

APPENDIX B

Post-Construction Stormwater Management Requirements for Development Projects in the Central Coast Region (Resolution R3-2012-0025)

**POST-CONSTRUCTION STORMWATER MANAGEMENT REQUIREMENTS FOR
DEVELOPMENT PROJECTS IN THE
CENTRAL COAST REGION**

September 6, 2012

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION**

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Documents also are available at:

http://www.waterboards.ca.gov/centralcoast/water_issues/programs/stormwater/docs/lid/lid_hydromod_charette_index.shtml

POST-CONSTRUCTION STORMWATER MANAGEMENT REQUIREMENTS FOR DEVELOPMENT PROJECTS IN THE CENTRAL COAST REGION

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A. Watershed Management Zones (WMZs)

The urbanized portions of the Central Coast Region are categorized into 10 Watershed Management Zones (WMZs), based on common key watershed processes and receiving water type (creek, marine nearshore waters, lake, etc). Maps in Attachment A illustrate the WMZs for the Central Coast Region's urbanized areas. Designated Groundwater Basins of the Central Coast Region (Attachment B) underlie some but not all WMZs in urbanized portions of the Central Coast Region. The map and table in Attachment B illustrates the Groundwater Basins of the Central Coast Region. Each WMZ and, where present, Groundwater Basin, is aligned with specific Post-Construction Stormwater Management Requirements to address the impacts of development on those watershed processes and beneficial uses.

- 1) The Permittee shall maintain the ability to identify the WMZs and their boundaries, and to determine the WMZ in which development projects are proposed, throughout the urbanized portions of their jurisdiction corresponding with the Phase I or Phase II Municipal Stormwater Permit boundary.
- 2) The Permittee shall maintain the ability to determine whether development projects are proposed in areas overlying designated Groundwater Basins, throughout the urbanized portions of their jurisdiction subject to either a Phase I or Phase II Municipal Stormwater Permit.

B. Post-Construction Requirements

The primary objective of these Post-Construction Stormwater Management Requirements (hereinafter, Post-Construction Requirements) is to ensure that the Permittee is reducing pollutant discharges to the Maximum Extent Practicable and preventing stormwater discharges from causing or contributing to a violation of receiving water quality standards in all applicable development projects that require approvals and/or permits issued under the Permittee's planning, building, or other comparable authority. The Post-Construction Requirements emphasize protecting and, where degraded, restoring key watershed processes to create and sustain linkages between hydrology, channel geomorphology, and biological health necessary for healthy watersheds. Maintenance and restoration of watershed processes impacted by stormwater management is necessary to protect water quality and beneficial uses.

1) Regulated Projects

Regulated Projects include all New Development or Redevelopment projects that create and/or replace $\geq 2,500$ square feet of impervious surface (collectively over the entire project site)

- a) Regulated Projects include, but are not limited to the following road projects/practices:
 - i) Removing and replacing a paved surface resulting in alteration of the original line and grade, hydraulic capacity or overall footprint of the road
 - ii) Extending the pavement edge, or paving graveled shoulders
 - iii) Resurfacing by upgrading from dirt to asphalt, or concrete; upgrading from gravel to asphalt, or concrete; or upgrading from a bituminous surface treatment ("chip seal") to asphalt or concrete
- b) Regulated Projects do not include:
 - i) Road and Parking Lot maintenance:
 - (1) Road surface repair including slurry sealing, fog sealing, and pothole and square cut patching
 - (2) Overlaying existing asphalt or concrete pavement with asphalt or concrete without expanding the area of coverage
 - (3) Shoulder grading
 - (4) Cleaning, repairing, maintaining, reshaping, or regrading drainage systems

- (5) Crack sealing
- (6) Resurfacing with in-kind material without expanding the road or parking lot
- (7) Practices to maintain original line and grade, hydraulic capacity, and overall footprint of the road or parking lot
- (8) Repair or reconstruction of the road because of slope failures, natural disasters, acts of God or other man-made disaster
- ii) Sidewalk and bicycle path or lane projects, where no other impervious surfaces are created or replaced, built to direct stormwater runoff to adjacent vegetated areas
- iii) Trails and pathways, where no other impervious surfaces are replaced or created, and built to direct stormwater runoff to adjacent vegetated areas
- iv) Underground utility projects that replace the ground surface with in-kind material or materials with similar runoff characteristics
- v) Curb and gutter improvement or replacement projects that are not part of any additional creation or replacement of impervious surface area (e.g., sidewalks, roadway)
- vi) Second-story additions that do not increase the building footprint
- vii) Raised (not built directly on the ground) decks, stairs, or walkways designed with spaces to allow for water drainage
- viii) Photovoltaic systems installed on/over existing roof or other impervious surfaces, and panels located over pervious surfaces with well-maintained grass or vegetated groundcover, or panel arrays with a buffer strip at the most down gradient row of panels
- ix) Temporary structures (in place for less than six months)
- x) Electrical and utility vaults, sewer and water lift stations, backflows and other utility devices
- xi) Above-ground fuel storage tanks and fuel farms with spill containment system
- c) For all New Development Regulated Projects:
 - i) Site Design Measures shall be applied throughout the Regulated Project site
 - ii) Water Quality Treatment, Runoff Retention, and Peak Management Performance Requirements, as applicable to the Regulated Project, shall apply to the Regulated Project's entire Equivalent Impervious Surface Area for the site (see Attachment E for how to calculate)
- d) For Redevelopment Regulated Projects:
 - i) Site Design Measures shall be applied throughout the Regulated Project site
 - ii) Water Quality Treatment and Runoff Retention Performance Requirements shall apply to the Regulated Project's entire Equivalent Impervious Surface Area for the site (see Attachment E for how to calculate)
 - iii) Peak Management Performance Requirements shall apply only to the additional runoff generated by increased impervious surfaces on the Regulated Project site
 - iv) Water Quality Treatment Performance Requirements shall apply to the runoff from existing, new, and replaced impervious surfaces on sites where runoff from existing impervious surfaces cannot be separated from runoff from new and replaced impervious surfaces
- e) The Permittee shall apply the Post-Construction Requirements, within 365 days of Central Coast Water Board approval of the Post-Construction Requirements, to all applicable Regulated Projects that require approvals and/or permits issued under the Permittee's planning, building, or other comparable authority. Applicable Regulated Projects include both private development requiring permits, and public projects:
 - i) Private Development Projects

- (1) Discretionary Projects – The Permittee shall apply the Post-Construction Requirements to those projects that have not received the first discretionary approval of project design.
 - (2) Ministerial Projects – If the project is only subject to ministerial approval, the Permittee shall apply the Post-Construction Requirements to those projects that have not received any ministerial approvals. If the ministerial project receives multiple ministerial approvals, the Permittee shall apply the Post-Construction Requirements to the first ministerial approval. Ministerial approvals include, but are not limited to, building permits, site engineering improvements, and grading permits.
 - ii) Public Development Projects
 - (1) The Permittee shall develop and implement an equivalent approach, to the approach used for private development projects, to apply the Post-Construction Requirements to applicable public development projects, including applicable university development project
 - iii) Exemptions – The Permittee may propose, to the Central Coast Water Board Executive Officer, a lesser application of the Post-Construction Requirements for projects with completed project applications dated prior to the Central Coast Water Board approval of the Post-Construction Requirements. The Permittee must demonstrate that the application of the Post-Construction Requirements would pose financial infeasibility for the project. The Permittee shall not grant any exemptions without prior approval from the Central Coast Water Board Executive Officer.
- 2) Performance Requirement No. 1: Site Design and Runoff Reduction
- a) The Permittee shall require all Regulated Projects that create and/or replace $\geq 2,500$ square feet of impervious surface (collectively over the entire project site), including detached single-family home projects, to implement at least the following design strategies:
 - i) Limit disturbance of creeks and natural drainage features
 - ii) Minimize compaction of highly permeable soils
 - iii) Limit clearing and grading of native vegetation at the site to the minimum area needed to build the project, allow access, and provide fire protection
 - iv) Minimize impervious surfaces by concentrating improvements on the least-sensitive portions of the site, while leaving the remaining land in a natural undisturbed state
 - v) Minimize stormwater runoff by implementing one or more of the following site design measures:
 - (1) Direct roof runoff into cisterns or rain barrels for reuse
 - (2) Direct roof runoff onto vegetated areas safely away from building foundations and footings, consistent with California building code
 - (3) Direct runoff from sidewalks, walkways, and/or patios onto vegetated areas safely away from building foundations and footings, consistent with California building code
 - (4) Direct runoff from driveways and/or uncovered parking lots onto vegetated areas safely away from building foundations and footings, consistent with California building code
 - (5) Construct bike lanes, driveways, uncovered parking lots, sidewalks, walkways, and patios with permeable surfaces
 - b) The Permittee shall confirm that projects comply with Site Design and Runoff Reduction Performance Requirements by means of appropriate documentation (e.g., check lists) accompanying applications for project approval.

- 3) Performance Requirement No. 2: Water Quality Treatment
- a) The Permittee shall require Regulated Projects, except detached single-family homes, \geq 5,000 square feet of Net Impervious Area, and detached single-family homes \geq 15,000 square feet of Net Impervious Area, to treat stormwater runoff as required in the Water Quality Treatment Performance Requirements in Section B.3.b. to reduce pollutant loads and concentrations using physical, biological, and chemical removal.
 - i) Net Impervious Area is the total (including new and replaced) post-project impervious areas, minus any reduction in total imperviousness from the pre-project to post-project condition: *Net Impervious Area = (New and Replaced Impervious Area) - (Reduced Impervious Area Credit)*, where *Reduced Impervious Area Credit* is the total pre-project to post-project reduction in impervious area, if any.
 - b) The Permittee shall require each Regulated Project subject to Water Quality Treatment Performance Requirements to treat runoff using the onsite measures below, listed in the order of preference (highest to lowest):
 - i) Low Impact Development (LID) Treatment Systems – Implement harvesting and use, infiltration, and evapotranspiration Stormwater Control Measures that collectively achieve the following hydraulic sizing criteria for LID systems:
 - (1) Hydraulic Sizing Criteria for LID Treatment Systems – LID systems shall be designed to retain stormwater runoff equal to the volume of runoff generated by the 85th percentile 24-hour storm event, based on local rainfall data.
 - ii) Biofiltration Treatment Systems – Implement biofiltration treatment systems using facilities that must be demonstrated to be at least as effective as a biofiltration treatment system with the following design parameters:
 - (1) Maximum surface loading rate appropriate to prevent erosion, scour and channeling within the biofiltration treatment system itself and equal to 5 inches per hour, based on the flow of runoff produced from a rain event equal to or at least:
 - (a) 0.2 inches per hour intensity; or
 - (b) Two times the 85th percentile hourly rainfall intensity for the applicable area, based on historical records of hourly rainfall depth
 - (2) Minimum surface reservoir volume equal to the biofiltration treatment system surface area times a depth of 6 inches
 - (3) Minimum planting medium depth of 24 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. A Regulated Project may utilize an alternative planting medium if it demonstrates its planting medium is equal to or more effective at attenuating pollutants than the specified planting medium mixture.
 - (4) Proper plant selection¹
 - (5) Subsurface drainage/storage (gravel) layer with an area equal to the biofiltration treatment system surface area and having a minimum depth of 12 inches
 - (6) Underdrain with discharge elevation at top of gravel layer
 - (7) No compaction of soils beneath the biofiltration facility (ripping/loosening of soils required if compacted)

¹ Technical guidance for designing bioretention facilities is available from the Central Coast LID Initiative. The guidance includes design specifications and plant lists appropriate for the Central Coast climate. (http://www.centralcoastlidi.org/Central_Coast_LIDI/LID_Structural_BMPs.html)

- (8) No liners or other barriers interfering with infiltration, except for situations where lateral infiltration is not technically feasible.
- iii) Non-Retention Based Treatment Systems – Implement Stormwater Control Measures that collectively achieve at least one of the following hydraulic sizing criteria for non-retention based treatment systems:
- (1) Hydraulic Sizing Criteria for Non-Retention Based Treatment Systems:
- (a) Volume Hydraulic Design Basis – Treatment systems whose primary mode of action depends on volume capacity shall be designed to treat stormwater runoff equal to the volume of runoff generated by the 85th percentile 24-hour storm event, based on local rainfall data.
- (b) Flow Hydraulic Design Basis – Treatment systems whose primary mode of action depends on flow capacity shall be sized to treat:
- (i) The flow of runoff produced by a rain event equal to at least two times the 85th percentile hourly rainfall intensity for the applicable area, based on historical records of hourly rainfall depths; or
- (ii) The flow of runoff resulting from a rain event equal to at least 0.2 inches per hour intensity.
- c) Stormwater Control Plan Requirements – For each Regulated Project subject to the Water Quality Treatment Performance Requirement, the Permittee shall require the Project Applicant to provide the below information in a Stormwater Control Plan. The Permittee shall not grant final project approval, until the Stormwater Control Plan for the Regulated Project sufficiently demonstrates the Regulated Project design meets the Water Quality Treatment Performance Requirements.
- i) Project name, application number, location including address and assessor's parcel number
- ii) Name of Applicant
- iii) Project Phase number (if project is being constructed in phases)
- iv) Project Type (e.g., commercial, industrial, multi-unit residential, mixed-use, public), and description
- v) Total project site area
- vi) Total new impervious surface area, total replaced impervious surface area, total new pervious area, and calculation of Net Impervious Area
- vii) Statement of Water Quality Treatment Performance Requirements that apply to the Project
- viii) Summary of Site Design and Runoff Reduction Performance Requirement measures selected for the project
- ix) Description of all post-construction structural Stormwater Control Measures
- x) Supporting calculations used to comply with the applicable Water Quality Treatment Performance Requirements
- xi) Documentation certifying that the selection, sizing, and design of the Stormwater Control Measures meet the full or partial Water Quality Treatment Performance Requirement
- xii) Water quality treatment calculations used to comply with Water Quality Treatment Performance Requirement and any analysis to support infeasibility determination
- xiii) Statement of Compliance:
- (1) Statement that Water Quality Treatment Performance Requirement has been met on-site, or, if not achievable:
- (a) Documentation of the volume of runoff for which compliance cannot be achieved on-site and the associated off-site compliance requirements.
- (b) Statement of intent to comply with Water Quality Treatment Performance Requirement through Alternative Compliance

- 4) Performance Requirement No. 3: Runoff Retention
- a) The Permittee shall require Regulated Projects, except detached single-family homes, that create and/or replace $\geq 15,000$ square feet of impervious surface (collectively over the entire project site), and detached single-family homes $\geq 15,000$ square feet of Net Impervious Area, in WMZs 1, 2, 5, 6, 8 and 9, and those portions of WMZs 4, 7, and 10 that overlie designated Groundwater Basins (Attachment B) to meet the Runoff Retention Performance Requirements in Sections B.4.b. and B.4.c. using the LID Development Standards in Section B.4.d. for optimal management of watershed processes.
 - b) Adjustments to the Runoff Retention Performance Requirements for Redevelopment – Where the Regulated Project includes replaced impervious surface, the below adjustments apply. These adjustments are accounted for in the Tributary Area calculation in Attachment D.
 - i) Redevelopment Projects outside an approved Urban Sustainability Area, as described in Section C.3. – The total amount of replaced impervious surface shall be multiplied by 0.5 when calculating the volume of runoff subject to Runoff Retention Performance Requirements.
 - ii) Redevelopment Projects located within an approved Urban Sustainability Area (Section C.3.) – The total amount of runoff volume to be retained from replaced impervious surfaces shall be equivalent to the pre-project runoff volume retained.
 - c) The Permittee shall require Regulated Projects, subject to the Runoff Retention Performance Requirements, to meet the following Performance Requirements:
 - i) Watershed Management Zone 1 and portions of Watershed Management Zones 4, 7 and 10 which overlie designated Groundwater Basins:
 - (1) Retain 95th Percentile Rainfall Event – Prevent offsite discharge from events up to the 95th percentile 24-hour rainfall event as determined from local rainfall data.²
 - (2) Compliance must be achieved via infiltration
 - ii) Watershed Management Zone 2:
 - (1) Retain 95th Percentile Rainfall Event – Prevent offsite discharge from events up to the 95th percentile 24-hour rainfall event as determined from local rainfall data.
 - (2) Compliance must be achieved via storage, rainwater harvesting, infiltration, and/or evapotranspiration.
 - iii) Watershed Management Zones 5 and 8:
 - (1) Retain 85th Percentile Rainfall Event – Prevent offsite discharge from events up to the 85th percentile 24-hour rainfall event as determined from local rainfall data.
 - (2) Compliance must be achieved via infiltration.
 - iv) Watershed Management Zones 6 and 9:
 - (1) Retain 85th Percentile Rainfall Event – Prevent offsite discharge from events up to the 85th percentile 24-hour rainfall event as determined from local rainfall data.
 - (2) Compliance must be achieved via storage, rainwater harvesting, infiltration, and/or evapotranspiration.
 - d) LID Development Standards – The Permittee shall require Regulated Projects, subject to Runoff Retention Performance Requirements, to meet Runoff Retention Performance

² Use either the methodology provided in Part I.D of the December 2009 Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act, or, rainfall statistics provided by the Central Coast Water Board, whichever produces a more accurate value for rainfall depth.

Requirements (Sections B.4.b. and B.4.c.) using the following LID Development Standards:

- i) Site Assessment Measures – Permittees shall require the applicant for each Regulated Project to identify opportunities and constraints to implement LID Stormwater Control Measures. Permittees shall require the applicant to document the following, as appropriate to the development site:
 - Site topography
 - Hydrologic features including contiguous natural areas, wetlands, watercourses, seeps, or springs
 - Depth to seasonal high groundwater
 - Locations of groundwater wells used for drinking water
 - Depth to an impervious layer such as bedrock
 - Presence of unique geology (e.g., karst)
 - Geotechnical hazards
 - Documented soil and/or groundwater contamination
 - Soil types and hydrologic soil groups
 - Vegetative cover/trees
 - Run-on characteristics (source and estimated runoff from offsite which discharges to the project area)
 - Existing drainage infrastructure for the site and nearby areas including the location of municipal storm drains
 - Structures including retaining walls
 - Utilities
 - Easements
 - Covenants
 - Zoning/Land Use
 - Setbacks
 - Open space requirements
 - Other pertinent overlay(s)
- ii) Site Design Measures – Permittees shall require the applicant for each Regulated Project to optimize the use of LID site design measures, as feasible and appropriate at the project site. Regulated Projects subject to Performance Requirement No. 3 must augment design strategies required by Performance Requirement No. 1 (Section B.2.a.i-v) with the following:
 - Define the development envelope and protected areas, identifying areas that are most suitable for development and areas to be left undisturbed
 - Conserve natural areas, including existing trees, other vegetation, and soils
 - Limit the overall impervious footprint of the project
 - Construct streets, sidewalks, or parking lot aisles to the minimum widths necessary, provided that public safety or mobility uses are not compromised
 - Set back development from creeks, wetlands, and riparian habitats
 - Conform the site layout along natural landforms
 - Avoid excessive grading and disturbance of vegetation and soils
- iii) Delineation of discrete Drainage Management Areas (DMAs) – The Permittee shall require each Regulated Project to delineate DMAs to support a decentralized approach to stormwater management.
 - (1) The Permittee shall require the applicant for each Regulated Project to provide a map or diagram dividing the entire project site into discrete DMAs

- (2) The Permittee shall require the applicant for each Regulated Project to account for the drainage from each DMA using measures identified in Sections B.4.d.iv. and B.4.d.v., below.
- iv) Undisturbed and Natural Landscape Areas – Permittees shall require each Regulated Project to implement appropriate Site Design (Section B.4.d.ii.), and Runoff Reduction Measures in Performance Requirement No. 1, to reduce the amount of runoff for which retention and treatment is required. Runoff reduction measures that can be used to account for this reduction also include the below measures. The Tributary Area calculation in Attachment D accounts for these reductions.
- (1) Undisturbed or areas planted with native vegetation that do not receive runoff from other areas may be considered self-treating and no additional stormwater management is required.
- (2) Runoff from impervious surfaces, generated by the rainfall events identified in Section B.4.c, may be directed to undisturbed or natural landscaped areas. When the applicant can demonstrate that this runoff will be infiltrated and will not produce runoff to the storm drain system, or a surface receiving waterbody, or create nuisance ponding that may affect vegetation health or contribute to vector problems, then no additional stormwater management is required for these impervious surfaces.
- v) Structural Stormwater Control Measures – Where Regulated Project Applicants have demonstrated in their Stormwater Control Plans, and the Permittee has confirmed, that further use of Site Design measures listed in Section B.4.d.ii., Runoff Reduction measures listed in Performance Requirement No.1, and undisturbed and natural landscape areas discussed in Section B.4.d.iv. is technically infeasible, Structural Stormwater Control Measures designed for water quality treatment and/or flow control shall be used to comply with Performance Requirement No. 3.
- (1) The Permittee shall require the Regulated Project applicant to use structural Stormwater Control Measures that optimize retention and result in optimal protection and restoration of watershed processes, such as Structural Control Measures associated with small-scale, decentralized facilities designed to infiltrate, evapotranspire, filter, or capture and use stormwater. Where Regulated Project Applicants have demonstrated in their Stormwater Control Plans, and the Permittee has confirmed, that retention-based Stormwater Control Measures are technically infeasible, other non-retention-based Stormwater Control Measures are permissible (see Attachment D for information about using non-retention-based Stormwater Control Measures).
- vi) Hydrologic Analysis and Structural Stormwater Control Measure Sizing – To determine Stormwater Control Measure sizing and design, Permittees shall require Regulated Project applicants to use the hydrologic analysis and sizing methods as outlined in Attachment D, or a locally/regionally calibrated continuous simulation model that results in equivalent optimization of on-site runoff volume retention.
- e) Off-Site Mitigation – Off-site mitigation of full Retention Volume per Section B.4.d.vi. is not required where technical infeasibility as described in Section C.1.c. limits on-site

- compliance with the Runoff Retention Performance Requirement AND ten percent of a project's Equivalent Impervious Surface Area³ has been dedicated to retention-based Stormwater Control Measures. The Water Quality Treatment Performance Requirement is not subject to this adjustment, i.e., mitigation to achieve full compliance with the Water Quality Treatment Performance Requirement is required on- or off-site.
- i) Use the Attachment E instructions to calculate the ten percent adjustment for applying the Runoff Retention Performance Requirement.
 - ii) Use the Attachment F instructions to calculate the Off-Site retention requirements when a Regulated Project subject to the Runoff Retention Performance Requirement cannot allocate the full ten percent of the project site's Equivalent Impervious Surface Area to retention-based Stormwater Control Measures.
- f) Reporting Requirements – For each Regulated Project subject to the Runoff Retention Performance Requirement, the Permittee shall require the Project Applicant to provide the below information in a Stormwater Control Plan. The Permittee shall not grant final project approval, until the Stormwater Control Plan for the Regulated Project sufficiently demonstrates the Regulated Project design meets the Water Quality Treatment and Runoff Retention Performance Requirements.
- i) Project Name, application number, and location including address and assessor's parcel number
 - ii) Name of Applicant
 - iii) Project Phase number (if project is being constructed in phases)
 - iv) Project Type (e.g., commercial, industrial, multiunit residential, mixed-use, public), and description
 - v) Total project site area
 - vi) Total new and/or replaced impervious surface area
 - vii) Statement of Water Quality Treatment and Runoff Retention Performance Requirements that apply to the Project
 - viii) Adjusted Requirements based on the local jurisdiction's approval, that the Project is allowed a Special Circumstance, Watershed or Regional Plan, or Urban Sustainability Area designation
 - ix) Site assessment summary
 - x) LID Measures used:
 - (1) Site design measures
 - (2) Runoff Reduction Measures
 - (3) Post-construction structural Stormwater Control Measures
 - xi) Summary of Runoff Reduction Measures and Structural Stormwater Control Measures, by Drainage Management Area, as well as for the entire site
 - xii) Supporting calculations used to comply with the applicable Water Quality Treatment and Runoff Retention Performance Requirements
 - xiii) Documentation demonstrating infeasibility where Site Design and Runoff Reduction measures cannot retain required runoff volume
 - xiv) Documentation demonstrating infeasibility where retention-based Stormwater Control Measures cannot retain and/or treat the required runoff volume
 - xv) Documentation demonstrating infeasibility where on-site compliance cannot be achieved
 - xvi) Documentation demonstrating percentage of the project's Equivalent Impervious Surface Area dedicated to retention-based Stormwater Control Measures

³ Calculate Equivalent Impervious Surface Area using guidance in Attachment E

- xvii) Documentation of certification that the selection, sizing, and design of the Stormwater Control Measures meets the applicable Water Quality Treatment and Runoff Retention Performance Requirement
 - xviii) O&M Plan for all structural Stormwater Control Measures to ensure long-term performance
 - xix) Owner of facilities
 - xx) Statement of Compliance:
 - (1) Statement that the Water Quality Treatment and Runoff Retention Performance Requirements have been met on-site, or, if not achievable:
 - (a) Documentation of the volume of runoff for which compliance cannot be achieved on-site and the associated off-site compliance volume.
 - (b) Statement of intent to comply with Water Quality Treatment and Runoff Retention Performance Requirements through an Alternative Compliance agreement.
- 5) Performance Requirement No. 4: Peak Management
- The Permittee shall require all Regulated Projects that create and/or replace $\geq 22,500$ square feet of impervious surface (collectively over the entire project site) in Watershed Management Zones 1, 2, 3, 6, and 9 to manage peak stormwater runoff as required below (Section B.5.a.i.), and to meet Water Quality Treatment and Runoff Retention Performance Requirements.
- a) The Permittee shall apply the following Peak Management Performance Requirements:
 - i) Post-development peak flows, discharged from the site, shall not exceed pre-project peak flows for the 2- through 10-year storm events.
 - b) Reporting Requirements – For each Regulated Project subject to the Peak Management Performance Requirement, the Permittee shall require the Project Applicant to provide the below information in a Stormwater Control Plan. The Permittee shall not grant final project approval, until the Stormwater Control Plan for the Regulated Project sufficiently demonstrates the Regulated Project design meets the Water Quality Treatment, Runoff Retention, and Peak Management Requirements.
 - i) Project Name, application number, and location including address and assessor's parcel number
 - ii) Name of Applicant
 - iii) Project Phase number (if project is being constructed in phases)
 - iv) Project Type (e.g., commercial, industrial, multiunit residential, mixed-use, public), and description
 - v) Total project site area
 - vi) Total new and/or replaced impervious surface area
 - vii) Statement of Water Quality Treatment, Runoff Retention, and Peak Management Performance Requirements that apply to the Project
 - viii) Adjusted Requirements based on the local jurisdiction's approval, that the Project is allowed a Special Circumstance, Watershed or Regional Plan, or Urban Sustainability Area designation
 - ix) Site assessment summary
 - x) LID Measures used:
 - (1) Site design measures
 - (2) Runoff Reduction Measures
 - (3) Post-construction structural Stormwater Control Measures
 - xi) Summary of Runoff Reduction Measures and Structural Stormwater Control Measures, by Drainage Management Area, as well as for the entire site

- xii) Supporting calculations used to comply with the applicable Water Quality Treatment, Runoff Retention, and Peak Management Performance Requirements
 - xiii) Documentation demonstrating infeasibility where on-site compliance cannot be achieved
 - xiv) Documentation of certification that the selection, sizing, and design of the Stormwater Control Measures meets the applicable Water Quality Treatment, Runoff Retention, and Peak Management Performance Requirements
 - xv) O&M Plan for all structural SCMs to ensure long-term performance
 - xvi) Owner of facilities
 - xvii) Statement of Compliance:
 - (1) Statement that the Water Quality Treatment, Runoff Retention, and Peak Management Performance Requirements have been met on-site, or, if not achievable:
 - (a) Documentation of the volume of runoff for which compliance cannot be achieved on-site and the associated off-site compliance requirements.
 - (b) Statement of intent to comply with Water Quality Treatment, Runoff Retention, and Peak Management Performance Requirements through an Alternative Compliance agreement.
- 6) Performance Requirement No. 5: Special Circumstances
- The Permittee may designate Regulated Projects as subject to Special Circumstances based on certain site and/or receiving water conditions. The Special Circumstances designation exempts a Regulated Project from Runoff Retention and/or Peak Management Performance Requirements where those Performance Requirements would be ineffective to maintain or restore beneficial uses of receiving waters. The Regulated Project subject to Special Circumstances must still comply with the Water Quality Treatment Performance Requirements.
- a) Special Circumstances include:
- i) Highly Altered Channel Special Circumstance:
The Permittee may designate Regulated Projects as subject to Special Circumstances for Highly Altered Channels for the following conditions:
 - (1) Project runoff discharges into stream channels that are concrete-lined or otherwise continuously armored from the discharge point to the channel's confluence with a lake, large river (>200-square mile drainage area).
 - (2) Project runoff discharges to a continuous underground storm drain system that discharges directly to a lake, large river (>200-square mile drainage area), the San Lorenzo River in the City of Santa Cruz, or marine nearshore waters
 - (3) Project runoff discharges to other areas identified by the Central Coast Water Board
 - (4) Under no circumstance described in 6.a.i. can runoff from the Regulated Project result in adverse impacts to downstream receiving waters
 - ii) Intermediate Flow Control Facility Special Circumstance:
 - (1) The Permittee may designate Regulated Projects as subject to Special Circumstances for Intermediate Flow Control Facilities if the project runoff discharges to an existing (as of the date when the Central Coast Water Board approved Resolution R3-2012-0025) flow control facility that regulates flow volumes and durations to levels that have been demonstrated to be protective of beneficial uses of the receiving water downstream of the facility.
 - (2) The flow control facility must have the capacity to accept the Regulated Project's runoff.

- (3) Demonstration of facility capacity to accept runoff and to regulate flow volumes and durations must include quantitative analysis based on numeric, hydraulic modeling of facility performance.
- (4) Under no circumstance described in Section B.6.a.ii. can runoff from the Regulated Project result in adverse impacts to downstream receiving waters.
- iii) Historic Lake and Wetland Special Circumstance:
 - (1) The Permittee may designate Regulated Projects as subject to Special Circumstances for Historic Lakes and Wetlands for the following conditions:
 - (a) Project is located where there was once a historic lake or wetland where pre-development hydrologic processes included filtration and storage but no significant infiltration to support downstream receiving water.
 - (b) The Special Circumstance has been established based on a delineation of the historic lake or wetland approved by the Central Coast Water Board Executive Officer
- b) Performance Requirements for Highly Altered Channel and/or Intermediate Flow Control Facility Special Circumstances:
 - i) For Regulated Projects that: 1) create and/or replace $\geq 22,500$ square feet of impervious surface; 2) are located in WMZs 1, 2, 5, and 8, and those portions of WMZs 4, 7, and 10 that overlie a designated Groundwater Basin:
 - (1) Water Quality Treatment (Performance Requirement No. 2)
 - (2) Runoff Retention (Performance Requirement No. 3)
 - ii) For Regulated Projects that: 1) create and/or replace $\geq 22,500$ square feet of impervious surface; and 2) are located in WMZs 3, 6, and 9, and those portions of WMZs 4, 7, and 10 that do not overlie a designated Groundwater Basin:
 - (1) Water Quality Treatment (Performance Requirement No. 2)
- c) Performance Requirements for Historic Lake and Wetland Special Circumstances
 - i) For Regulated Projects that create and/or replace $\geq 15,000$ and $< 22,500$ square feet of impervious surface and meet the Historic Lake and Wetland Special Circumstance:
 - (1) Water Quality Treatment (Performance Requirement No. 2)
 - (2) Detention: Detain runoff such that the post-project peak discharge rate does not exceed the pre-project rate for all runoff up to the 95th percentile 24-hr rainfall event, or a more protective rate consistent with the Permittee's own development requirements
 - ii) For Regulated Projects that create and/or replace $\geq 22,500$ square feet of impervious surface and meet the Historic Lake and Wetland Special Circumstance:
 - (1) Water Quality Treatment (Performance Requirement No. 2)
 - (2) Peak Management: Detain runoff such that the post-project peak discharge rate does not exceed the pre-project rate for the 95th percentile 24-hr rainfall event and the 2- through 10-yr storm events or a more protective rate consistent with the Permittee's own development requirements.
- d) Documentation and Approval of Special Circumstances – The Permittee shall provide reasonable documentation to justify that a Regulated Project is more appropriately categorized under the Special Circumstances category.
 - i) Historic Lake and Wetland Special Circumstance – Prior to granting a Regulated Project Special Circumstances, the Permittee shall submit a proposal to the Central Coast Water Board Executive Officer for review and approval. The proposal shall include, at a minimum:
 - (1) Delineation of historic lakes and wetlands and any supporting technical information to substantiate the requested Special Circumstances designation; and

- (2) Documentation that the proposal was completed by a registered professional engineer, geologist, architect, and/or landscape architect.

C. Alternative Compliance (Off-Site Compliance)

Alternative Compliance refers to Water Quality Treatment, Runoff Retention and Peak Management Performance Requirements that are achieved off-site through mechanisms such as developer fee-in-lieu arrangements and/or use of regional facilities. Alternative Compliance may be allowed under the following circumstances:

1) Technical Infeasibility

Off-site compliance with Water Quality Treatment, Runoff Retention, or Peak Management Performance Requirements may be allowed when technical infeasibility limits or prevents use of structural Stormwater Control Measures.

a) To pursue Alternative Compliance based on technical infeasibility, the Regulated Project applicant, for Regulated Projects outside of Urban Sustainability Areas, must submit a site-specific hydrologic and/or design analysis conducted and endorsed by a registered professional engineer, geologist, architect, and/or landscape architect, demonstrating that compliance with the applicable numeric Post-Construction Stormwater Management Requirements is technically infeasible

b) The Regulated Project applicant must submit a description of the project(s) that will provide off-site mitigation. The proposed off-site projects may be existing facilities and/or prospective projects that are as effective in maintaining watershed processes as implementation of the applicable Post-Construction Stormwater Requirements on-site. The description shall include:

i) The location of the proposed off-site project(s), which must be within the same watershed as the Regulated Project. Alternative Compliance project sites located outside the watershed may be approved by the Central Coast Water Board Executive Officer

ii) A schedule for completion of offsite mitigation project(s), where the off-site mitigation project(s) has not been constructed.

c) Technical infeasibility may be caused by site conditions, including:

i) Depth to seasonal high groundwater limits infiltration and/or prevents construction of subgrade stormwater control measures⁴

ii) Depth to an impervious layer such as bedrock limits infiltration

iii) Sites where soil types significantly limit infiltration

iv) Sites where pollutant mobilization in the soil or groundwater is a documented concern

v) Space constraints (e.g., infill projects, some redevelopment projects, high density development)

vi) Geotechnical hazards

vii) Stormwater Control Measures located within 100 feet of a groundwater well used for drinking water

⁴ According to the CASQA Frequently Asked Questions about LID, "some MS4 permits and BMP guidance manuals require anywhere from 3-10 feet of separation from the groundwater level for infiltration practices. This distance depends on the soil type, pollutants of concern, and groundwater use. In some cases, however, where there may be groundwater or soil contamination, LID infiltrative practices may be restricted completely. (p. 7 in https://www.casqa.org/Portals/0/LID/CA_LID_FAQ_06-28-2011.pdf)

- viii) Incompatibility with surrounding drainage system (e.g., project drains to an existing stormwater collection system whose elevation or location precludes connection to a properly functioning treatment or flow control facility)
- 2) Approved Watershed or Regional Plan
- An approved Watershed or Regional Plan as described below (Section C.2.a.), may be used to justify Alternative Compliance for a Regulated Project's numeric Runoff Retention and Peak Management Performance Requirements without demonstrating technical infeasibility.
- a) The Permittee must submit the proposed Watershed or Regional Plan to the Central Coast Water Board Executive Officer for approval. Watershed and Regional Plans must take into consideration the long-term cumulative impacts of urbanization including existing and future development and include, at minimum:
 - i) A description of the project(s) that will provide off-site mitigation. The proposed off-site projects may be existing facilities and/or prospective projects.
 - ii) The location of the proposed off-site project(s), which must be within the same watershed as the Regulated Project. Alternative Compliance project sites located outside the watershed may be approved by the Central Coast Water Board Executive Officer.
 - iii) Demonstration that implementation of projects per the Watershed or Regional Plan will be as effective in maintaining watershed processes as implementation of the applicable Post-Construction Stormwater Requirements on-site. The proposal must include quantitative analysis (e.g., calculations and modeling) used to evaluate off-site compliance.
 - iv) A schedule for completion of offsite mitigation project(s), where the off-site mitigation project(s) has not been constructed.
 - b) The Permittee may use projects identified per the Watershed or Regional Plan to meet Water Quality Treatment Performance Requirements off-site only when:
 - i) The Regulated Project applicant has demonstrated that on-site water quality treatment is infeasible as described in Sections C.1.a and C.1.c., and
 - ii) The proposed off-site project(s) has been demonstrated to comply with the Water Quality Treatment Performance Requirements for the Regulated Project.
- 3) Approved Urban Sustainability Area
- The Permittee may allow Regulated Projects located within an approved Urban Sustainability Area to pursue Alternative Compliance for numeric Runoff Retention and Peak Management Performance Requirements without demonstrating technical infeasibility.
- a) The Urban Sustainability Area may only encompass redevelopment in high density urban centers (but not limited to incorporated jurisdictional areas) that are pedestrian-oriented and/or transit-oriented development projects intended to promote infill of existing urban areas. The Permittee must submit a proposal to the Central Coast Water Board Executive Officer for approval of an Urban Sustainability Area. The USA proposal must include, at minimum:
 - i) A definition and delineation of the USA for high-density infill and redevelopment for which area-wide approval for Alternative Compliance is sought.
 - ii) Information and analysis that supports the Permittee's intention to balance water quality protection with the needs for adequate housing, population growth, public transportation, land recycling, and urban revitalization.
 - iii) Demonstration that implementation of Alternative Compliance for Regulated Projects in the USA will meet or exceed the on-site requirements for Runoff Retention and Peak Management. The proposal must include quantitative analysis (e.g.,

- calculations and modeling) used to evaluate off-site compliance. Identification of specific off-site projects is not necessary for approval of the USA designation.
- b) The Permittee may allow Regulated Projects in a USA to meet Water Quality Treatment Performance Requirements off-site only when:
 - i) The Regulated Project applicant has demonstrated that on-site water quality treatment is infeasible as described in Sections C.1.a. and C.1.c., and
 - ii) The proposed off-site project(s) have been demonstrated to comply with the Water Quality Treatment Performance Requirements.
 - c) The Central Coast Water Board Executive Officer will deem complete a Permittee's USA proposal within 60 days of receiving a complete proposal. The Central Coast Water Board Executive Officer will approve or deny the proposal within 120 days of a proposal being deemed complete.
- 4) Other situations as approved by the Central Coast Water Board Executive Officer
 - 5) Location of Alternative Compliance Project(s) – The location of the proposed off-site project(s) must be within the same watershed as the Regulated Project. Alternative Compliance project sites located outside the watershed may be approved by the Central Coast Water Board Executive Officer.
 - 6) Timing and Funding Requirements for Alternative Compliance Projects – The Permittee shall develop a schedule for the completion of off-site mitigation projects, including milestone dates to identify funding, design, and construction of the off-site projects.
 - a) Complete the project(s) as soon as practicable and no longer than four years from the date of the certificate of occupancy for the project for which off-site mitigation is required, unless a longer period is otherwise authorized by the Central Coast Water Board Executive Officer.
 - b) The timeline for completion of the off-site mitigation project may be extended, up to five years with prior Central Coast Water Board Executive Officer approval. Central Coast Water Board Executive Officer approval will be granted contingent upon a demonstration of good faith efforts to implement an Alternative Compliance project, such as having funds encumbered and applying for the appropriate regulatory permits.
 - c) Require sufficient funding be transferred to the Permittee for public off-site mitigation projects. Require private off-site mitigation projects to transfer sufficient funding to a Permittee controlled escrow account, or provide the Permittee with appropriate project bonding within one year of the initiation of construction of the Regulated Project.
 - d) The Permittee may establish different timelines and requirements that are more restrictive than those outlined above.

D. Field Verifications of Post-Construction Stormwater Control Measures

- 1) The Permittee shall establish and implement a mechanism (a checklist or other tools) to verify⁵ that structural Water Quality Treatment, Runoff Retention, and/or Peak Management controls are designed and constructed in accordance with these Post-Construction Stormwater Management Requirements
- 2) Prior to occupancy of each Regulated Project, the Permittee shall field verify that the Site Design, Water Quality Treatment, Runoff Retention, and/or Peak Management controls have been implemented in accordance with these Post-Construction Requirements

⁵ A series of checklists that can be used by both inspectors and maintenance personnel is available in the City of Santa Barbara Storm Water BMP Guidance Manual, Appendix H: Facility Inspection and Maintenance Checklists. GeoSyntec Consultants, July 2008.

http://www.santabarbaraca.gov/Resident/Community/Creeks/Low_Impact_Development.htm

- a) The Permittee may accept third-party verification of SCMs conducted and endorsed by a registered professional engineer, geologist, architect, and/or landscape architect
- b) The Permittee shall ensure, through conditions of approval or other legally enforceable agreements or mechanisms, that site access is granted to all representatives of the Permittee for the sole purpose of performing operation and maintenance (O&M) inspections of the installed Stormwater Control Measures

E. Operation and Maintenance for Structural SCMs

The Permittee shall require O&M Plans and Maintenance Agreements that clearly establish responsibility for all structural Water Quality Treatment, Runoff Retention, and/or Peak Management controls on private and public Regulated Projects. The Permittee shall also maintain a structural SCM tracking database to support long-term performance of structural SCMs.

1) O&M Plan

The Regulated Project applicant shall develop and implement a written O&M Plan that, at a minimum, includes each component listed below. The Permittee may allow the Regulated Project applicant to include the O&M Plan components in the Stormwater Control Plan in place of developing a separate document. The Permittee shall approve the O&M Plan prior to final approval/occupancy. The O&M Plan must include, at minimum:

- a) A site map identifying all structural Stormwater Control Measures requiring O&M practices to function as designed
- b) O&M procedures for each structural stormwater control measure including, but not limited to, LID facilities, retention/detention basins, and proprietorship devices.
- c) The O&M Plan will include short-and long-term maintenance requirements, recommended frequency of maintenance, and estimated cost for maintenance.

2) Maintenance Agreement and Transfer of Responsibility for SCMs

Prior to issuing approval for final occupancy each Permittee shall require that Regulated Projects subject to these Post-Construction Requirements provide verification of ongoing maintenance provisions for Structural Stormwater Control Measures, including but not limited to legal agreements, covenants, CEQA mitigation requirements, and or conditional use permits. Verification shall include, at a minimum:

- a) The project owner's signed statement accepting responsibility for the O&M of the installed onsite and/or offsite structural treatment and flow control SCMs until such responsibility is legally transferred to another entity; and either
 - i) A signed statement from the public entity assuming responsibility for structural treatment and flow control SCM maintenance and stating that the SCM meets all local agency design standards; or
 - ii) Written conditions in the sales or lease agreements or deed for the project that require the buyer or lessee to assume responsibility for the O&M of the onsite and/or offsite structural treatment and flow control SCM until such responsibility is legally transferred to another entity; or
 - iii) Written text in project deeds, or conditions, covenants and restrictions for multi-unit residential projects that require the homeowners association or, if there is no association, each individual owner to assume responsibility for the O&M of the onsite and/or offsite structural treatment and flow control SCM until such responsibility is legally transferred to another entity; or
 - iv) Any other legally enforceable agreement or mechanism, such as recordation in the property deed, that assigns responsibility for the O&M of the onsite and/or offsite structural treatment and flow control SCM to the project owner(s) or the Permittee

3) Structural Stormwater Control Measure O&M Database

The Permittee shall develop a database with information regarding each structural Stormwater Control Measure installed per these Post-Construction Stormwater Management Requirements. The Database shall contain, at a minimum, fields for:

- a) SCM identification number and location/address
- b) Type of SCM
- c) Completion date of the following project stages, where applicable:
 - i) Construction
 - ii) Field verification of SCM
 - iii) Final Project approval/occupancy
 - iv) O&M plan approval by Permittee
- d) Location (physical and/or electronic) where the O&M Plan is available to view
- e) Party responsible for O&M
- f) Source of funding for O&M
- g) Verification that responsible party has maintained the SCM as outlined in the O&M Plan, or, indication that a self-inspection program is in place to verify that the SCM continues to function as designed and to repair and/or replace the SCM if it is not functioning as designed
- h) Any problems identified during inspections including any vector or nuisance problems.

F. Permittee Reporting Requirements

- 1) The Permittee shall submit a sample checklist and the number of permits regulated under the Site Design and Runoff Reduction Requirement (No. 1) as part of Stormwater Program Annual Reporting. This information must demonstrate the Site Design and Runoff Reduction Performance Requirement (No. 1) is applied to all applicable projects.
- 2) The Permittee shall report the following for all Regulated Projects subject to numeric Performance Requirements (Nos. 2, 3, 4, and 5) in Stormwater Program Annual Reporting:
 - a) The total number of completed Regulated Projects
 - b) The total number of Regulated Projects within each of the following categories of new and/or replaced impervious surface:
 - i) $\geq 5,000$ and $< 15,000$ (based on Net Impervious Area)
 - ii) $\geq 15,000$ and $< 22,500$
 - iii) $\geq 22,500$
 - c) A list of which projects were granted each of the following :
 - i) Special Circumstances – Highly Altered Channel
 - ii) Special Circumstances – Intermediate Flow Control Facility
 - iii) Special Circumstances – Historic Lake or Wetland
 - iv) Alternative Compliance – Technical Infeasibility
 - (1) Performance Requirement No. 2: Water Quality Treatment
 - (2) Performance Requirement No. 3: Runoff Retention
 - (3) Performance Requirement No. 4: Peak Management
 - v) Alternative Compliance – Watershed or Regional Plan
 - vi) Alternative Compliance – Urban Sustainability Area
 - vii) Other Technical Infeasibility
 - (1) Technical infeasibility to retain the required runoff volume (per Performance Requirement No. 3: Runoff Retention) using Site Design and Runoff Reduction measures
 - (2) Technical infeasibility to retain and/or treat the required runoff volume (per Performance Requirement No. 3: Runoff Retention) using retention-based Stormwater Control Measures

- d) Confirmation by the Permittee that for all Permittee-approved technical infeasibility determinations, the Regulated Project's Stormwater Control Plan adequately demonstrated the basis for the technical infeasibility
- e) A list of mitigation projects constructed for Alternative Compliance and the following project information:
 - i) A summary description of pollutant and flow reduction analyses (compiled from design specifications submitted by project applicants and approved by the Permittee) comparing the expected aggregate results of Alternative Compliance projects to the results that would otherwise have been achieved by meeting the numeric Performance Requirements on-site
 - ii) For public offsite mitigation projects, a summation of total offsite mitigation funds raised to date and a description (including location, general design concept, volume of water expected to be retained, and total estimated budget) of all pending public offsite mitigation projects
- f) Number of Regulated Projects where Field Verification of Post-Construction Stormwater Management Measures was required and was NOT completed
- g) Number of Regulated Projects where the required O&M Plan was NOT submitted/completed
- h) Number of Regulated Projects where Ownership and Responsibility of structural Stormwater Control Measures was not completed
- i) Structural Stormwater Control Measure O&M Database, including elements identified in Section E.3. Tabular spreadsheet data are acceptable.
 - i) The Permittee shall provide Central Coast Water Board staff electronic access to the database.

G. Pre-existing Programs

- a) A Permittee may propose, for Central Coast Water Board Executive Officer approval, implementation of pre-existing post-construction stormwater management requirements for development projects in the Permittee's jurisdictional coverage area, in place of implementing the requirements set forth in the Post-Construction Requirements. To be eligible for consideration and approval, the proposal must demonstrate the following:
 - i) The Permittee's pre-existing post-construction stormwater management requirements are as effective as the Post-Construction Requirements in maintaining watershed processes, impacted by stormwater management, that are necessary to protect water quality and beneficial uses;
 - ii) The Permittee was implementing its pre-existing post-construction stormwater management requirements prior to Central Coast Water Board approval of the Post-Construction Requirements; and
 - iii) The Permittee's pre-existing post-construction stormwater management requirements include LID site design and runoff reduction measures, numeric runoff treatment controls, numeric runoff retention controls, numeric runoff peak management controls, and project applicability thresholds as effective as those included in the Post-Construction Requirements.
- b) A Permittee must submit its proposal within 30 days of adoption of the Post-Construction Requirements by the Central Coast Water Board. The Central Coast Water Board Executive Officer will approve or deny the proposal within 90 days of receipt of a proposal.
- c) If the Central Coast Water Board Executive Officer denies a Permittee's proposal, the Permittee shall adhere to the Post-Construction Requirements provisions and deadlines.

ATTACHMENT A: Watershed Management Zones

Available electronically at:

http://www.waterboards.ca.gov/centralcoast/water_issues/programs/stormwater/docs/lid/lid_hydromod_charette_index.shtml

ATTACHMENT B: Designated Groundwater Basins

Groundwater basin areas are defined by the California Department of Water Resources (CDWR)⁶ and used in the Central Coast Water Board Joint Effort for Hydromodification Control to identify groundwater receiving-water issues and areas where recharge is a key watershed process. CDWR based identification of the groundwater basins on the presence and areal extent of unconsolidated alluvial soils identified on a 1:250,000 scale from geologic maps provided by the California Department of Conservation, Division of Mines and Geology. CDWR then further evaluated identified groundwater basin areas through review of relevant geologic and hydrogeologic reports, well completion reports, court-determined adjudicated basin boundaries, and contact with local agencies to refine the basin boundaries.

Designated Groundwater Basins include those identified in the CDWR Groundwater Basins Map. Numbers correspond to Groundwater Basins in Table 1.

⁶ California Department of Water Resources. 2004. Groundwater basin map. <http://www.water.ca.gov/groundwater/bulletin118/gwbasin_maps_descriptions.cfm>. Accessed September 15, 2006.

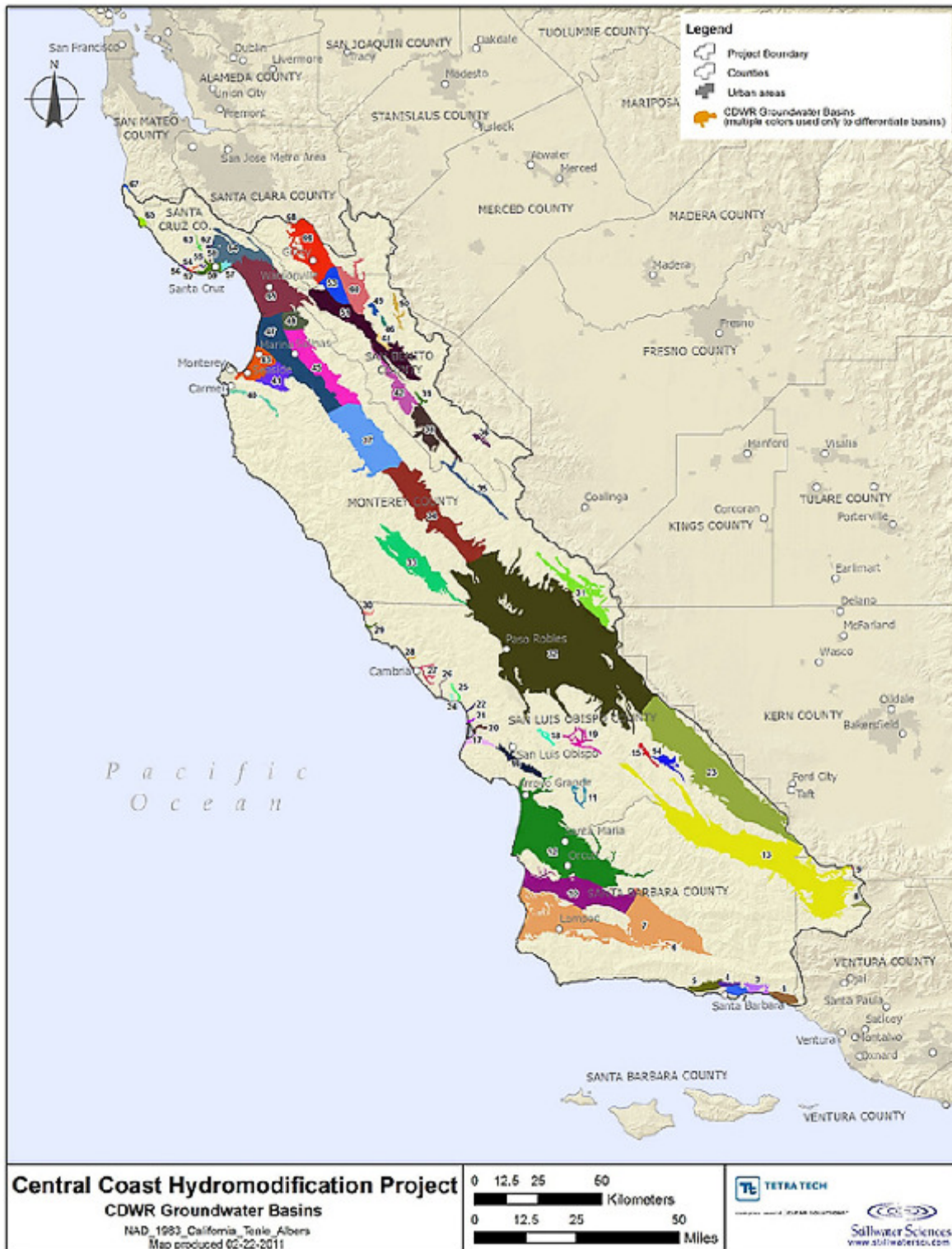


Table 1: Groundwater Basins in the Central Coast Region by GIS Basin Number (See Map)

GIS BASIN NUMBER	GROUNDWATER BASIN NAME	GIS BASIN NUMBER	GROUNDWATER BASIN NAME
1	Carpinteria	35	Peach Tree valley
2	Santa Barbara	36	Hernandez valley
3	Montecito	37	Salinas valley
4	Foothill	38	Bitter Water valley
5	Goleta	39	Dry Lake valley
6	Santa Ynez River valley	40	Carmel valley
7	Santa Ynez River valley	41	Salinas valley
8	Lockwood valley	42	San Benito river valley
9	Mil Potrero area	43	Salinas valley
10	San Antonio Creek valley	44	Tres Pinos valley
11	Huasna valley	45	Salinas valley
12	Santa Maria	46	Upper Santa Ana valley
13	Cuyama valley	47	Salinas valley
14	Big Spring area	48	Salinas valley
15	Rafael valley	49	Santa Ana valley
16	San Luis Obispo valley	50	Quien Sabe valley
17	Los Osos valley	51	Gilroy-Hollister valley
18	Rinconada valley	52	Needle Rock point
19	Pozo valley	53	Gilroy-Hollister valley
20	Chorro valley	54	West Santa Cruz terrace
21	Morro valley	55	West Santa Cruz terrace
22	Toro valley	56	Majors creek
23	Carrizo Plain	57	Soquel valley
24	Cayucos valley	58	West Santa Cruz terrace
25	Old valley	59	West Santa Cruz terrace
26	Villa valley	60	Gilroy-Hollister valley
27	Santa Rosa valley	61	Pajaro valley
28	San Simeon valley	62	Scotts valley
29	Arroyo de la Cruz valley	63	Felton area
30	San Carpoforo valley	64	Santa Cruz Purisima formation
31	Cholame valley	65	Ano Nuevo area
32	Salinas valley	66	Gilroy-Hollister valley
33	Lockwood valley	67	Pescadero valley
34	Salinas valley	68	Santa Clara valley

ATTACHMENT C: Definitions Related to Post-Construction Requirements

Bioretention – A Stormwater Control Measure designed to retain stormwater runoff using vegetated depressions and soils engineered to collect, store, treat, and infiltrate runoff. Bioretention designs do not include underdrains.

Biotreatment or Biofiltration Treatment – A Stormwater Control Measure designed to detain stormwater runoff, filter stormwater through soil media and plant roots, and release the treated stormwater runoff to the storm drain system. Biotreatment systems include an underdrain.

Discretionary Approval – A project approval which requires the exercise of judgment or deliberation when the MS4 decides to approve or disapprove a particular activity, as distinguished from situations where the MS4 merely has to determine whether there has been conformity with applicable statutes, ordinances, or regulations.

Dispersion – The practice of routing stormwater runoff from impervious areas, such as rooftops, walkways, and patios, onto the surface of adjacent pervious areas. Stormwater runoff is dispersed via splash block, dispersion trench, or sheet flow and soaks into the ground as it moves slowly across the surface of the pervious area.

Drainage Management Area (DMAs) – Following the low impact development principle of managing stormwater through small-scale, decentralized measures, DMAs are designated individual drainage areas within a Regulated Project that typically follow grade breaks and roof ridge lines and account for each surface type (e.g., landscaping, pervious paving, or roofs). Stormwater Control Measures for runoff reduction and structural facilities are designed for each DMA.

Equivalent Impervious Surface Area – is equal to *Impervious Tributary Surface Area* (ft²) + *Pervious Tributary Surface Area* (ft²), where *Impervious Tributary Surface Area* is defined as the sum of all of the site's conventional impervious surfaces, and *Pervious Tributary Surface Area* is defined as the sum of all of the site's pervious surfaces, corrected by a factor equal to the surface's runoff coefficient.

Evapotranspiration (ET) – The loss of water to the atmosphere by the combined processes of evaporation (from soil and plant surfaces) and transpiration (from plant tissues).

Flow-Through Water Quality Treatment Systems – Stormwater Control Measures that are designed to treat stormwater through filtration and/or settling. Flow-through systems do not provide significant retention or detention benefits for stormwater volume control.

Groundwater Basins – Groundwater basin areas defined by the California Department of Water Resources (DWR) and used in the Central Coast Water Board Joint Effort for Hydromodification Control to identify groundwater receiving-water issues and areas where recharge is a key watershed process. DWR based identification of the groundwater basins on the presence and areal extent of unconsolidated alluvial soils identified on a 1:250,000 scale from geologic maps provided by the California Department of Conservation, Division of Mines and Geology. DWR then further evaluated identified groundwater basin areas through review of relevant geologic and hydrogeologic reports, well completion reports, court-determined adjudicated basin boundaries, and contact with local agencies to refine the basin boundaries.

Impervious Surface – A hard, non-vegetated surface area that prevents or significantly limits the entry of water into the soil mantle, as would occur under natural conditions prior to development. Common impervious surfaces include, but are not limited to, roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, oiled, macadam or other surfaces which similarly impede the natural infiltration of stormwater. Open, uncovered retention/detention facilities shall not be considered as impervious surfaces for purposes of determining whether the thresholds for application of Performance Requirements are exceeded. However, for modeling purposes, open, uncovered facilities that retain/detain water (e.g., retention ponds, pools) shall be considered impervious surfaces.

Land recycling – The reuse of abandoned, vacant, or underused properties for redevelopment or repurposing

Landscaped Areas – Areas of soil and vegetation not including any impervious surfaces of ancillary features such as impervious patios, BBQ areas, and pools.

Large River – A river draining 200 square miles or more.

Low Impact Development (LID) – A stormwater and land use management strategy that strives to mimic pre-disturbance hydrologic processes of infiltration, filtration, storage, evaporation, and transpiration by emphasizing conservation, use of on-site natural features, site planning, and distributed stormwater management practices that are integrated into a project design.

Ministerial Approval – A project approval which involves little or no personal judgment by the MS4 as to the wisdom or manner of carrying out the project and only involves the use of fixed standards or objective measurements.

Native Vegetation – Vegetation comprised of plant species indigenous to the Central Coast Region and which reasonably could have been expected to naturally occur on the site.

Net Impervious Area – The sum of new and replaced post-project impervious areas, minus any reduction in total imperviousness from the pre-project to post-project condition: *Net Impervious Area = (New and Replaced Impervious Area) – (Reduced Impervious Area Credit)*, where *Reduced Impervious Area Credit* is the total pre-project to post-project reduction in impervious area, if any.

New Development – Land disturbing activities that include the construction or installation of buildings, roads, driveways and other impervious surfaces. Development projects with pre-existing impervious surfaces are not considered New Development.

Percentile Rainfall Event (e.g., 85th and 95th) – A percentile rainfall event represents a rainfall amount which a certain percent of all rainfall events for the period of record do not exceed. For example, the 95th percentile rainfall event is defined as the measured rainfall depth accumulated over a 24-hour period, for the period of record, which ranks as the 95th percentile rainfall depth based on the range of all daily event occurrences during this period.

Permeable or Pervious Surface – A surface that allows varying amounts of stormwater to infiltrate into the ground. Examples include pasture, native vegetation areas, landscape areas, and permeable pavements designed to infiltrate.

Pre-Project – Stormwater runoff conditions that exist onsite immediately before development activities occur. This definition is not intended to be interpreted as that period before any human-induced land activities occurred. This definition pertains to redevelopment as well as initial development.

Project Site – The area defined by the legal boundaries of a parcel or parcels of land within which the new development or redevelopment takes place and is subject to these Post-Construction Stormwater Management Requirements.

Rainwater Harvest – Capture and storage of rainwater or stormwater runoff for later use, such as irrigation (without runoff), domestic use (e.g. toilets), or storage for fire suppression.

Receiving Waters – Bodies of water, surface water systems or groundwater that receive surface water runoff through a point source, sheet flow or infiltration.

Redevelopment – On a site that has already been developed, construction or installation of a building or other structure subject to the Permittee's planning and building authority including: 1) the creation or addition of impervious surfaces; 2) the expansion of a building footprint or addition or replacement of a structure; or 3) structural development including construction, installation or expansion of a building or other structure. It does not include routine road maintenance, nor does it include emergency construction activities required to immediately protect public health and safety.

Replaced Impervious Surface – The removal of existing impervious surfaces down to bare soil or base course, and replacement with new impervious surface. Replacement of impervious surfaces that are part of routine road maintenance activities are not considered replaced impervious surfaces.

Self-Retaining Areas – (also called “zero discharge” areas), are designed to retain some amount of rainfall (by ponding and infiltration and/or evapotranspiration) without producing stormwater runoff. Self-Retaining Areas may include graded depressions with landscaping or pervious pavement.

Self-Treating Areas – are a portion of a Regulated Project in which infiltration, evapotranspiration and other natural processes remove pollutants from stormwater. The self-treating areas may include conserved natural open areas and areas of native landscaping. The self-treating area only treats the rain falling on itself and does not receive stormwater runoff from other areas.

Routine Road Maintenance – includes pothole and square cut patching; overlaying existing asphalt or concrete pavement with asphalt or concrete without expanding the area of coverage; shoulder grading; reshaping/regrading drainage systems; crack sealing; resurfacing with in-kind material without expanding the road prism or altering the original line and grade and/or hydraulic capacity of the road.

Single-Family Residence – 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.

Stormwater Control Measures – Stormwater management measures integrated into project designs that emphasize protection of watershed processes through replication of pre-

development runoff patterns (rate, volume, duration). Physical control measures include, but are not limited to, bioretention/rain gardens, permeable pavements, roof downspout controls, dispersion, soil quality and depth, minimal excavation foundations, vegetated roofs, and water use. Design control measures include but are not limited to conserving and protecting the function of existing natural areas, maintaining or creating riparian buffers, using onsite natural drainage features, directing runoff from impervious surfaces toward pervious areas, and distributing physical control measures to maximize infiltration, filtration, storage, evaporation, and transpiration of stormwater before it becomes runoff.

Stormwater Control Plan – A plan, developed by the Regulated Project applicant, detailing how the project will achieve the applicable Post-Construction Stormwater Management Requirements (for both onsite and offsite systems).

ATTACHMENT D: Hydrologic Analysis and Stormwater Control Measure Sizing Guidance

Project site conditions will influence the ability to comply with the Water Quality Treatment and Runoff Retention Performance Requirements. This Appendix provides the acceptable hydrologic analysis and Stormwater Control Measure (SCM) sizing methodology to evaluate runoff characteristics. This guidance provides an event-based hydrologic analysis approach. Calculations are conservative to acknowledge the limitations of event-based approaches. Using an event-based approach avoids the necessity of using calibrated, continuous simulation modeling. The Permittee can allow project applicants to use a locally/regionally calibrated continuous simulation-based model to improve hydrologic analysis and SCM sizing.

1) Determination of Tributary Area

Determining the Tributary Area is the basis for calculating the runoff volumes subject to Performance Requirement Number 3. Tributary Area should be calculated for each individual Drainage Management Area to facilitate the design of SCMs for each Drainage Management Area. The generic equation below illustrates how various portions of the site are addressed when determining the Tributary Area. The Tributary Area calculation must also account for the adjustments for Redevelopment Projects subject to Performance Requirement No. 3.

a) Compute the Tributary Area, using the equation:

$$\text{Tributary Area} = (\text{Entire Project Area}) - (\text{Undisturbed or Planted Areas})^* - (\text{Impervious Surface Areas that Discharge to Infiltrating Areas})^{**}$$

*As defined in Section B.4.d.iv.1.

** As defined in Section B.4.d.iv.2.

b) Adjustments for Redevelopment Project Tributary Area – Where the Regulated Project includes replaced impervious surface, the following Tributary Area adjustments apply:

- i) Redevelopment Projects outside an approved Urban Sustainability Area, as described in Section C.3. – The total amount of replaced impervious surface area shall be multiplied by 0.5 when calculating the Tributary Area.
- ii) Redevelopment Projects located within an approved Urban Sustainability Area (Section C.3) – The replaced impervious surface areas may be subtracted from the Tributary Area. The total amount of runoff volume to be retained from replaced impervious surfaces shall be equivalent to the pre-project runoff volume retained.

2) Determination of Design Volumes

There are two design volumes to calculate, the Retention Volume and the Water Quality Volume.

a) Determine the 85th and 95th percentile storm event:

Use either the methodology provided in Part I.D of the December 2009 Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects

under Section 438 of the Energy Independence and Security Act,⁷ or, rainfall statistics provided by the Central Coast Water Board, whichever produces a more accurate value for rainfall depth.

- b) Compute the Runoff Coefficient⁸ “C” for the area tributary to the SCMs, using the equation:

$$C = 0.858i^3 - 0.78i^2 + 0.774i + 0.04$$

Where “i” is the fraction of the tributary area that is impervious⁹

- c) Compute Runoff:

$$\text{Runoff from 95}^{\text{th}} \text{ Percentile 24-hr Rainfall Depth} = C \times \text{Rainfall Depth}_{95^{\text{th}}} \times \text{Tributary Area}$$

$$\text{Runoff from 85}^{\text{th}} \text{ Percentile 24-hr Rainfall Depth} = C \times \text{Rainfall Depth}_{85^{\text{th}}} \times \text{Tributary Area}$$

All rainfall directly incident to each SCM must be considered in determining runoff, including: tributary landscaping, impervious areas, pervious pavements, and bioretention features.

- d) Calculate Retention Volume:

Calculate the Retention Volume associated with the WMZ’s Runoff Retention Requirement (e.g., Retain 95th Percentile Rainfall Event, or, Retain 85th Percentile Rainfall Event) by multiplying runoff by the 48-hour drawdown regression coefficient¹⁰ of 1.963:

$$\text{Retention Volume} = \text{Runoff from 95}^{\text{th}} \text{ Percentile 24-hr Rainfall Depth} \times 1.963$$

or,

$$\text{Retention Volume} = \text{Runoff from 85}^{\text{th}} \text{ Percentile 24-hr Rainfall Depth} \times 1.963$$

The required Retention Volume shall be spread out over the site to the maximum extent feasible to promote infiltration.

Note: For redevelopment projects located within an approved Urban Sustainability Area (Section C.3.), the total amount of runoff volume to be retained from replaced impervious surfaces shall be equivalent to the pre-project runoff volume retained.

- e) Calculate Water Quality Volume:

⁷ USEPA, 841-B-09-00. http://www.epa.gov/owow/NPS/lid/section438/pdf/final_sec438_eisa.pdf

⁸ As set forth in WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87, (1998), pages 175-178 and based on the translation of rainfall to runoff using a runoff regression equation developed using two years of data from more than 60 urban watersheds nationwide.

⁹ As defined in Post-Construction Requirements Attachment C.

¹⁰ This drawdown regression constant, 1.963, appears in Urban Runoff Quality Management (WEF Manual of Practice No. 23/ASCE Manual of Practice No. 87, (1998), pp. 175-178) and is typically used in the regression equation relating mean annual runoff-producing rainfall depths to the “Maximized Water Quality Capture Volume” which corresponds to the “knee of the cumulative probability curve.” This regression was based on analysis of long-term rainfall data from seven rain gages representing climatic zones across the country. The Maximized Water Quality Capture Volume corresponds to approximately the 85th percentile runoff event, and ranges from 82 to 88%.

Calculate the Water Quality Volume, by multiplying runoff from the 85th Percentile 24-hr rainfall depth by the 48-hour drawdown regression coefficient of 1.963:

Water Quality Volume = Runoff from 85th Percentile 24-hr Rainfall Depth X 1.963

Note: For WMZs requiring retention of the 85th Percentile 24-hr rainfall depth, the Retention Volume and the Water Quality Volume are equivalent.

3) Structural Stormwater Control Measure Sizing

The Permittee shall require the Regulated Project applicant to use structural Stormwater Control Measures that optimize retention and result in optimal protection and restoration of watershed processes, such as Structural Control Measures associated with small-scale, decentralized facilities designed to infiltrate, evaporate, filter, or capture and use stormwater, to address the volumes calculated in 1 (above). Where the Regulated Project is within a Watershed Management Zone where infiltration is required, Permittees must use SCM designs that optimize infiltration of the entire Retention Volume to minimize the potential need for off-site mitigation. Various resources provide design guidance for fully infiltrative SCMs including:

- The Southern California LID BMP Manual
- The Contra Costa C.3 Manual
- The City of Santa Barbara LID BMP Manual
- The City of San Diego Storm Water Standards
- Central Coast LID Initiative Bioretention Design Guidance

a) Where full Retention/Infiltration Cannot Be Achieved

Where constraints limit the ability to fully infiltrate the Design Volume, a SCM design that ensures treatment of the 85th percentile storm event and optimizes infiltration may be used. The SCM design shall function as a retention/detention facility and may include an underdrain with an orifice control to ensure that a minimum of 48 hours of extended detention is provided for the Water Quality Volume. Draw down calculations based on time steps and design configuration shall be used to size the orifice.

b) Where site constraints preclude all retention/infiltration of the Design Volume.

Flow-through SCM designs may be used to ensure treatment of the 85th percentile where site constraints prevent retention/infiltration of the Design Volume. Non-retention based treatment systems shall adhere to Performance Requirement No. 2.

ATTACHMENT E: Ten Percent Adjustment to Retention Requirement – Calculation Instructions

Off-site mitigation of full Retention Volume per Section B.4.d.vi. is not required where technical infeasibility as described in Section C.1.c. limits on-site compliance with the Runoff Retention Performance Requirement AND ten percent of a project's Equivalent Impervious Surface Area has been dedicated to retention-based SCMs. The Water Quality Treatment Performance Requirement is not subject to this adjustment, i.e., mitigation to achieve full compliance is required on- or off-site.

Calculating Ten Percent of a Project's Equivalent Impervious Surface Area

The area of the project that must be dedicated to structural SCMs to waive off-site compliance with the Runoff Retention Requirement is equal to ten percent of the project's Equivalent Impervious Surface Area, defined as:

$$\text{Equivalent Impervious Surface Area (ft}^2\text{)} = (\text{Impervious Tributary Surface Area (ft}^2\text{)}) + (\text{Pervious Tributary Surface Area (ft}^2\text{)})$$

Impervious Tributary Surface Area is defined as the sum of all of the site's conventional impervious surfaces. When calculating Impervious Tributary Area:

- Do include: concrete, asphalt, conventional roofs, metal structures and similar surfaces
- Do not include: green roofs

Pervious Tributary Surface Area is defined as the sum of all of the site's pervious surfaces, corrected by a factor equal to the surface's runoff coefficient. When calculating Pervious Tributary Surface Area:

- Do include surfaces such as: unit pavers on sand; managed turf¹¹; disturbed soils; and conventional landscaped areas (see Table 1 for correction factors).

Example:

Project Site includes 500 ft² of unit pavers on sand.

$$\text{Pervious Tributary Surface Area} = 500 \text{ ft}^2 \times C = 50 \text{ ft}^2$$

Where C = Correction Factor for unit pavers, 0.1, from Table 1.

- Do not include: Infiltration SCM surfaces (e.g., SCMs designed to specific performance objectives for retention/infiltration) including permeable pavement, bioretention cells, bioswales; natural and undisturbed landscape areas, or landscape areas compliant with the Model Water Efficient Landscape Ordinance (California Code of Regulations, Title 23. Waters, Division 2. Department of Water Resources, Chapter 2.7.), or a local ordinance at least as effective as the Model Water Efficient Landscape Ordinance.

¹¹ Managed Turf includes turf areas intended to be mowed and maintained as turf within residential, commercial, industrial, and institutional settings.

TABLE 1: Correction Factors¹² for Use in Calculating Equivalent Impervious Surface Area

Pervious Surface	Correction Factor
Disturbed Soils/Managed Turf (dependent on original Hydrologic Soil Group)	A: 0.15 B: 0.20 C: 0.22 D: 0.25
Pervious Concrete	0.60
Cobbles	0.60
Pervious Asphalt	0.55
Natural Stone (without grout)	0.25
Turf Block	0.15
Brick (without grout)	0.13
Unit Pavers on Sand	0.10
Crushed Aggregate	0.10
Grass	0.10

¹² Factors are based on runoff coefficients selected from different sources: Turf and Disturbed Soils from *Technical Memorandum: The Runoff Reduction Method*. Center for Watershed Protection & Chesapeake Stormwater Network. p.13, April 18, 2008.

http://town.plympton.ma.us/pdf/land/scheuler_runoff_reduction_method_techMemo.pdf. All other correction factors from *C.3 Stormwater Handbook, Santa Clara Valley Urban Runoff Pollution Prevention Program, Appendix F*, p. F-9., May 2004.

http://www.sanjoseca.gov/planning/stormwater/pdfs/appendices_files/Appendix_F_Final.pdf

ATTACHMENT F: Calculating Off-Site Retention Requirements When Less Than 10 Percent of the Project Site Equivalent Impervious Surface Area is Allocated to Retention-Based Structural Stormwater Control Measures

The following instructions demonstrate how to determine the Off-Site Retention Requirements when a Regulated Project subject to the Runoff Retention Performance Requirement, cannot allocate the full 10% of the project site's Equivalent Impervious Surface Area¹³ to retention-based Stormwater Control Measures (SCMs).

STEP A. Potential Off-Site Mitigation Retention Volume

First calculate the Potential Off-Site Mitigation Retention Volume, which represents the additional volume of runoff that would have been retained on-site, had the full 10% of Equivalent Impervious Surface Area been dedicated to retention-based SCMs.

Equation A:

Potential Off-Site Mitigation Retention Volume = (the portion of the 10% Equivalent Impervious Area not allocated on-site) X (the On-Site Retention Feasibility Factor)

Where:

- *The portion of the 10% Equivalent Impervious Surface Area not allocated on-site* is that portion not allocated to on-site structural retention-based SCMs. For example, if 10% of Equivalent Impervious Surface Area is 1,000 ft² and only 8% (800 ft²) is allocated to retention-based SCMs, the remaining 2% (200 ft²) is the value inserted in the equation.
- *The On-Site Retention Feasibility Factor* is the ratio of Design Retention Volume¹⁴ managed on-site (ft³), to actual area (ft²) allocated to structural SCMs. This establishes the site's retained volume:area ratio, expressed as cubic feet of retained runoff volume per square foot of area. For example, if a project is able to infiltrate 3,500 ft³ of runoff over an 800-ft² area, this ratio of 3,500:800, or 4.38, is the On-Site Retention Feasibility Factor.

STEP B. Actual Off-Site Mitigation Retention Volume

Next, determine the Actual Off-Site Mitigation Retention Volume, which may be less than the Potential Off-Site Mitigation Retention Volume. The Actual Off-Site Mitigation Retention Volume is the lesser of the volume calculated in Equation A, and the remaining portion of the Design Retention Volume, calculated per Attachment D, not controlled on-site. There are two possible outcomes when the Runoff Retention Performance Requirement is not met on-site and less than 10% of the site's Equivalent Impervious Surface Area is allocated to retention-based SCMs:

- Potential Off-Site Mitigation Retention Volume is the Actual Off-Site Mitigation Retention Volume
- Remaining Design Retention Volume represents Actual Off-Site Design Retention Mitigation Volume

¹³ Calculate Equivalent Impervious Surface Area using guidance in Post-Construction Requirements Attachment E

¹⁴ Calculate Design Retention Volume using guidance in Post-Construction Requirements Attachment D, or equivalent method. Final Design Retention Volumes should reflect the applicant's demonstrated effort to use non-structural design measures to reduce the amount of runoff (e.g., reduction of impervious surfaces) as required by the Post-Construction Requirements' LID Development Standards (Section B.4.d).