

BMP T5.10A: Downspout Full Infiltration – Drywells

Downspout Full Infiltration Drywells are either pre-manufactured structures or holes in the ground filled with rock that allow roof runoff to infiltrate into the soil below.

Applications, Limitations and Setbacks

Downspout Full Infiltration Drywells are designed to infiltrate runoff from residential roof downspout drains and cannot be used to directly infiltrate runoff from pollutant-generating surfaces (e.g. driveways).

Soil investigation is an important first step to determining the feasibility of using downspout full infiltration. The required soil investigation described in Section 5 includes an initial assessment of the type of site soils, and the infiltration potential.

Setbacks

- 100 feet from closed or active landfills.
- 10 feet from any sewage disposal drainfield, including reserve areas and grey water reuse systems.
- 100 feet upgradient from any septic system unless site topography clearly prohibits subsurface flows from intersecting the drainfield.
- 10 feet from an underground storage tank and its connecting pipes that is used to store petroleum products, chemical, or liquid hazardous wastes in which 10% or more of the storage volume of the tank and connecting pipes is beneath the ground.
- 10 feet from any structure, property line, or sensitive area (except slopes over 40%). However, if the roof downspout infiltration system is a common system shared by two or more adjacent residential lots and contained within an easement for maintenance given to owners of all residential properties draining to the system, then the setback from the property line(s) shared by the adjacent lots may be waived.

- 50 feet from the top of any slope over 40%. This setback may be reduced to 15 feet based on a geotechnical evaluation.

Infeasibility Criteria

The following criteria describe conditions that make Downspout Full Infiltration Drywells infeasible to meet Minimum Requirement #5. Citation of any of the infeasibility criteria must be based on an evaluation of site-specific conditions and documented in the LID Feasibility Checklist. Downspout Full Infiltration Drywells are considered infeasible under the following conditions:

- A qualified professional determines that soils in the infiltration zone at the location of the drywell do not fall within USDA textural classes of coarse sands to medium sands, loam, or cobbles and gravels.
- Less than three feet of permeable soil exists from the proposed finished ground elevation at the drywell location to the seasonal high groundwater table.
- Less than one foot exists between the bottom of the drywell to the seasonal high groundwater table.
- The facility is less than 100 feet from closed or active landfills.
- The facility is less than 10 feet from a sewage disposal drainfield, including reserve areas and grey water reuse systems.

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- The facility is less than 100 feet upgradient from any septic system unless site topography clearly prohibits subsurface flows from intersecting the drainfield.
 - The facility is less than 10 feet from an underground storage tank and its connecting pipes that is used to store petroleum products, chemical, or liquid hazardous wastes in which 10% or more of the storage volume of the tank and connecting pipes is beneath the ground.
 - The facility is less than 10 feet from any structure, property line, or sensitive area (except slopes over 40%). However, if the roof downspout infiltration system is a common system shared by two or more adjacent residential lots and contained within an easement given to owners of all residential properties draining to the system, then the setback from the property line(s) shared by the adjacent lots may be waived.
 - The facility is less than 50 feet from the top of any slope over 40%. This setback may be reduced to 15 feet based on a geotechnical evaluation.
- the gravel amounts specified above for the soil type and impervious surfaced served.
- Choking stone or filter fabric (geotextile) shall be placed on top of the drain rock and filter fabric shall be placed on drywell sides prior to backfilling. Filter fabric shall not be placed on the bottom.
 - Spacing between drywells shall be a minimum of 10 feet.
 - Downspout infiltration drywells must not be built on slopes greater than 25% (4:1). Drywells may not be placed on or above a landslide hazard area or on slopes greater than 15% without evaluation by a professional engineer with geotechnical expertise or a licensed geologist, hydrogeologist, or engineering geologist, and with approval from the Responsible Official.

Design Criteria

- Drywell bottoms must be a minimum of 1 foot above seasonal high ground water level or impermeable soil layers
- Drywells shall contain a minimum volume of gravel:
 - If located in coarse sands and cobbles (defined as a particle size of 2mm or greater in accordance with ASTM D422-63 particle size analysis), at least 60 cubic feet of gravel per 1,000 square feet of impervious surface served.
 - If located in medium sands (defined as 0.5 mm to 2 mm in accordance with ASTM D422-63 particle size analysis), at least 90 cubic feet of gravel per 1,000 square feet of impervious surface served.
- Drywells shall be at least 4 feet in diameter and deep enough to contain

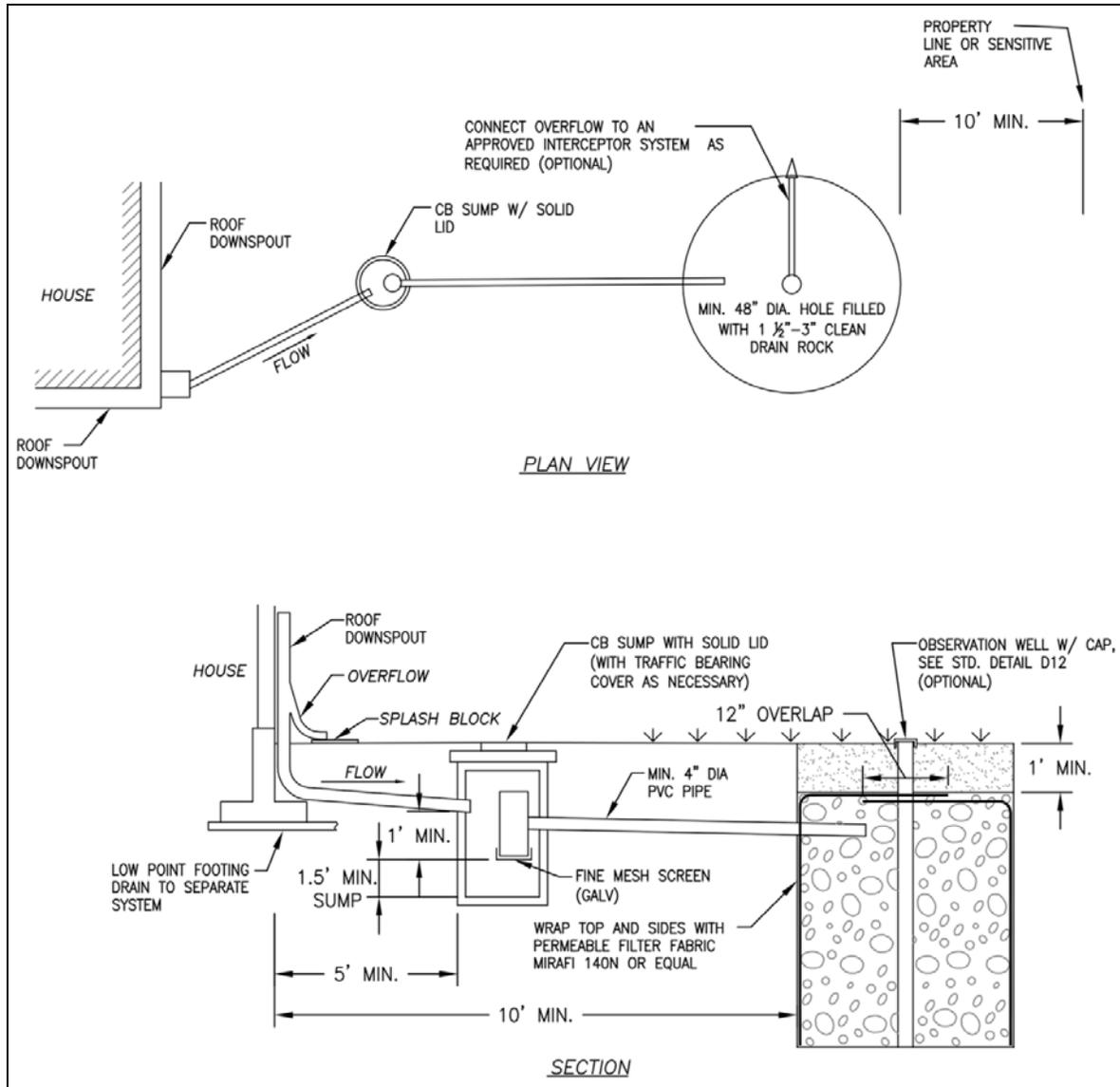


Figure 12: Typical Downspout Infiltration Drywell
 (Modified from Clark County standard detail D16.1, January 2015)



Clark County 2015 Stormwater Manual Implementation Summary of Procedure

This procedure statement documents discussions and decisions from Community Development, Public Works and Prosecuting Attorney's office. Implementation of new stormwater regulations require staff to work through specific details of the regulations with applicants. The purpose is to ensure consistent application of county requirements. These procedure statements document decisions for future reference and will be kept on the [ClarkNet web page](#).

Procedure statement #2015-007 – May 2016 Roof Drywell Design in Fine Sand and Loam Soils

Problem Statement

The Clark County Stormwater Manual (2015) adheres to the SWMMWW (2014) standards for roof downspout full infiltration feasibly, requiring their use in fine sand- and loam-textured soils. However, the manual does not provide drywell volume sizing for drywells placed in a fine sand- or loam-textured substrate.

A second problem with following the SWMMWW (2014) is its use of the term "loam" creates confusion because the term loam includes materials that are not suitable for drywells because they may contain up to 27 percent clay and 50 percent silt, with only 23 percent sand using the USDA soil texture triangle.

Background Information

The manual does include trench length standards for substrate textures as fine as loam. The standard design figure for an infiltration trench in the SWMMWW shows the trench cross section as 2 feet by 1.5 feet, with the 2-foot side on the bottom. Trench volume for medium sand or coarse sand may be then calculated for a standard length by multiplying the cross sectional area by length. The standard trench volume needed for 1,000 square feet of for coarse sand is 60 cubic feet, and the trench volume for medium sand is 90 cubic feet, These trench volumes are exactly the same as BMP T5.10 drywell volumes for those substrate textures.

Pierce County's stormwater manual addresses the problems with allowing infiltration BMPs in loam soils. The Pierce County Stormwater Manual specifies the allowable range of sandy and loam soils in the USDA soil texture triangle (Figure A-1 of Volume III Appendix A, December 2015). The allowable fine textured soils for full roof downspout infiltration are materials with at least 40 to 50 percent sand and no more than 20 percent clay.

Guidance for Drywell Design Using the Manual Standard Gravel-Filled Sump

Drywell volumes for river rock filled drywells

Based on the SWMMWW (2014) trench lengths, the volumes for drywells in substrates finer than medium sand (USDA defined size range) are:

- Very fine to fine sand: 225 cubic feet per 1,000 square feet of roof area
- Loam (defined as having no more than 20 percent clay and greater than 40 to 50 percent sand): 375 cubic feet per 1,000 square feet of roof area

USDA particle size chart

The table below defines the breaks between coarse, medium and fine sand.

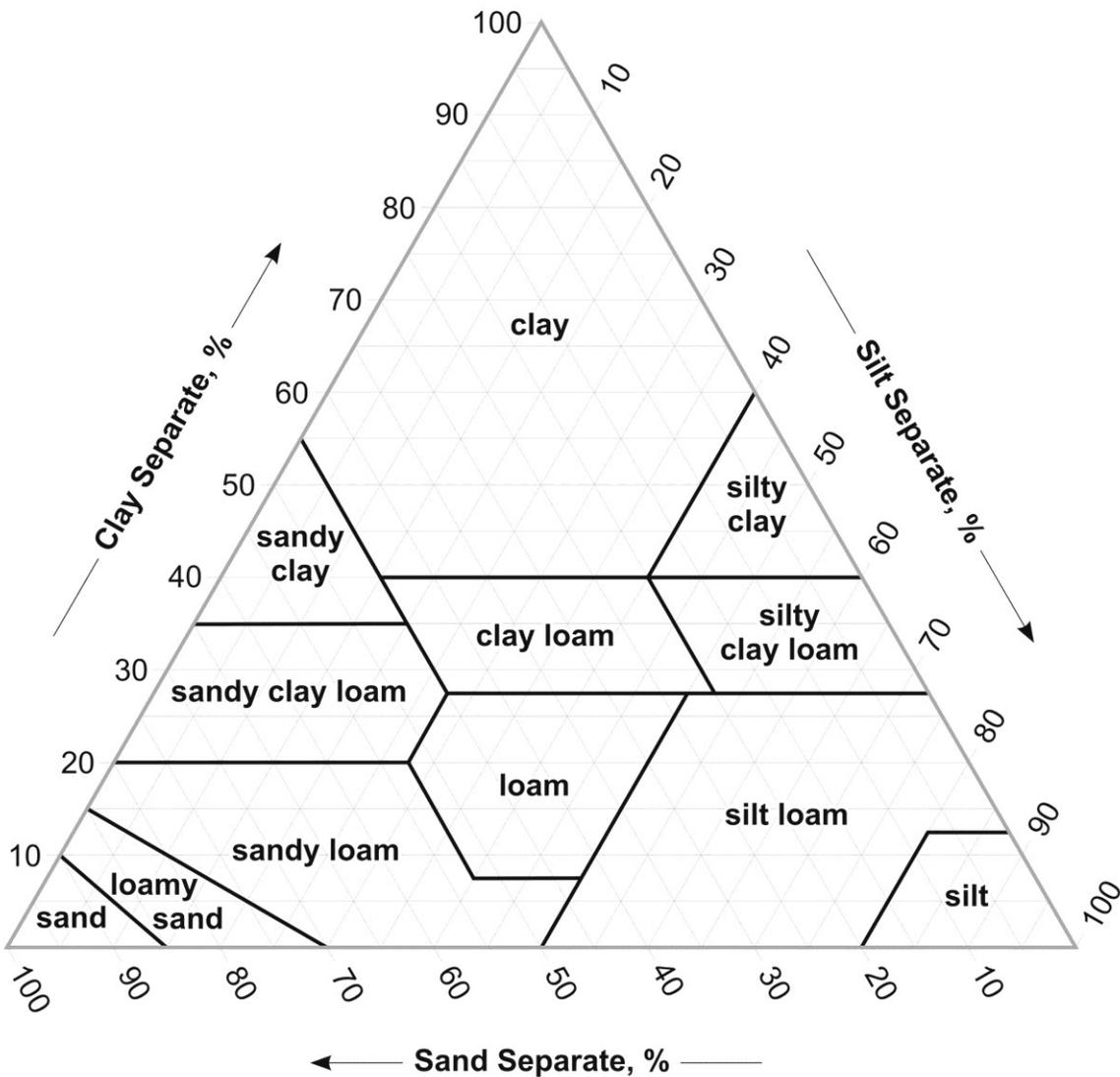
Table 1. USDA soil-separates classifications (Soil Survey Division Staff 1993).

Name of Soil Separate	Diameter Limits (mm)
Very fine sand	0.05-0.10
Fine sand	0.10-0.25
Medium sand	0.25-0.50
Coarse sand	0.50-1.00
Very coarse sand	1.00-2.00

USDA soil texture triangle

The USDA soil texture triangle shows the textures for loam, sand and clay soils. Only substrate materials with 40 percent or greater sand and no more than 20 percent clay are suitable for roof downspout infiltration using drywells and infiltration trenches.

Soil Textural Triangle



Use of modular infiltration galleries

Modular infiltration galleries are becoming more common, replacing rock-filled trenches and drywells. Follow the manufacture guidelines for full infiltration for the site soil texture but consider that infiltration area should be similar to trenches and gallery volume should be at least 1/3 of infiltration trench rock volume.