RULES RELATING TO STORM DRAINAGE STANDARDS

JANUARY 2000

Department of Planning and Permitting
City and County of Honolulu
Honolulu, Hawaii

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Department of Planning and Permitting
City and County of Honolulu

RULES RELATING TO

STORM DRAINAGE STANDARDS

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Effective January 1, 2000

Amended Section 1-4 and
Plates 1, 2, and 6
November 27, 2010
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Amended Page ii,
Sections 1-1, 1-2, 1-3 and
Section 1-5
December 12, 2012
Effective June 1, 2013

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DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU

RULES RELATING TO STORM DRAINAGE STANDARDS

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RULES OF THE DEPARTMENT OF PLANNING AND PERMITTING RELATING TO STORM DRAINAGE STANDARDS

§1-1 PURPOSE

These Rules address requirements for both storm runoff quantities for flood control as well as storm runoff quality and reflect the [most] recent changes to Federal, State, and County requirements related to the quality of storm water discharges. By establishing criteria to address water quality, the City and County of Honolulu continues its efforts in complying with Federal Regulatory requirements to control the discharge of pollutants in storm water as specified in the Clean Water Act as amended by the Water Quality Act of 1987.

These standards are not intended to limit the initiative and resourcefulness [of the engineer] in developing drainage plans, or be viewed as maximum limits in design criteria. More stringent criteria should be used where reasonable.

[Eff: June 1, 2013] (*Auth: Sec 14-12.31, ROH) (Imp: Sec14-12.31, ROH)*

§1-2 MODIFICATIONS

A. The Director may modify provisions of these rules whenever:

   1. Full conformance to these rules is not achievable because of the size and shape, location or geological or topographical conditions, or land uses.

   2. The project provides for adequate storm water controls to mitigate adverse downstream impacts related to runoff flows and water quality; complies with Subdivision Rules and Regulations and the Land Use Ordinance; and covenants or other legal provisions are provided as needed, to ensure continued conformity to and achievement of mitigation measures; and

   3. The modification is reasonably necessary and not contrary to the intent and purpose of these rules.

B. Modification requests must be in writing and substantiated by facts presented with the request.

C. Before granting any modification, the Director may consult with the Departments of Design and Construction, Environmental Services, Facilities Maintenance, Parks and Recreation, Transportation Services, Board of Water Supply or any other appropriate agency for review and recommendation.

[Eff: June 1, 2013] (Auth: Sec 14-12.31, ROH) (Imp: Sec14-12.31, ROH)

§1-3 DEFINITIONS

As used in these Rules, the following definitions shall apply unless the context indicates otherwise:

"Best Management Practices" or "BMPs" means pollution control measures, applied to nonpoint sources, on-site or off-site, to control erosion and the transport of sediments and other pollutants, which have an adverse impact on waters of the state. BMPs may include a schedule of activities, the prohibition of practices, maintenance procedures, treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, or drainage from raw material storage.

"Biofiltration" means the simultaneous process of filtration, adsorption and biological uptake of pollutants in stormwater that takes place when shallow-depth runoff flows slowly over and through vegetated areas.

"City" means the City and County of Honolulu.

"Department" means the Department of Planning and Permitting, City and County of Honolulu.

"Department of Health" or "DOH" means the Clean Water Branch, Department of Health, State of Hawaii, the water pollution regulatory agency of the state.

"Design Engineer" means a licensed civil engineer in the State of Hawaii.

"Development" means land which is being developed or developed lands.

"Director" means the Director of the Department of Planning and Permitting.

"Disturbed Area" means the area of the project that is expected to undergo any disturbance, including, but not limited to excavation, grading, clearing, demolition, uprooting of vegetation, equipment staging, and storage areas. Areas which are cleared, graded, and/or excavated for the sole purpose of landscape renovation or growing crops are not included in the disturbed area quantity. This exemption does not extend to the construction of buildings and roads of agriculture-related operations that disturb one (1) acre or more.

"Engineering Control Facility" means any drainage device such as a basin, well, pond, ditch, dam, or excavation used for the temporary or permanent storage of storm water by means of detention, retention, divergence, or infiltration for the purpose of reducing storm water volume and/or peak storm discharge flows, and which may provide gravity settling of particulate pollutants. It includes, but is not limited to, detention ponds, retention ponds, infiltration wells or ditches, holding tanks, diversion ditches or swales, drainpipes, check dams, and debris basins.

"EPA" means United States Environmental Protection Agency.

"Evapotranspiration" means the combined loss of water into the atmosphere by evaporation (water changing from a liquid to a vapor from soil, water, or plant surfaces) and transpiration (water that is taken up by plant roots and transpired through plant tissue and leaves).

"Flood" or "flooding" means the inundation to a depth of three inches or more of any property not ordinarily covered by water. The terms do not apply to inundation caused by tsunami wave action.

“Impervious Surface” means a surface covering or pavement of a developed parcel of land that prevents the land’s natural ability to absorb and infiltrate rainfall/storm water.

“Infiltration” means the downward migration of surface water (i.e., runoff) through the planting soil (if present) and into the surrounding *in situ* soils and ultimately into groundwater.

“Low Impact Development, or LID” means a storm water management strategy that seeks to maintain or restore the natural hydrologic character of the site, reduce off-site runoff, improve water quality, provide groundwater recharge, and mitigate the impacts of increased runoff and storm water pollution. LID comprises a set of site design approaches and integrated management techniques that promote the use of natural systems for infiltration, evapotranspiration, treatment, and use of rainwater.

“Maximum Extent Practicable” or "MEP" means economically achievable measures for the control of the addition of pollutants from existing and new categories of nonpoint sources of pollution, which reflect the greatest degree of pollutant reduction achievable through the application of the best available nonpoint source pollution control practices, technologies, processes, siting criteria, operating methods or other alternatives.

“National Pollutant Discharge Elimination System permit” or “NPDES permit” means the permit issued to the City pursuant to *Title 40, Code of Federal Regulations, Part 122,* Subpart B, Section 122.26(a) (1) (iii), for storm water discharge from the City’s separate storm sewer systems; or the permit issued to a person or property owner for a storm water discharge associated with industrial activity pursuant to *Title 40, Code of Federal Regulations, Part 122*, Subpart B, Section 122.26(a) (1) (ii), or other applicable section of Part 122; or the permit issued to a person or property owner for the discharge of any pollutant from a point source into the state waters through the City's separate storm sewer system pursuant to *Hawaii Administrative Rules*, Chapter 11-55, "Water Pollution Control".

“New Development” means land disturbing activities; structural development, including construction or installation of a building or structure, the creation of impervious surfaces; and land subdivision.

“Redevelopment” means development that would create or add impervious surface area on an already developed site.

“Site Design Strategies” means LID design techniques that are intended to maintain or restore the site’s hydrologic and hydraulic functions with the intent of minimizing runoff volume and preserving existing flow paths.

“Source Control BMPs” means low-technology practices designed to prevent pollutants from contacting storm water runoff or to prevent discharge of contaminated runoff to the storm drainage system.

"Storm water" means storm water runoff, surface runoff, street wash, or drainage and may include discharges from fire fighting activities.

“Treatment Control BMPs” means engineered technologies designed to remove pollutants from storm water runoff prior to discharge to the storm drain system or receiving waters.

[Eff: June 1, 2013] (Auth: Sec 14-12.31, ROH) (Imp: Sec14-12.31, ROH)

§1-5 SECTION II – STANDARDS FOR STORM WATER QUALITY

In response to the requirements of the City's NPDES permit, the City Council passed Ordinance 96-34 addressing the need to regulate storm runoff design criteria for flood control and water quality. This includes establishing controls on the timing and rate of discharge of storm water runoff to reduce storm water runoff pollution to the maximum extent practicable through the implementation of best management practices and engineering control facilities designed to reduce the generation of pollutants.

Long-term water quality is impacted by the volume and frequency of discharged pollutants.

Water quality is also impacted by the modification of a stream's hydrograph caused by increases in flows and durations that result when land is developed (e.g., made more impervious). This phenomenon known as hydromodification, effectively reduces stream base-flow (groundwater flow into streams) and increases overland or storm-flow which causes reduced groundwater recharge and increased peak discharge rates into streams. Hydromodification may result in stream channel instability, streambank or shoreline erosion, loss of habitat, increased sediment transport and deposition, and increased flooding. Consequently, water quality measures for a development should also be designed to include LID BMPs to manage and control hydromodification.

§1-5.1 PART I - WATER QUALITY CRITERIA

A. OBJECTIVES OF WATER QUALITY CRITERIA

The purpose of the water quality criteria is to reduce the pollution associated with storm water runoff from new development and redevelopment. By establishing these criteria, the City and County of Honolulu is satisfying Federal regulatory requirements to control the discharge of pollutants in storm water as specified in the Clean Water Act Amendments of 1987 and its NPDES permit for discharges from the Municipally Owned and Operated Separate Storm Sewer System issued by the Hawaii Department of Health (DOH) under the authority by the United States Environmental Protection Agency (EPA). Under the NPDES program, the City is required to reduce the discharge of pollutants to receiving waters to the "maximum extent practicable" (MEP).

B. REQUIREMENT APPLICABILITY

1. DEVELOPMENT AND REDEVELOPMENT INCLUDED

Applicable new development and redevelopment projects as defined in B.2a of §1-5.1 Part I Water Quality Criteria must address storm water quality to the MEP through the use of Low Impact Development (LID) Site Design Strategies, Source Control Best Management Practices (BMPs), LID Post-Construction Treatment Control BMPs, and Other Post-Construction Treatment Control BMPs.

For redevelopment projects, the requirements presented in B.6 of §1-5.1 Part I Water Quality Criteria apply only to the addition, and not to the entire development. Redevelopment includes, but is not limited to expansion of a building footprint; addition to or replacement of a structure; replacement of an impervious surface that is

not part of a routine maintenance activity; land disturbing activities related to structural or impervious surfaces. Redevelopment does not include routine maintenance activities that are conducted to maintain original hydraulic capacity, original purpose of facility or emergency redevelopment activity required to protect public health and safety. Impervious surface replacement, such as the reconstruction of parking lots and roadways which does not disturb additional area is considered a routine maintenance activity. Redevelopment does not include the repaving of existing roads.

Projects cannot be subdivided or phased to avoid complying with these requirements. Development and redevelopment of the same or adjacent property (ies) permitted within 5 years may be considered together for purposes of assessing the above criteria. The sizing of water quality facilities and drainageways shall be based upon the ultimate use of the drainage area, unless the water quality feature will be re-built/sized during subsequent phases of construction.

2. REGULATED PROJECTS

For purposes of meeting the objectives presented in A of §1-5.1 Part I Water Quality Criteria, projects shall be regulated as follows[1]:

a. Priority A Projects. New development and redevelopment projects that disturb at least 1 acre of land and that are not required to obtain a separate industrial NPDES storm water permit from DOH for long term storm water discharges. Projects at least 5 acres in size are classified as A1, and all others are classified as A2.

b. Priority B Projects. New development and redevelopment projects that do not meet the criteria of a Priority A project but meet any of the following criteria:

   1) Retail Gasoline Outlet with at least 10,000 square feet of total impervious surface area;

   2) Automotive Repair Shop with at least 10,000 square feet of total impervious surface area;

   3) Restaurant with at least 10,000 square feet of total impervious surface area;

   4) Parking lot with at least 10,000 square feet of total impervious surface area

   Impervious surfaces include, but are not limited to, rooftops; walkways; patios; driveways; parking lots; storage areas; impervious concrete and asphalt; and any other continuous watertight pavement or covering. Landscaped soil and pervious pavement, underlain with pervious soil or pervious storage material, are not impervious surfaces.

3. PROJECT APPLICABILITY

These rules shall be effective as of June 1, 2013. The Director may exempt projects from the application of these rules if projects are determined to have submitted

[1] Criteria for Regulated Projects may be revised as necessary by the Department (as described in B.7 of §1-5.1 Part I Water Quality Criteria)

completed construction drawings and completed site-specific drainage reports prior to June 1, 2013.

4. OFF-SITE RUNOFF APPLICABILITY

   These criteria are required to be applied to runoff arising from a site and not from off-site runoff, unless the off-site runoff is entering the site as overland flow, and/or will not be separated from on-site runoff. If off-site runoff is to be conveyed through a water quality facility, then the facility must be designed to meet the requirements as described below for the combined on-site and off-site runoff volumes and/or rates.

5. JURISDICTIONAL APPLICABILITY

   These requirements apply to projects that drain to City and County drainage facilities and all natural drainage ways that the City and County has ownership and/or responsibility for. Developments that are located in areas that do not drain to the above facilities may be required to meet other DOH requirements.

6. MANAGEMENT PRACTICES TO MEET CRITERIA

   a. Priority A1 Projects

      The criteria shall be met for Priority A1 projects as follows:

      i. Incorporate appropriate LID Site Design Strategies to the MEP.

      ii. Incorporate appropriate Source Control BMPs to the MEP.

      iii. Unless determined to be infeasible, retain on-site by infiltration or evapotranspiration, the Water Quality Volume or "WQV" with appropriate LID Retention Post-Construction Treatment Control BMPs. The WQV is defined in A of §1-5.2 Part II, Water Quality Design Standards.

      iv. Unless determined to be infeasible, biofilter any portion of the Water Quality Volume that is not retained on-site with appropriate LID Biofiltration Post-Construction Treatment Control BMPs.

      "Infeasible" means conditions at the site make the implementation of a specific Low Impact Development Best Management Practice technically infeasible. Infeasibility criteria are defined in E of §1-5.2 Part II, Water Quality Design Standards. If it is demonstrated to be infeasible to retain and/or biofilter the Water Quality Volume, one of the following alternative compliance measures is required:

      - Either harvest/reuse, or treat (by detention, filtration, settling, or vortex separation) and discharge with appropriate Other Post-Construction Treatment Control BMPs, any portion of the Water Quality Volume that is not retained on-site or biofiltered.

      - Retain or biofilter at an offsite location, the volume of runoff equivalent to the difference between the project's WQV and the amount retained on-site or biofiltered. Offsite mitigation projects must be submitted for City approval.

b. Priority A2 Projects

The criteria shall be met for Priority A2 projects as follows:

i. Incorporate appropriate LID Site Design Strategies to the MEP.

ii. Incorporate appropriate Source Control BMPs to the MEP.

iii. Unless determined to be infeasible, either retain on-site by infiltration or evapotranspiration, the Water Quality Volume with appropriate LID Retention Post-Construction Treatment Control BMPs, or biofilter the Water Quality Volume with appropriate LID Biofiltration Post-Construction Treatment Control BMPs, or a combination of the two.

Infeasibility criteria are defined in E of §1-5.2 Part II, Water Quality Design Standards. If it is demonstrated to be infeasible to retain and/or biofilter the Water Quality Volume, one of the following alternative compliance measures is required:

- Either harvest/reuse, or treat (by detention, filtration, settling, or vortex separation) and discharge with appropriate Other Post-Construction Treatment Control BMPs, any portion of the Water Quality Volume that is not retained on-site or biofiltered.
- Retain or biofilter at an offsite location, the volume of runoff equivalent to the difference between the project's WQV and the amount retained on-site or biofiltered. Offsite mitigation projects must be submitted for City approval.

c. Priority B Projects

The criteria shall be met for Priority B projects as follows:

i. Consider appropriate LID Site Design Strategies.

ii. Incorporate appropriate Source Control BMPs to the MEP.

Documents providing details and recommendations on LID Site Design Strategies, Source Control BMPs, and Treatment Control BMPs may be found on the City's website.

7. ADDITIONAL REQUIREMENTS

The criteria identified in B.6 of §1-5.1 Part I, Water Quality Criteria are minimum requirements. If the department determines that additional controls and/or lower thresholds for developments are required to meet the specific water quality needs in watersheds that drain to sensitive receiving waters (as defined by the Hawaii State Department of Health Water Quality Limited Segments [WQLS], or Class 1 Inland Waters, or Class AA Marine Waters), additional requirements may be imposed. These may include design requirements that result in larger facilities as well as additional types of structural or non-structural controls. The design solution will be contingent upon the pollutants that are found to be impacting such water bodies and the regulatory status of the water body.

8. DEDICATION OF FACILITIES TO CITY AND COUNTY

   Water Quality facilities may be dedicated to the City. Application for dedication to the City must be approved prior to preparing subdivision maps and construction plans.

9. WATER QUALITY FACILITIES WITHIN PARKS

   Parks may be utilized to satisfy water quality facility requirements, with concurrence of the appropriate City agencies, if such parks meet the intent and requirements of the park dedication ordinance and rules.

10. STORM WATER QUALITY FACILITIES REVIEW

    The incorporation of storm water quality considerations is encouraged early in the development process as early design considerations will likely lead to more cost-effective projects. Storm water quality management strategies for Priority A1 projects shall be documented in a Storm Water Quality Report (SWQR). Storm water quality management strategies for Priority A2 and Priority B projects shall be documented in a Storm Water Quality Checklist (SWQC). A Storm Water Quality Report Preparation Manual, Storm Water Quality Checklist Preparation Manual, Storm Water Quality Report Template, and Storm Water Quality Checklist Templates may be found on the City's website to assist with and facilitate the preparation of SWQRs and SWQCs.

    a. Submittal Requirements

       Storm Water Quality Reports or Storm Water Quality Checklists shall be submitted for City review as follows:

       1) For Priority A1 and Priority A2 projects, the project's Storm Water Quality Report or Storm Water Quality Checklist shall accompany construction plan approvals.

       2) For Priority B projects, the project's Storm Water Quality Checklist shall accompany applications for applicable building and grading permits.

       A narrative explaining the project's water quality management strategy must be included in the project's Master Plan, discretionary land use permit, or Environmental Assessment/Environmental Impact Statement.

       Storm Water Quality Reports and Storm Water Quality Checklists shall be signed by the owner/developer certifying that the management practices will be implemented and maintained, and signed and stamped by a Professional Engineer licensed and registered to practice in the state of Hawaii, stating that the management practices are in accordance with these Rules and are consistent with the information presented in the construction plans.

11. MAINTENANCE

    All storm water quality facilities, including those constructed offsite per B.6 of §1-5.1 Part I, will require regular maintenance by the owner/developer or authorized representative to ensure they operate as designed and to prevent resuspension of previously captured particles. Necessary information, such as inspection/maintenance

frequencies, activities, and responsible individuals shall be documented in the Storm Water Quality Report or Storm Water Quality Checklist as applicable. In addition to regular maintenance, annual inspections must be performed for all Post-Construction BMPs by the owner/developer or authorized representative, including inspection and performance of any required maintenance in the late summer/early fall, prior to the start of the rainy season. A log of inspection and maintenance activities must be kept for a minimum of 5 (five) years and be made available to the City upon request.

For facilities that will be dedicated to the City, the City reserves the right to alter the maintenance plan to conform to its practices.

§1-5.2 PART II - WATER QUALITY DESIGN STANDARDS

A. VOLUME BASED STORM WATER QUALITY CONTROL FACILITIES

Volume based storm water quality facilities include Infiltration Basins, Infiltration Trenches, Subsurface Infiltration Systems, Dry Wells, Bioretention Basins, Permeable Pavement, Green Roofs, Vegetated Bio-Filters, Enhanced Swales, Detention Basins, and Sand Filters.

Volume based storm water quality facilities shall be sized as determined in B.6 of §1-5.1 Part I, Water Quality Criteria. The WQV is calculated as follows:

$$\boldsymbol{WQV = PCA \times 3630}$$

Where:
- WQV = water quality volume (cubic feet)
- P = design storm runoff depth (inches)
- C = volumetric runoff coefficient
- A = total drainage area (acres)

A design storm runoff depth of 1 inch shall be used. The volumetric runoff coefficient shall be calculated using the following equation as developed by EPA for smaller storms in urban areas:

$$\boldsymbol{C = 0.05 + 0.009I}$$

Where:
- C = volumetric runoff coefficient
- I = percent of impervious cover, expressed as a percentage

Infiltration Basin. An infiltration basin is a shallow impoundment with no outlet, where storm water runoff is stored and infiltrates through the basin invert and into the soil matrix. Infiltration Basins shall have a flat invert, interior side slopes (length per unit height) no steeper than 3:1 unless approved by a licensed professional engineer with geotechnical expertise, and at least 3 feet from the basin invert to the seasonally high groundwater table. The soil infiltration rate below the basin invert shall be at least 0.5 inches per hour, and drain completely in 48 hours.

Infiltration Trench. An infiltration trench is a rock-filled trench with no outlet, where storm water runoff is stored in the void space between the rocks and infiltrates through the bottom and into the soil matrix. Infiltration Trenches shall have no more than 6 inches of a top backfill layer, no more than 12 inches of a bottom sand layer, and 1.5-3.0 inch diameter trench rock. The soil infiltration rate below the trench invert shall be at least 0.5 inches per hour, the depth from the trench invert to the seasonally high groundwater table shall be at least 3 feet, and the trench shall completely drain in 48 hours. The depth of the infiltration trench shall not exceed the greater of the trench width and trench length to avoid classification as a Class V injection well.

Subsurface Infiltration System. A subsurface infiltration system is a rock (or alternative pre-manufactured material) storage bed below other surfaces such as parking lots, lawns and playfields for temporary storage and infiltration of runoff. In addition to applicable manufacturer's guidelines, the soil infiltration rate below the system invert shall be at least 0.5 inches per hour, the depth from the system invert to the seasonally high groundwater table shall be at least 3 feet, and the system shall completely drain in 48 hours. The depth of the subsurface infiltration system storage bed shall not exceed the greater of the storage bed's width and storage bed's length to avoid classification as a Class V injection well.

Dry Well. A dry well is a subsurface aggregate-filled or prefabricated perforated storage facility, where roof runoff is stored and infiltrates into the soil matrix. The soil infiltration rate below the dry well invert shall be at least 0.5 inches per hour, the depth from the dry well invert to the seasonally high groundwater table shall be at least 3 feet, and the dry well shall completely drain in 48 hours. If the dry well is aggregate-filled, 1.0-3.0 inch aggregate shall be used unless an alternative is approved by a licensed professional engineer with geotechnical expertise. The depth of the dry well shall not exceed the diameter to avoid classification as a Class V injection well.

Bioretention Basin. Sometimes referred to as a Rain Garden, a Bioretention Basin is an engineered shallow depression that collects and filters storm water runoff using conditioned planting soil beds and vegetation. The filtered runoff infiltrates through the basin invert and into the soil matrix. Bioretention Basins shall have a flat invert, interior side slopes (length per unit height) no steeper than 1:1 for single family residential installations and no steeper than 3:1 for all other installations unless approved by a licensed professional engineer with geotechnical expertise, and at least 3 feet from the basin invert to the seasonally high groundwater table. The ponding depth shall be no greater than 12 inches, the mulch thickness shall be 2-4 inches, and the planting soil depth shall be 2-4 feet. The soil infiltration rate below the basin invert shall be at least 0.5 inches per hour, and the basin shall drain completely in 48 hours.

Permeable Pavement. Sometimes referred to as pervious pavement or porous pavement, permeable pavement refers to any porous, load-bearing surface that allows for temporary rainwater storage in an underlying aggregate layer until it infiltrates into the soil matrix. It includes pervious concrete, porous asphalt, interlocking paver blocks, and reinforced turf and gravel filled grids. Permeable pavement shall have a reservoir layer no thicker than 3 feet and have at least 3 feet from the reservoir invert to the seasonally high groundwater table. The soil beneath the reservoir layer invert shall have an infiltration

rate of at least 0.5 inches per hour, and the reservoir layer shall drain completely in 48 hours.

Green Roof. Sometimes referred to as a Vegetated Roof or Eco-roof, a green roof is a roof that is entirely or partially covered with vegetation and soils for the purpose of filtering, absorbing, evapotranspirating, and retaining/ detaining the rain that falls upon it. Green roofs shall have a slope no greater than 20 percent, at least 2 inches of soil media, and at least 2 inches of drainage layer.

Vegetated Bio-Filter. Sometimes referred to as a Bioretention Filter, Stormwater Curb Extension, or Planter Box, a Vegetated Bio-Filter is an engineered shallow depression that collects and filters storm water runoff using conditioned planting soil beds and vegetation. The filtered runoff discharges through an underdrain system. Vegetated Bio-Filters shall have a relatively flat invert, the ponding depth shall be no greater than 12 inches, the mulch thickness shall be 2-4 inches, and the planting soil depth shall be 2-4 feet. The planting soil shall have a coefficient of permeability equal to at least 1.0 foot per day, and the WQV shall drain completely in 48 hours.

Enhanced Swale. Sometimes referred to as a Bioretention Swale or Dry Swale, an Enhanced Swale is a shallow linear channel with a planting bed and covered with turf or other surface material (other than mulch or plants). Runoff filters through a planting bed, is collected in an underdrain system, and discharged at the downstream end of the swale. Enhanced Swales shall have interior side slopes (length per unit height) no steeper than 3:1 unless approved by a licensed professional engineer with geotechnical expertise, a bottom width between 2-8 feet, and a longitudinal slope no greater than 2 percent without check dams or 5 percent with check dams. If used, check dams shall be no higher than 12 inches. The maximum ponding depth is 18 inches and the minimum media depth is 18 inches.

Detention Basin. Sometimes referred to as a Dry Extended Detention Basin, a detention basin is a shallow man-made impoundment intended to provide for the temporary storage of storm water runoff to allow particles to settle. It does not have a permanent pool and is designed to drain between storm events. Detention Basins shall have an invert sloped between 1-2 percent, interior side slopes (length per unit height) no steeper than 3:1 unless approved by a licensed professional engineer with geotechnical expertise, a minimum length to width ratio of 2 to 1, and a maximum depth of 8 feet. With outlets no smaller than 4 inches in diameter, the basin shall drain completely in 48 hours when full and 24-36 hours when half full.

Sand Filter. A sand filter is an open chambered structure that captures, temporarily stores, and treats storm water runoff by passing it through an engineered media (e.g., sand). Sand filter beds shall have at least 18 inches of sand with a coefficient of permeability of at least 3.5 feet per day, and shall drain completely in 48 hours.

B. FLOW BASED STORM WATER QUALITY CONTROL FACILITIES

Flow-through based storm water quality facilities include Vegetated Swales, Vegetated Filter Strips, and Manufactured Treatment Devices.

Flow-through based storm water quality facilities shall be sized for the Water Quality Flow Rate (WQF), which is calculated using the Rational Formula as follows:

$$\boldsymbol{WQF = CiA}$$

Where: WQF = water quality flow rate (cubic feet per second)
C = runoff coefficient
i = peak rainfall intensity (inches per hour)
A = total drainage area (acres)

A peak rainfall intensity of 0.4 inches per hour shall be used. The runoff coefficient shall be determined from Table 4. The runoff coefficient shall be, at a minimum, the midpoint of the given range of values. The higher value shall be used if soil conditions indicate that pervious areas will have little infiltration/interception potential.

For drainage areas containing multiple land uses the following formula may be used to compute a composite weighted runoff coefficient:

$$\boldsymbol{C_c = \left(\sum_{i=1}^{n} C_i A_i\right) \Big/ A_t}$$

Where: C_c = composite weighted runoff coefficient
$C_{1,2,\ldots n}$ = runoff coefficient for each land use cover type
$A_{1,2,\ldots n}$ = drainage area of each land use cover type (acres)
A_t = total drainage area (acres)

The calculated WQF for Vegetated Swales and Vegetated Filter Strips may be reduced by 25% if the soil beneath the BMP is classified as Hydrologic Soils Group (HSG) "A" or "B", as reported by the USDA Natural Resources Conservation Service (http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm), or if the soil beneath the BMP is amended by incorporating 6 inches of compost/amendments and tilled up to 8 inches.

Vegetated Swale. Sometimes referred to as a Grass Swale, Grass Channel, or Biofiltration Swale, a vegetated swale is a broad shallow earthen channel vegetated with erosion resistant and flood tolerant grasses. Runoff typically enters the swale at one end and exits at the other end. Vegetated Swales shall have interior side slopes (length per unit height) no steeper than 3:1 unless approved by a licensed professional engineer with geotechnical expertise, a bottom width no greater than 10 feet, and a water depth no greater than 4 inches. The velocity in the swale shall not exceed 1 foot per second, and the hydraulic residence time shall be at least 7 minutes.

Vegetated Buffer Strip. Sometimes referred to as a Vegetated Filter Strip or Biofiltration Strip, a vegetated buffer strip is a grassy slope vegetated with turf grass that is designed to accommodate sheet flow. They may remove pollutants by vegetative filtration. Vegetated Buffer Strips shall have a length (in the direction of flow) no less than 15 feet, the depth of flow shall not exceed 1 inch, and the velocity shall not exceed 1 foot per

second. The flow length of the tributary area discharging onto the strip shall not exceed 75 feet.

Manufactured Treatment Device. Sometimes referred to as hydrodynamic or vortex separators, a manufactured treatment device is a proprietary water quality structure utilizing settling, filtration, adsorptive/absorptive materials, vortex separation, vegetative components, or other appropriate technology to remove pollutants from storm water runoff. These devices must provide a TSS removal rate of 80%, verified by a Technology Acceptance and Reciprocity Partnership (TARP) state or other third party testing organization, provided that such verification is conducted in accordance with the protocol "Stormwater Best Management Practices Demonstration Tier II Protocol for Interstate Reciprocity" (which may be found at http://www.dep.state.pa.us/dep/deputate/pollprev/techservices/tarp/).

C. AREA BASED STORM WATER QUALITY CONTROL FACILITIES

Area based storm water quality facilities include Downspout Disconnection.

Downspout Disconnection. Sometimes referred to as Rooftop Disconnection or Downspout Dispersion, is the redirection of roof runoff to a vegetated area in a dispersed manner. Downspout disconnection facilities shall be sized such that the size of the vegetated area receiving the roof runoff is at least 10% of the size of the roof area that drains to the downspout, or the flow path of the vegetated area receiving the roof runoff is at least as long as the flow path of the roof area that drains to the downspout.

D. DEMAND BASED STORM WATER QUALITY CONTROL FACILITIES

Demand based storm water quality facilities include Harvesting / Reuse.

Harvesting/Reuse. Sometimes referred to as Capture/Reuse or Rainwater Harvesting, is the collection and temporary storage of roof runoff in rain barrels or cisterns for subsequent non-potable outdoor use (landscape irrigation, vehicle washing). Harvesting / Reuse facilities shall be sized such that at least 80% of the total annual runoff is captured, and at least 80% of the total annual reuse demand is met.

E. INFEASIBILITY CRITERIA

Table 5 lists exemption criteria for Low Impact Development (LID).

[Eff: June 1, 2013] (Auth: Sec 14-12.31, ROH) (Imp: Sec14-12.31, ROH)

TABLE 4: RUNOFF COEFFICIENTS FOR WATER QUALITY FLOW CALCULATIONS

Type of Drainage Area	Runoff Coefficient
Business	
Downtown areas	0.70 – 0.95
Neighborhood areas	0.50 – 0.70
Residential	
Single-family areas	0.30 – 0.50
Multi-units, detached	0.40 – 0.60
Multi-units, attached	0.60 – 0.75
Suburban	0.25 – 0.40
Apartment dwelling areas	0.50 – 0.70
Industrial	
Light areas	0.50 – 0.80
Heavy areas	0.60 – 0.90
Parks, cemeteries	0.10 – 0.25
Playgrounds	0.20 – 0.40
Railroad yards	0.20 – 0.35
Unimproved areas	0.10 – 0.30
Lawns	
Sandy soil, flat, ≤ 2%	0.05 – 0.10
Sandy soil, average 2-7%	0.10 – 0.15
Sandy soil, steep ≥ 7%	0.15 – 0.20
Heavy soil, flat, ≤ 2%	0.13 – 0.17
Heavy soil, average 2-7%	0.18 – 0.22
Heavy soil, steep ≥ 7%	0.25 – 0.35
Streets	
Asphaltic	0.70 – 0.95
Concrete	0.70 – 0.95
Brick	0.75 – 0.85
Drives and walks	0.75 – 0.95
Roofs	0.75 – 0.95

TABLE 5: EXEMPTION CRITERIA FOR LOW IMPACT DEVELOPMENT

Exemption Criteria	Infiltration Basin	Infiltration Trench	Subsurface Infiltration	Dry Well	Bioretention Basin	Permeable Pavement
Soils beneath basin invert have measured infiltration rates less than 0.5 in/hr	●	●	●	●	●	●
Unable to maintain a distance of at least 3 ft from BMP invert to seasonally high groundwater table	●	●	●	●	●	●
Site has known man-made plumes or contaminated soils	●	●	●	●	●	●
Site has high potential for concentrated pollutant/chemical spills	●	●	●	●	●	●
Site is up-gradient of ephemeral streams (i.e. habitat type change downstream)	●	●	●	●	●	●
Site is up-gradient of known shallow landslide-prone area	●	●	●	●	●	●
Unable to maintain a distance of at least 50 ft to the nearest groundwater well used for drinking water	●	●	●	●	●	●
Unable to maintain a distance of at least 35 ft to the nearest septic system	●	●	●	●	●	●
Unable to maintain a distance of at least 20 ft to the nearest building foundation	●	●	●		●	
Unable to maintain a distance of at least 10 ft to the nearest building foundation				●		
Unable to maintain a distance of at least 100 ft to the nearest down-gradient building foundation	●	●	●	●	●	
Unable to maintain a distance of at least 10 ft to the nearest property line	●	●	●	●	●	
Unable to divert flows in excess of WQDS around BMP, and unable to create safe overflow mechanism for flows in excess of WQDS	●	●	●		●	
Excavation would disturb iwi kupuna or other archaeological resources	●	●	●		●	
Site has high potential for oil and/or grease spills						●
Site has high potential to receive sand and/or sediment loads						●
Unable to maintain a pavement slope no greater than 5%						●
Pavement would be above a utility vault						●
Pavement is expected to receive more than 1,000 average daily trips						●
Other justification for an exemption proposed by the developer/agent and is acceptable to the City	●	●	●	●	●	●

TABLE 5: EXEMPTION CRITERIA FOR LOW IMPACT DEVELOPMENT (continued)

Exemption Criteria	Vegetated Bio-Filter	Green Roof	Enhanced Swale	Downspout Disconnect	Vegetated Swale	Vegetated Filter Strip	Tree Box Filter
Unable to divert flows in excess of WQDS around BMP, and unable to create safe overflow mechanism for flows in excess of WQDS	●		●		●	●	
Excavation would disturb iwi kupuna or other archaeological resources	●		●		●	●	●
Invert of underdrain layer is below seasonally high groundwater table	●		●				
Site does not receive enough sunlight to support vegetation	●				●	●	
Site lacks sufficient hydraulic head to support BMP operation by gravity	●		●				●
Roof is for a single family residential dwelling		●					
Space is unavailable due to renewable energy, electrical, and mechanical systems		●					
Slope on roof exceeds 20% (11 degrees)		●					
Slope of receiving vegetated area exceeds 5%				●			
Diverted runoff drains within 10 feet of a retaining wall				●			
Diverted runoff drains within 10 feet of property line				●			
Concentrated flow cannot be established naturally					●		
Sheet flow cannot be established naturally						●	
Entrance at surface not possible							●
Residential and no planting strip							●
No curb and gutter							●
Other justification for an exemption proposed by the developer/agent and is acceptable to the City	●	●	●	●	●	●	●

● denotes that the BMP is considered infeasible if the exemption criteria is applicable

[Eff: June 1, 2013] (Auth: Sec 14-12.31, ROH) (Imp: Sec14-12.31, ROH)

These amendments to the rules were adopted on December 12, 2012, following a public hearing held on November 27, 2012, after public notice was given on October 26, 2012, in the Hawaii State and County Public Notices, Honolulu City and County.

These amendments to the rules shall take effect on June 1, 2013.

JIRO A. SUMADA
Acting Director
Department of Planning and Permitting

APPROVED:

PETER B. CARLISLE
Mayor
City and County of Honolulu

Dated: 12/28/12

APPROVED AS TO FORM
AND LEGALITY:

Deputy Corporation Counsel

FILED:

Given unto my hand and affixed with the
Seal of the City and County of Honolulu this
02 day of January, 2013.

BERNICE K.N. MAU, City Clerk