be noted that the requirement for treatment and trash capture would still apply to each tributary area.

If Delta Volume Capture is not required on a site, and treatment is the only requirement, apply a factor of 1.5 to the total flow that must be addressed. This factor is built into the Storm Water Calculator.

CHAPTER 4: SITE ASSESSMENT

SOIL

Many of the BMPs in this Manual use structural soil as a key component of their function. Structural soil is a specific soil mix that is primarily made up of angular rock, a small amount of organics, and a tackifier which binds the organics to the rock. Structural soil was originally developed for urban tree planting and is used in BMPs because it can be compacted to 95% to support traffic loading while still providing over 23 inches per hour of infiltration. Structural soil is most appropriately used in areas where the soil will be load bearing or where ground subsidence over time is not acceptable. For more information on structural soil see the "Reference Documents" section of this Manual.



Some BMPs may not require the use of structural soil and a more organic type planting soil and/or treatment media may be used in its place. It may be possible in some cases to use native soil or to amend the native soil so that it is suitable. Use of non-structural soil will depend on evaluation of the criteria in "Chapter 4: Site Assessment" as well as consideration of load bearing needs and may require evaluation by a licensed Geotechnical Engineer.

All soils used in BMPs must provide adequate porosity (as determined by the calculations and the design), be able to support plant life, and not introduce pollutants into the storm water.



LANDSCAPING REQUIREMENTS

Vegetation is an important element of the storm water BMPs in this manual. Plants provide a physical structure that increases storm water infiltration into the soil and promotes a soil community of microorganisms that remove pollutants. Therefore, it is critical that the vegetation is healthy and maintained throughout the life of the BMPs. The Maintenance Declaration, or equivalent mechanism, must ensure vegetation is maintained.

At plant maturity, at least 50% of a BMP must be vegetated for the BMP to be considered a LID BMP per the BMP Selection Table. If 50% vegetated cover will not be established before the completion of construction, the following shall be supplied as part of the project design submittal approval process in order to be considered a LID BMP: 1) an erosion control plan for the LID BMPs with sufficient measures to provide soil stabilization and treatment until plant

maturity (e.g. ground-up, composted mulch on all bare soils with rock inlet protection); and 2) a planting and irrigation plan for the LID BMPs that shall include, by plant genus species and common name, selected plants, maximum spacing, total number of plants to be installed, and a table with mature plant size (canopy). Alternatively, a BMP can be considered to be a LID BMP if the 100% Volume Capture/Hydromodification Control design criteria is met and the BMP is designed in series with one of the Runoff Reduction Measures (Disconnected Roof Drains, Paved Area Disconnection, Interceptor Trees, Buffer Strips and Bovine Terraces) as part of a "treatment train."

The environments within these BMPs, in particular long periods of inundation, can be stressful on many plant species. The BMP Approved Plant List, Appendix F, consists of California native plants and other cultivars that have been proven to thrive in the types of environments found in BMPs listed in this Manual.

These features are considered part of the landscaping and must, at a minimum, comply with the landscaping standards, building codes, and ordinances of the local Governing Agencies and must be maintained over time in conformance with the recorded Maintenance Declaration or other maintenance responsibility mechanism.

SITE DEFINITION AND CONTROL OF RUN-ON DRAINAGE

For the purposes of this manual, the definition of "site" includes any and all areas of improvements associated with the project, such as public improvements, frontages, utility services, and any other improvements associated with the development.

Run-on is the drainage generated from upstream tributary areas that drain into your site. The drainage entering the site that reaches a BMP needs to be incorporated into project design. All BMPs must be adequately sized to accept the runoff that they receive. It may be possible to collect offsite storm water before it enters the project site and bypassed. If offsite drainage will contribute to the storm water on-site then it must be considered in the sizing and location of the selected BMPs.

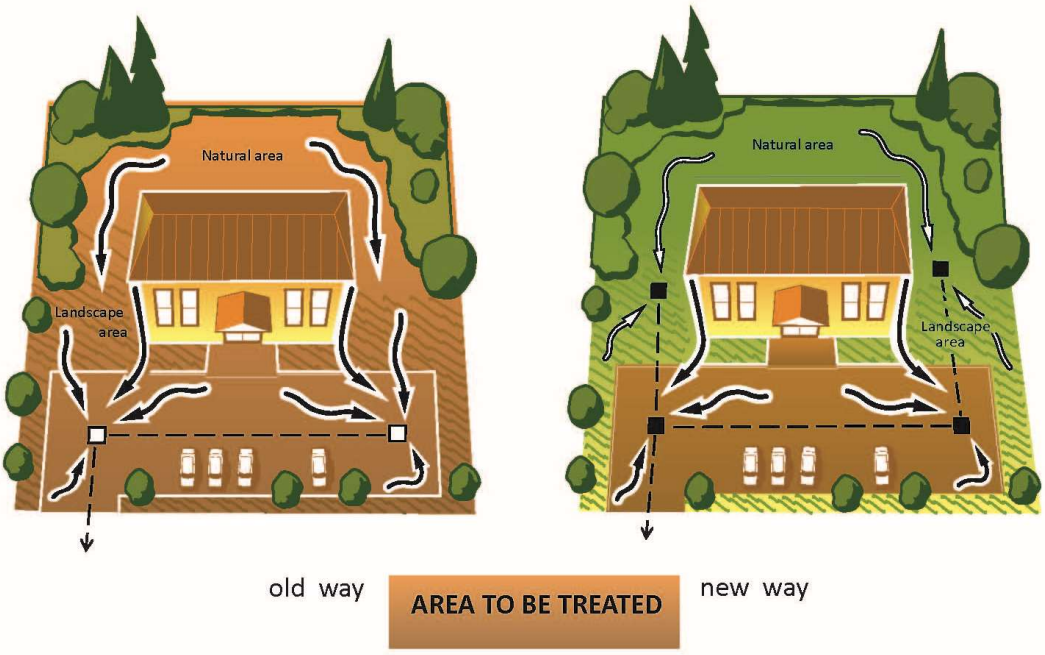
ON-SITE OFFSET

BMPs must be sized to address all flows and/or volume they physically receive. If this is not possible, another BMP within another project tributary area may be oversized and used to offset the shortfall. This practice is referred to as an "on-site offset." Justification for the use of an on-site offset must be provided to the Governing Agency explaining why the proposed design cannot accommodate all flows and/or volume. Most commonly, this would be due to the inability to physically route the water to the BMP or a physical lack of space due to other utilities.

The Volume Capture and Hydromodification Requirements apply to the entire project site, as opposed to particular tributary areas individually. Storm water may be routed to the portion of the site most suited for infiltration and Delta Volume Capture from other less suitable areas. This may be particularly useful on sites that are partially prohibited from infiltrating (e.g. contamination or slope stability issues) or have areas more suited to infiltration. On-site offset may not be provided to meet treatment and trash control requirements and must be met in each individual tributary.

MINIMIZING THE SIZE OF BMPS – RUNOFF REDUCTION MEASURES

There are a number of ways to reduce the amount of treatment and/or Delta Volume Capture required. One of the simplest ways is to minimize the amount of impervious area on the project site. Another way is to *keep clean water clean*. This means that if off-site drainage is directed onto the site and is collected and bypassed through the site instead of allowing it to contribute to the water to be treated, it may be excluded from the tributary area. If natural or landscaped areas drain to paved or impervious areas, collect the runoff while it is clean (while it is in the landscaped area) before it crosses impervious areas and picks up pollutants.



Runoff Reduction Measures can be implemented on-site to reduce the amount treatment and Volume Capture needed. Runoff reduction measures, like disconnecting downspouts, and planting interceptor trees, reduce the amount of storm water that needs to be managed by BMPs, by intercepting rainwater and/or allowing it to infiltrate. Using these types of Runoff Reduction Measures can reduce the size of the BMPs needed up to 50%.

Credit for Runoff Reduction Measures used shall be calculated as part of the “Storm Water Calculator” located in Appendix C. Additional information can be found in the Fact Sheets in Appendix E.

CHAPTER 5: BMP SELECTION

BMP SELECTION



PRIORITIZATION OF LID

Prioritization needs to be given to small scale landscaped based infiltration BMPs that treat storm water as close to the source as possible. These types of LID BMPs are given the highest priority in the selection process.

BMP FACT SHEETS

The Fact Sheets provide detailed information for each BMP including a description, advantages, limitations; key design features, sizing design, inspection and maintenance requirements, and a design detail where appropriate. Each BMP listed below, and in the "BMP Selection Table", has a Fact Sheet in Appendix E.

BMP SELECTION TABLE

BMP selection should be done for each project tributary area by completing a "BMP Selection Table" found in Appendix B. The selection table lays out the decision matrix as described above for the BMPs that will be used with the project.

This table shall be used for all projects in order to select the highest priority BMPs possible. BMPs rated with the highest priority should be used and an explanation of infeasibility will be required before a lower priority BMP may be selected. When selecting BMPs for a site, it is important to consider a number of factors. These feasibility factors include the elements identified in the site assessment, including: groundwater contamination, high bedrock or hardpan, and slope stability, among others.

SUMMARY OF BMP PRIORITY GROUPS

All projects should consider the use of the "Universal LID Features." If those features are unable to be used, then "Priority 1" should be considered. If those BMPs are inappropriate or infeasible, then "Priority 2" should be considered, and so on. Any time a lower priority BMP is selected, justifications shall be provided for reasons why higher-level priority BMPs are deemed inappropriate.

UNIVERSAL BMPs AND RUNOFF REDUCTION MEASURES

BMPs in this priority are generally not dependent on-site constraints and should be considered for use with all projects. BMPs in this category include rainwater harvesting,

green roofs, interceptor trees, buffer strips, and flow through planters. *All* BMPs shall be identified in the text and clearly identified visually on project site drawings in the Initial and Final SWLID*S* including, but not limited to, rainwater harvesting, green roofs, interceptor trees, buffer strips, flow through planters, and downspout disconnects.

PRIORITY 1 - These features meet all the criteria of LID; they are small scale, vegetated, and infiltration based, and meet both the Delta Volume Capture and Treatment Requirements. BMPs in this priority are installed without perforated pipe and/or impermeable liners. Infiltration must be provided by the underlying native soils. All BMPs must be designed to eliminate all surface water within 72 hours to prevent mosquito breeding.

PRIORITY 2 - These features meet all the criteria of LID because they are small scale, vegetated and infiltration based, and meet both the Delta Volume Capture and Treatment Requirements. BMPs in this priority are designed with perforated pipe installed high in the treatment area, as opposed to at the bottom of the feature, to ensure that Delta Volume Capture occurs in the area below the perforated pipe. Once the volume below the perforated pipe is filled, any additional flow will be collected by the perforated pipe. This filtered storm water will then be conveyed to the storm drain system.

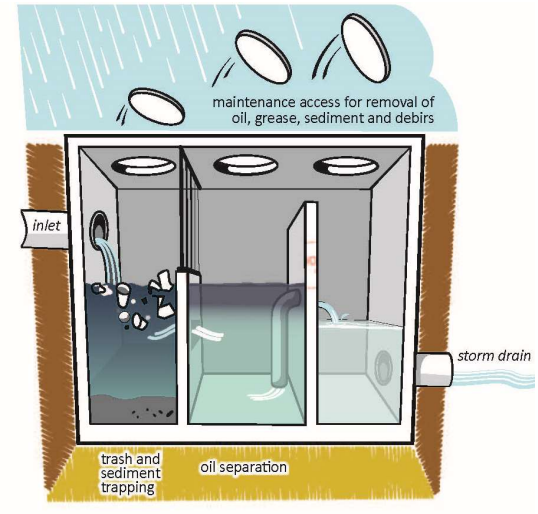
PRIORITY 3 - These BMPs filter storm water and then convey it to the storm drain system, and as such, do not meet all of the objectives of LID because they do not provide for infiltration, and thus do not provide Delta Volume Capture. BMPs in this priority are intentionally designed *not to* infiltrate and shall only be used in cases where infiltration is not possible or allowed.

Examples of site constraints that would preclude infiltration include: ground contamination, high groundwater, and slope instability. Further discussion of site evaluation and infiltration can be found in Chapter 4. The other appropriate use for Priority 3 BMPs is redevelopment of previously developed sites.

If the volume of storm water (and/or impervious area) of a developed site is not greater than that before it was developed, then the increase in volume would be zero and the Delta Volume Capture requirement would not apply, and only Treatment would be required. Infiltration still provides water quality benefits and is encouraged wherever feasible.

Priority 3 BMPs are designed with a moisture barrier lining and perforated pipe in the bottom of the feature to ensure drainage.

PRIORITY 4 - BMPs in this priority achieve either Delta Volume Capture or Treatment, but not both, and are typically landscape based. They may also be infiltration based, but not vegetated. They must be used as part of a treatment train in sequence with other BMPs in order to achieve both objectives. Examples include: Tree Filter Units, Modular Wetlands, or infiltration trenches without vegetation.



PRIORITY 5 - BMPs in this priority are physical structured units that do not achieve Volume Capture and are generally not landscape based. They must be used as part of a treatment train in sequence with other BMPs in order to achieve both objectives. These features may also be appropriate for high pollutant generating land uses that require pretreatment. Examples include: Chambered Separator Units and Trash Excluders.

PRIORITY 6 - OFFSET PROGRAM

Every effort should be made to address all storm water requirements on the project site. Treatment of the runoff (water quality flow) is a requirement that must be met on-site and in all tributary areas even when offset for volume capture is allowed. Trash capture measures still must be met as outlined in Tables 1 and 2.

Offset may only be considered when one of the following conditions is present:

(1) The project's proximity to geotechnical hazards preclude infiltration,

(2) The proposed BMPs location puts it in proximity to a contaminated groundwater site such that infiltration poses a risk of causing pollutant mobilization,

(3) Site constraints that prohibit the ability to infiltrate storm water due to shallow groundwater and/or depth to hardpan, or

(4) Other criteria proposed by a Governing Agency and approved by the NCRWQCB Executive Officer, in which compliance with Delta Volume Capture is not feasible, such as high-density development or sensitive biological areas.

If the project is unable to address all design requirements on-site and the use of offset is necessary, the project must either:

a) Be referred to the NCRWQCB for review and approval, if the Governing Agency does not have a NCRWQCB approved Offset Program, or
b) Follow the Governing Agency's approved Offset Program including all process, submittals, and requirements.

CONTRIBUTING USE/POLLUTANT LOADING

The offset selected should treat the same type of pollutants that are generated by the untreated portion of your projects. For example, if the portion of your site that is not treated is roadway, then the offset projects selected should treat runoff from a roadway.

LOCATION OF OFFSET

All offset projects should be located within the same city or unincorporated area in which the project causing the impact is located. Projects located in other areas may be approved on a case by case basis. Projects that have the potential to cause a significant impact to a particular creek, as determined by the governing agency, either because of the size of the project or the sensitivity of the creek, will need to complete an offset project in the same creek watershed, if feasible.

DETENTION

Detention facilities which are integrated for hydraulic system design may be used to provide Volume Capture and/or Treatment *if* the design meets the design criteria specified for LID in this LID Manual.

PROPRIETARY UNITS

Proprietary units, or vendor units, fall lower on the BMP prioritization because they generally do not meet both the Treatment and Delta or 100% Volume Capture requirements. These types of units can be very effective if used as part of a treatment train (in series with other BMPs), where specific pollutants are present (such as gas stations), or in infill situations where Volume Capture isn't required. If proprietary units are proposed, additional review by the Governing Agency and/or the NCRWQCB may be required. A maintenance plan and inspection checklist meeting the manufacturer's recommendations will need to be submitted for review with the SWLIDS.

HIGH POLLUTANT LOADING LAND USES

Some land uses, such as gas stations and loading docks, may produce especially high pollutant loads. In these cases, pretreatment devices, such as oil grease separators or inlet inserts, may be necessary to remove site specific pollutants, such as hydrocarbons, before storm water is directed to typical BMPs. This “treatment train” approach ensures that BMPs continue to function properly.

CHAPTER 6: SUBMITTAL

STORM WATER LOW IMPACT DEVELOPMENT SUBMITTAL (SWLIDS)

INITIAL SWLIDS

The Initial SWLIDS will be submitted with the entitlement application for the tentative map, design review, use permit, or equivalent level of design. The Initial SWLIDS shall include a completed Storm Water LID Determination Worksheet, an Initial SW LID Submittal Coversheet, site layout, selected BMPs with individual identifiers, their location shown on drawings (including, but not limited to, locations of rain water harvesting, green roofs, interceptor trees, and downspout disconnects), sizing calculations, tributary areas to each BMP, a description or diagram of how BMPs will be accessible for Post-Construction inspections, a narrative description of how the chosen BMPs are designed to work, a preliminary description of maintenance requirements and proposed funding source. The Initial SWLIDS will need to be approved by the appropriate Governing Agency prior to approval of the tentative map, design review, use permit, or equivalent.

FINAL SWLIDS

The Final SWLIDS is submitted with the Improvement Plans, Grading Permit, Building Permit, or equivalent level of design and shall include all of the elements required for the Initial SWLIDS. In addition, all elements of the designed BMPs shall be shown on their respective drawing sheet (i.e. swales shown on grading sheets and bypass inlets shown on utility sheets). A final version of the Inspection and Maintenance Plan is required which includes long term inspection and maintenance instructions and requirements, inspection checklists, identification of the responsible parties, and a funding source.

A signed and recorded copy of a Maintenance Declaration designating the responsible party for maintenance, including irrigation, and funding source must be submitted with the Final SWLIDS. The Final SWLIDS will need to be approved by the appropriate Governing Agency prior to approval of the Improvement Plans, Grading Permit, Building Permit, or equivalent. The Maintenance Declaration will need to be recorded before construction is completed and before occupancy can be given in order to capture any field construction changes that occur.

CHAPTER 6: SUBMITTAL

WHAT THE SW LID SUBMITTAL MUST INCLUDE:

NARRATIVE PORTION

PROJECT DESCRIPTION



The project description section of the narrative should describe the proposed project type, location, specific uses and features of note. Environmentally sensitive features such as creeks, wetlands, or trees should be described and whether they are going to be avoided, saved, or removed. The existing predevelopment site should be described, and any existing impervious area noted. Existing and proposed drainage patterns need to be discussed.

How these requirements were triggered (impervious area, CALGreen, etc.) and the level of Treatment and/or Volume Capture achieved should be included.

POLLUTION PREVENTION MEASURES

All pollution prevention measures should be described and any measures that are providing area reduction credits should be specifically noted.

DESCRIPTION OF THE TYPES OF BMPs SELECTED

Describe each type of BMP, its priority group, where it is intended to be used, and the reason for its selection. Identify any specific alterations to the design that is proposed. Any time a lower priority BMP is selected, justifications shall be provided for reasons why higher-level priority BMPs are deemed inappropriate.

DESCRIPTION OF MAINTENANCE PROCEDURES AND PROPOSED FUNDING SOURCE

Outline what maintenance is required for each type of BMP selected and how often it should be serviced. Describe the proposed funding source that will be utilized to ensure long-term maintenance, who will be financially responsible, and who will be responsible to ensure maintenance is performed. Required maintenance and funding sources shall include all items for the proper functioning of BMPs, including irrigation.

COMPLETED BMP SELECTION TABLE

Complete the "BMP Selection Table" for each tributary area within the site to demonstrate that the BMP of the highest priority has been selected in each location.

COPY OF COMPLETED STORM WATER LID DETERMINATION WORKSHEET

Include a copy of the Storm Water LID Determination Worksheet confirming that the project requires a SWLIDS.

EXHIBITS

EXHIBIT OR PLAN SHEET

All exhibits should be provided at an appropriate scale so that they are clear and legible and may be a plan sheet if necessary.

EXISTING CONDITION EXHIBIT

This exhibit shall show the proposed tributary areas over the existing site. The existing impervious area for each tributary area shall to be shown and labeled in square feet or acres. This exhibit will be used to determine the pre-development Curve Number and the Delta Volume Capture.

This exhibit shall show the different types of land cover and the associated C values in each tributary area. This information allows a composite C value calculation to be completed for the Treatment Requirement.

PROPOSED CONDITION EXHIBIT

This exhibit shall show the developed site layout, clearly delineated tributary areas and associated C values and/or CN values as appropriate, new or replaced area, labeled storm drain inlets, identification of all Runoff Reduction Measures, and all proposed BMPs with individual identifiers. All BMPs and Runoff Reduction Measures shall be dimensioned and labeled. The sites K value and the on-site soil type should be noted.

PRELIMINARY DETAIL FOR EACH TYPE OF BMP SELECTED

Provide a preliminary 8.5"x11" detail for each BMP type or include on submitted drawings. These should be taken straight from the Fact Sheets unless changes to the design are proposed. The reason for the deviation from the standard design should be address in the narrative portion of the SWLIDS. Required plantings, erosion control

while plantings are being established such as ground-up composted tree mulch (no floatable bark or wood chips allowed), irrigation, and inlet protection.

PROJECT DRAWINGS

Show all applicable elements of the selected BMPs on the appropriate plan sheet. For example; swales on the grading sheet, perforated pipe on the utilities sheet.

CALCULATIONS - FORMULAS

Complete calculations will need to be provided for each BMP using the "Storm Water Calculator" which can be downloaded from the City of Santa Rosa's website at www.srcity.org/stormwaterLID. Additional supporting calculations must be included where appropriate. Methodology, formulas, and references are described on the following pages.

HYDROMODIFICATION CONTROL REQUIREMENT

Hydromodification Control is required for any project that creates or replaces one acre or more of impervious area. The Hydromodification Control Requirement is to infiltrate and/or reuse 100% of the total calculated volume of storm water generated by the developed site for a 1.0 inch rain event in a 24-hour period. If this requirement is met with the installation of LID BMPs that include 50% or more mature vegetation coverage, then both the Delta Volume Capture and Treatment Requirements are satisfied. However, all tributary areas must provide trash capture. These requirements may be achieved using treatment trains where a variety of BMPs, both practices and constructed features, are constructed in series in order to achieve improved storm water quality.

All volume calculations are completed using the Curve Number Method, as described on the next page. The proposed site will be used to determine the tributary areas and post development curve number used for these calculations.

DESIGN REQUIREMENTS

The water quality design storm used for all SWLIDS calculations is 1.0 inch in a 24-hour period.

For all projects: The treatment component requires that all runoff generated by this water quality design storm from impermeable surfaces be treated on site for the pollutants of concern. Trash capture requirements must be met as outlined in Tables 1 and 2.

For projects that increase the amount of impervious surface, but create or replace less than a total of one acre: The Delta Volume Capture component requires that any increase in volume due to development for the water quality design storm must be infiltrated and/or reused on site. Further discussion of the Treatment and Delta Volume Capture requirements and the

accompanying formulas can be found in Chapter 6. Trash capture requirements must be met as outlined in Tables 1 and 2.

For projects that create or replace one acre or more of impervious surface: These larger projects must mitigate their impacts by capturing 100% of the post development volume generated by the water quality rain event.

The Delta Volume Capture and Hydromodification Requirements apply to the project site as a whole, as opposed to particular tributary areas individually. Storm water may be routed to the portion of the site most suited for infiltration and volume capture from other less suitable areas. This may be particularly useful on sites that are partially prohibited from infiltration (e.g. contamination or slope stability issues) or have areas more suited to infiltration.

Trash capture requirements must be met as outlined in Tables 1 and 2.

CHAPTER 7: MAINTENANCE AND INSPECTION

MAINTENANCE AND INSPECTION



INTRODUCTION

The maintenance and inspection section of the SWLIDS shall describe provisions required to keep BMPs operating as originally designed and approved. At a minimum, the SWLIDS and Maintenance Declaration shall include:

- Scope and frequency of BMP inspections.
- Regularly scheduled maintenance.
- Provisions for unscheduled maintenance.
- Recordkeeping requirements.
- Identification of the responsible party.
- Identification of the funding source, including irrigation.
- Identification of access routes to BMPs.
- Costs associated with inspection and maintenance.
- Design life including periodic replacement cost.
- Specific provisions recommended by the manufacturer of any proprietary system BMP.

Additional reference information regarding maintenance requirements and inspection checklists are included in BMP Fact Sheets which can be found in Appendix E.

REQUIREMENTS FOR BMPs ON PRIVATE LAND

RESPONSIBILITY FOR BMP ON PRIVATE LAND

Maintenance and Inspection of all BMPs on private land are the responsibility of the property owner. This responsibility shall run with the land and be legally recorded, executed, and transferred upon sale of the property. Property owners shall inspect, or ensure the inspection by a qualified professional, of all BMPs at least once a year or at the frequency specified in the BMP Fact Sheets and report it annually to the Governing Agency.

DECLARATION OF COVENANTS TO MAINTAIN BMP ON PRIVATE LAND

Legally binding, signed maintenance declaration of covenant, or equivalent mechanism, stating the ongoing maintenance of BMPs on private property are the owner's

responsibility is required for the long-term maintenance of all BMPs located on private properties. This declaration shall legally assign maintenance responsibility to the property owner and assure that all BMPs will remain fully functional and that all areas identified for Treatment and/or Volume Capture will discharge to the specified BMP.

This declaration shall be recorded among the deed records at the County Recorder's Office so that it will run with the title to the land and shall include a map clearly identifying each BMP. Additionally, a copy of this declaration shall be included in any sales and/or lease agreements for properties with storm water BMPs. A copy of the executed document shall be provided to the governing agency.

FUNDING AND MAINTENANCE ACTIVITY REQUIREMENTS FOR BMPs ON PRIVATE LAND

The funding of all inspection, maintenance, and replacement of BMPs on private land is the sole responsibility of the property owner.

RECORD KEEPING FOR BMP ON PRIVATE LAND

Records regarding annual inspections and maintenance shall be retained for at least five years and made available upon request to the Governing Agency. These records shall include copies of completed inspection reports and maintenance checklists to document any inspection and maintenance activities that were conducted over the last five years. Any corrective actions, repairs, or replacements shall also be documented and kept in the BMP inspection and maintenance records for a minimum of five years.



REMEDIATION OF PROBLEMS FOR BMP ON PRIVATE LAND

The remediation of problems, in addition to routine maintenance needed to keep the BMP in working order is the responsibility of the property owner. This responsibility runs with the land and transfers to the new owner in the event the property is sold. In the event adequate BMP maintenance is not conducted, the property owner shall allow the Governing Agency's staff, or their designees, to enter the property and take the necessary steps to restore the BMPs to good working order. The property owner will be responsible for reimbursing the Governing Agency for expenditures associated with restoring the BMPs to good working order, in addition to any administrative costs, fines, or penalties imposed.

CHAPTER 7: MAINTENANCE AND INSPECTION

REQUIREMENTS FOR BMPs ON COMMON LAND

RESPONSIBILITY FOR BMP ON COMMON LAND

Maintenance and inspection of all BMPs on common land (those held by Home Owners Associations or HOAs) are the responsibility of the HOA. This responsibility shall run with the land and be legally recorded, executed, and transferred upon sale of the property. The HOA shall inspect and/or ensure the inspection by a qualified professional, of all BMPs at least once a year and at the frequency specified in the maintenance and inspection section of the SWLIDS.

CC&Rs FOR BMP ON COMMON LAND

For projects with BMPs located within a common area or easement to be maintained by a HOA, language regarding the responsibility for inspection and maintenance must be included in the project's CC&R's. In addition, the CC&R's shall include the location and brief description of all storm water BMPs installed with the project. This language shall be reviewed and approved by the Governing Agency as part of the Final SWLIDS approval process.

SIGNED DECLARATION FOR BMP ON COMMON LAND

A legally binding, signed maintenance declaration, or equivalent mechanism approved by the Governing Agency, is required for all BMPs located on common land. This declaration shall legally assign maintenance responsibility to the HOA and will be executed by the HOA. The declaration shall be recorded at the County Recorder's Office. It will run with the title to the land. Additionally, a copy of this declaration shall be included in any sales and/or lease agreements for properties with storm water BMPs.

FUNDING FOR BMP ON COMMON LAND

The funding of all inspection, maintenance, replacement, and reporting of BMPs on common land is the sole responsibility of the HOA.

RECORD KEEPING FOR BMP ON COMMON LAND

Records regarding annual inspections and maintenance shall be retained for at least five years and made available upon request to the Governing Agency. These records shall include copies of completed inspection reports, and maintenance checklists to document any inspection and maintenance activities that were conducted over the last five years. Any corrective actions, repairs or replacements, shall also be documented and kept in the BMP inspection and maintenance records for a minimum of five years.

REMEDIATION OF PROBLEMS FOR BMP ON COMMON LAND

In the event adequate BMP maintenance is not achieved, the HOA shall allow the Governing Agency's staff to enter the property and take the necessary steps to restore the BMPs to good working order. The property owner will be responsible for reimbursing the Governing Agency for expenditures associated with restoring the BMPs to good working order in addition to any administrative costs, fines, or penalties imposed.

REQUIREMENTS FOR BMPs IN THE PUBLIC RIGHT OF WAY RESPONSIBILITY



Project sponsors and property owners are encouraged to locate storm water BMPs within the limits of their private property on the project site. However, in cases where proposed BMPs are required to treat/mitigate storm water runoff from public improvements, required as part of the project or existing public right of way that drains into the project area, BMPs may need to be located in the public right of way. If BMPs are proposed in a public area for transfer to, and long-term maintenance by, the Governing Agency, the BMPs must meet the design guidelines of this LID Manual. Check with the Governing Agency for any specific regulations related to BMPs in the right of way.

Also, it is expected that BMPs constructed as a part of public Capital Improvement Projects (CIP) will be located in the public right of way. While these projects do not need a recorded Maintenance Declaration, long term maintenance and funding must be considered.

Inspection and maintenance shall remain under the project or property owner's responsibility until the BMPs are legally transferred to public ownership. Additionally, by the use of maintenance indemnification agreements, a private entity may maintain BMP located in the public right of way. Once the BMPs are legally transferred, the maintenance, inspection, and replacement are the responsibility of the Governing Agency. Publicly constructed Capital Improvement Projects (CIP) are the responsibility of the Governing Agency.

CHAPTER 7: MAINTENANCE AND INSPECTION

SIGNED MAINTENANCE DECLARATION FOR BMP IN THE PUBLIC RIGHT OF WAY

For cases in which a Governing Agency agrees to accept responsibility for BMP long term operation, including inspection and maintenance, verification, such as a signed statement from the Governing Agency accepting responsibility for the BMP is required.

FUNDING FOR BMP IN THE PUBLIC RIGHT OF WAY

The funding of all inspection, maintenance, and replacement of BMPs built by private development is the sole responsibility of the property owner or developer. Funding shall include costs of irrigation if irrigation is required. With legal authorization, the Governing Agency may create a Special Tax District, or equivalent mechanism. A storm water tax would be assessed on the property owners within the Special Tax District to provide the funding for long term BMP inspection, maintenance, and periodic replacement which would be performed or coordinated by the applicable agency. Special Tax District funding shall also consider and include costs for governing agency administration (such as accounting, legal, tracking, etc.), contract management (for outside contractors), as well as contingency and escalating factors.

RECORD KEEPING FOR BMP IN THE PUBLIC RIGHT OF WAY

All records will be kept by the Governing Agency.

CHAPTER 8: CALCULATIONS

CALCULATIONS

All BMPs must be sized using the "Storm Water Calculator" which can be downloaded from the City of Santa Rosa's website at www.srcity.org/stormwaterLID. The following formulas are provided for reference and are used in the Storm Water Calculator. Additional supporting calculations may be submitted where appropriate.

HYDROMODIFICATION REQUIREMENT: 100% OF THE VOLUME GENERATED BY THE DEVELOPED SITE FOR A 1.0" RAIN EVENT OVER A 24-HOUR PERIOD

Required if the project creates or replaces 1.0 acre or more of impervious surface.

FORMULA: **EQ. 6.1**

$$S = \frac{1000}{CN_{POST}} - 10$$

WHERE:

S=Potential maximum retention after runoff (in)[7]
CN= Curve Number for the developed condition[8] associated with the tributary area (A) used below.

FORMULA: **EQ. 6.2**

$$Q = \frac{((P*K)-(0.2*S))^2}{((P*K)+(0.8*S))} * \frac{1ft}{12in}$$

WHERE:

Q= Runoff depth (ft)[9]
P=1.0" Precipitation
K=Seasonal Precipitation Factor[10]
S= Potential maximum retention after runoff (in)[7]

[7] As defined by the "Urban Hydrology for Small Watersheds" TR-55 manual.
[8] Per Table 2-2 of the "Urban Hydrology for Small Watersheds" TR-55 manual.
[9] Q in feet of depth as defined by the "Urban Hydrology for Small Watersheds" TR-55 Manual.
[10] From the Sonoma County Water Agency Flood Control Design Criteria.

FORMULA: **EQ. 6.3**

$$V = (Q)(A)$$

WHERE:

V= Volume of storm water to be retained (ft^3)
Q= Runoff depth (ft) [11]
A= Tributary Area (ft^2) corresponding to the associated Curve Number (CN) used above.

100% TREATMENT REQUIREMENT: All of the runoff generated by a rain event with an intensity of 0.20 in/hr must be treated from *all tributary areas*. All run-on must also be considered and either bypassed through the project site or include in the calculations for BMP sizing.

100% TREATMENT FLOW CALCULATION -RATIONAL METHOD

FORMULA: **EQ. 6.4**

$$Q_{TREATMENT=}(I)(A)(C_{POST})(K)$$

WHERE:

$Q_{TREATMENT}$= Design flow rate required to be treated (cfs)
I= 0.2 (in/hr) Intensity[12]
A= Tributary area (acres)
C_{POST}= Rational method runoff coefficient for the developed condition
K= Seasonal Precipitation Factor

DELTA VOLUME CAPTURE REQUIREMENT: The increase in volume of storm water generated by the developed site for a 1.0" rain event over a 24-hour period due to development must be infiltrated and/or reused on site. This requirement only applies if the total amount of impervious area is increased due to development. This requirement may be met on a *site basis*, meaning a greater volume of storm water may be captured in one tributary area to allow a lesser volume to be captured in another.

DELTA VOLUME CAPTURE CALCULATION- CURVE NUMBER METHOD
(*Equations 6.5 and 6.6 will need to be calculated for both the pre-developed and post developed condition.)*

[11] Q in feet of depth as defined by the "Urban Hydrology for Small Watersheds" TR-55 Manual.
[12] Intensity as defined by the NPDES MS4 Permit Order No. R1-2015-0030.

CHAPTER 8: CALCULATIONS

FORMULA: **EQ. 6.5**

$$S = \frac{1000}{CN} - 10$$

WHERE:
S= Potential maximum retention after runoff (in)[13]
CN= Curve Number[14] for the developed condition or pre-developed condition as appropriate.

FORMULA: **EQ.6.6**

$$Q = \frac{((P*K)-(0.2*S))^2}{((P*K)+(0.8*S))} * \frac{1ft}{12in}$$

WHERE:
Q= Runoff depth (ft)[15]
P= 1.0" Precipitation
K= Seasonal Precipitation Factor[16]
S= Potential maximum retention after runoff (in)[13]

FORMULA: **EQ. 6.7**

$\Delta Q = Q_{post} - Q_{pre}$

WHERE:
Q_{pre}=Pre-development runoff depth (ft)
Q_{post}= Post development runoff depth (ft)

FORMULA: **EQ. 6.8**

$$V = (\Delta Q)(K)(A)$$

WHERE:
V= Volume of storm water to be retained (ft^3)
$\Delta Q = Q_{post} - Q_{pre}$=Pre-development runoff depth (ft) – Post development runoff depth (ft)
K= Seasonal Precipitation Factor[16]
A= Tributary Area (ft^2)

[13] As defined by the "Urban Hydrology for Small Watersheds" TR-55 manual.
[14] Per Table 2-2 of the "Urban Hydrology for Small Watersheds" TR-55 manual.
[15] Q in feet of depth as defined by the "Urban Hydrology for Small Watersheds" TR-55 Manual.
[16] From the Sonoma County Water Agency Flood Control Design Criteria