§247 - APPENDIX C

SIMPLIFIED APPROACH TO STORMWATER MANAGEMENT FOR SMALL PROJECTS

§247 - APPENDIX C.1

Applicability, Submittal and Approval Requirements

Applicability:

- Small projects 1,500 to 3,000 square feet of Proposed Impervious Surfaces (as defined in this Stormwater Management Ordinance) and with less than 10,000 square feet of proposed Earth Disturbance (as defined in this Ordinance) may apply the "Simplified Approach to Stormwater Management for Small Projects" (Simplified Approach).
- Only projects that meet the above size thresholds as specified in the Township's Stormwater Management Ordinance may use this Simplified Approach. Sketch plans may be submitted for review by the Township in lieu of formal Stormwater Management Site Plans; however, these projects are still required to address water quality and infiltration requirements as outlined in this Simplified Approach.
- Any project with more than 3,000 square feet of Proposed Impervious Surface or more than 10,000 square feet of proposed Earth Disturbance can NOT apply this Simplified Approach.
- The Applicant should first review the planned project with the Code Enforcement Officer prior to initiating the Simplified Approach to confirm the following:
    - That the proposed project is not otherwise exempt from the stormwater management control and the engineered Stormwater Management Site Plan requirements of the Townships's Stormwater Management Ordinance;
    - That the proposed project is eligible to use this Simplified Approach;
    - To determine which components of the proposed project must be included in the calculation of "impervious surfaces (areas)"; and,
    - Whether any local conditions are known to the Municipal Engineer that would preclude the use of any of the techniques included in this Simplified Approach.

Submittal and Approval Requirements:

Use of the Simplified Approach requires:

- The applicant to submit the following to the Township for review and approval prior to beginning construction:
    - A Simplified Stormwater Management Site Plan (i.e. sketch plan) and accompanying Worksheet; and
    - A completed, signed and notarized "Simplified Approach - Stormwater Operation & Maintenance (O&M) and Project Improvement Agreement".
- The first 1-inch of rainfall runoff from Proposed Impervious Surfaces must be captured and infiltrated on the applicant's property.
- The Township Solicitor will record the "Simplified Approach - Stormwater Operation & Maintenance (O&M) and Project Improvement Agreement", at the expense of the owner, at the Montgomery County Office of the Recorder of Deeds after approval and signature by the Township.
    - A final inspection may be conducted by the Township after completion of construction.

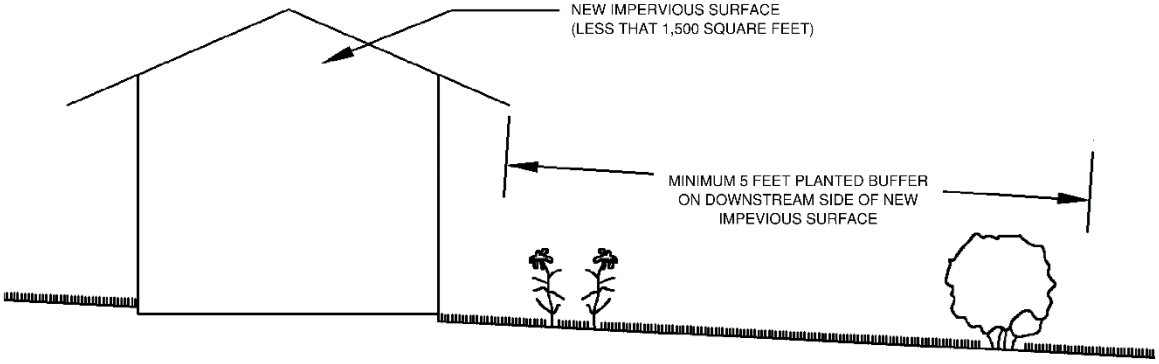
§247 - APPENDIX C.2
Simplified Approach to Stormwater Management for Small Projects

C.2.a For New Impervious Areas less than 1,500 Square Feet.

C.2.a.(1) Buffer Strip

Provide buffer areas on the downstream side of any new impervious surfaces (e.g. patios, decks, sheds) where the runoff discharges in a sheet flow manner (e.g. roof leaders or other pipes are not part of the new construction). The buffer areas should be at least 5 feet wide and the downhill slope shall not be greater than 10% (see example below on calculating slope). The buffer can be a mix of grass, shrubs, and trees. If buffer areas cannot be provided for the entire length of the impervious surfaces, install an infiltration system or combination of infiltration systems noted in this appendix and divert surface runoff from the impervious surfaces to this facility.

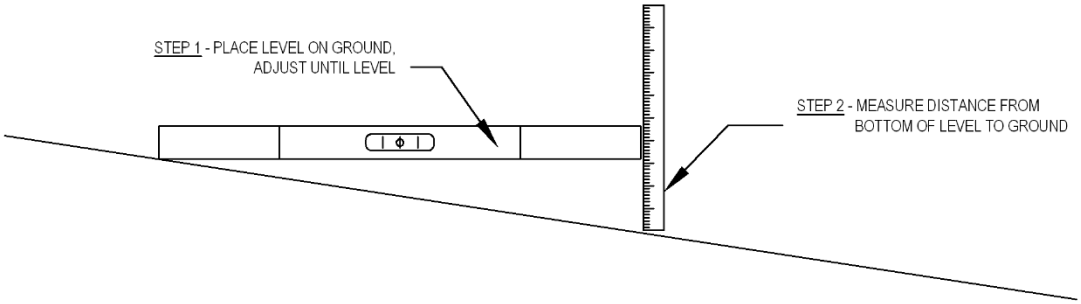
FIGURE 1
BUFFER STRIP CONFIGURATION



To measure ground slope, place a level on the ground and adjust until level. Next measure the distance from the bottom of the level to the ground. The slope is found by the following equation:

Slope (%) = 100 * (Distance from bottom of level to ground / Length of level)

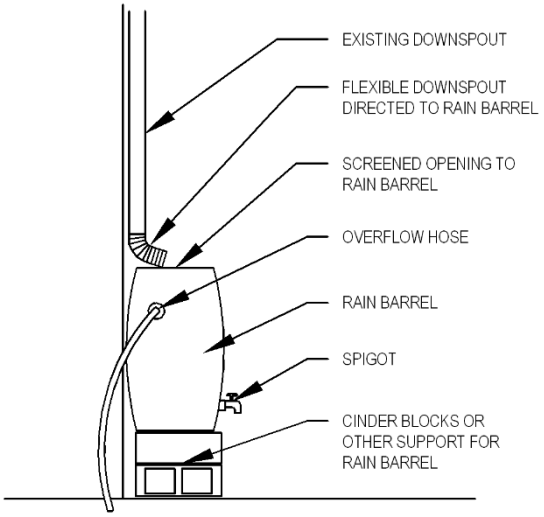
FIGURE 2
MEASURING GROUND SLOPE



C.2.a.(2) Rain Barrels

Rain Barrels and similar devices have been used for centuries to capture storm water from the roofs of buildings, and in many parts of the world these systems serve as a primary water supply source. The reuse of stormwater for potable needs is not advised without water treatment. These systems can reduce potable water needs for uses such as irrigation while also reducing stormwater discharges. Although Rain Barrels do not store large volumes of water, they can be used to control stormwater from very small areas or as a supplement to other management practices discussed in this appendix.

FIGURE 6
TYPICAL RAIN BARREL CONFIGURATION



Example Sizing:

STEP 1 – Determine Area of Total New Impervious Surfaces (A)

STEP 2 – Determine Required Recharge (Infiltration) Volume (Rev)

Infiltrate 1 inch of rainfall per square foot of impervious area
Rev (cubic feet) = 1.0 (inch) * A (square feet) / 12 (inches/foot)

STEP 3 – Sizing of Select Infiltration Method

(Rev) / (0.5) = (Depth) x (Width) x (Length)
Note: Rev is divided by 0.5 as a safety factor to account for the fact that the Rain Barrel may not be empty at the start of a storm event

Example:

STEP 1 – Determine Area of Total New Impervious Surfaces

Suppose total impervious surfaces = 40 square feet

STEP 2 – Determine Required Recharge (Infiltration) Volume (Rev)

Rev (cubic feet) = 1.0 (inch) * A (square feet) / 12 (inches/foot)
Rev = (1.0 inch) * (40 square feet) / (12 inches/foot)
Rev = 3.3 cubic feet

STEP 3 – Sizing of Select Infiltration Method

(3.3 cubic feet) / (0.5) = (Barrel Volume)
Barrel Volume = 6.6 cubic feet = 49.4 gallons (possibly a 55 gallon drum)

Maintenance Issues:

Properly designed and installed Rain Barrels require some regular maintenance to function properly.

- Flush barrels to remove sediment. Brush the inside surfaces and thoroughly disinfect the barrel with a bio-degradable eco-friendly disinfectant.
- Winter concern: Do not allow water to freeze in devices. (Empty out before water freezes.)

C.2.b. For New Impervious Areas 1500 square feet to 3000 Square Feet

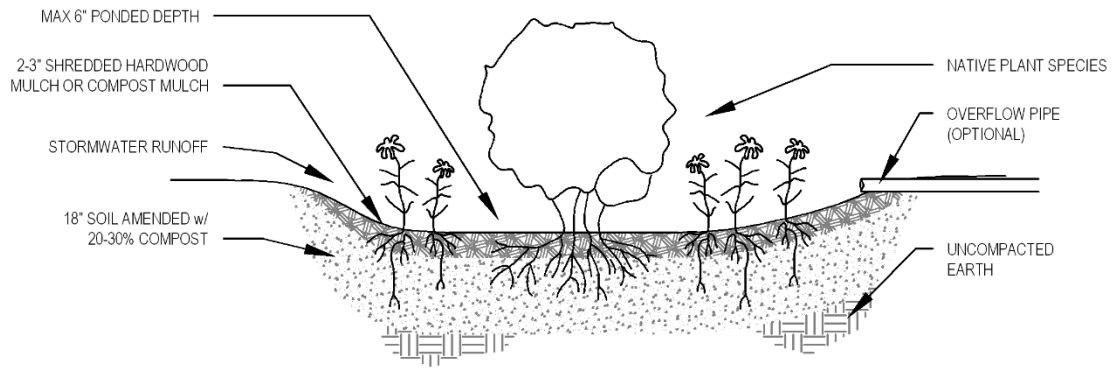
Choose an infiltration system or combination of infiltration systems noted in this appendix and divert surface runoff from the impervious surfaces to this facility. It is noted that any infiltration facility shall be no less than 10-ft from a building or property line.

C.2.b.(1) Rain Gardens

Rain Gardens, also referred to as bioretention, are a method of treating relatively small volumes of stormwater by allowing water to pond in a surface depression. Native species are planted within the depression to improve water quality as well as aesthetics. Water quality improvements are achieved through filtration and settling of particles through a layer of mulch and through infiltration into the surrounding soil. Plant life also contributes to pollutant uptake and improvement of water quality. Construction of a rain garden should be performed after all other areas of the site are stabilized to avoid clogging. During construction, compaction of the subgrade soil should be avoided, and construction should be performed with only light machinery. Additional resources on rain gardens can be found online:

www.raingardens.org/docs/rain_garden_factsheet.pdf
http://www.dnr.state.wi.us/org/water/wm/dsfm/shore/documents/rgmanual.pdf
http://www.dof.virginia.gov/mgt/resources/pub-Rain-Garden-Tech-Guide_2008-05.pdf

FIGURE X.3
TYPICAL RAIN GARDEN CONFIGURATION



Example Sizing:

STEP 1 – Determine Area of Total New Impervious Surfaces (A)

STEP 2 – Determine Required Recharge (Infiltration) Volume (Rev)

Infiltrate 1 inch of rainfall per square foot of impervious area
Rev (cubic feet) = 1.0 (inch) * A (square feet) / 12 (inches/foot)

STEP 3 – Sizing of Select Infiltration Method

(Rev) = (Depth) x (Width) x (Length)

Example:

STEP 1 – Determine Area of Total New Impervious Surfaces

Suppose total impervious surfaces = 1500 square feet

STEP 2 – Determine Required Recharge (Infiltration) Volume (Rev)

Rev (cubic feet) = 1.0 (inch) * A (square feet) / 12 (inches/foot)
Rev = (1.0 inch) * (1500 square feet) / (12 inches/foot)
Rev = 125 cubic feet

STEP 3 – Sizing of Select Infiltration Method

Suppose a ponded depth of 0.5 feet (maximum ponded depth) is desired
(Rev) = (Depth) x (Width) x (Length)
(125 cubic feet) = (0.5 ft) x (Width) x (Length)
(Width) x (Length) = Surface Area = 250 square feet (possibly 10 feet x 25 feet)

Construction Issues:

Several issues should be addressed during construction of this practice to ensure proper function.

- A percolation test should be performed prior to construction to determine the suitability of the site for infiltration. Percolation test instructions can be found at the end of this appendix.
- Do not allow sediment to wash back into the bed during construction. This can clog the bottom layer and limit infiltration capacity.
- Avoid compaction of the bottom. This can limit the infiltration capacity.
- An overflow pipe can be used to direct excess water to a particular location. If an overflow pipe is used, it should be placed at the top of the depression, such that water is still allowed to pond.
- Plants used in the rain garden should be tolerant of both wet and dry conditions, as well as be suitable for your light and soil conditions. Plant selection guidance can be found in the internet links listed above.

Maintenance Issues:

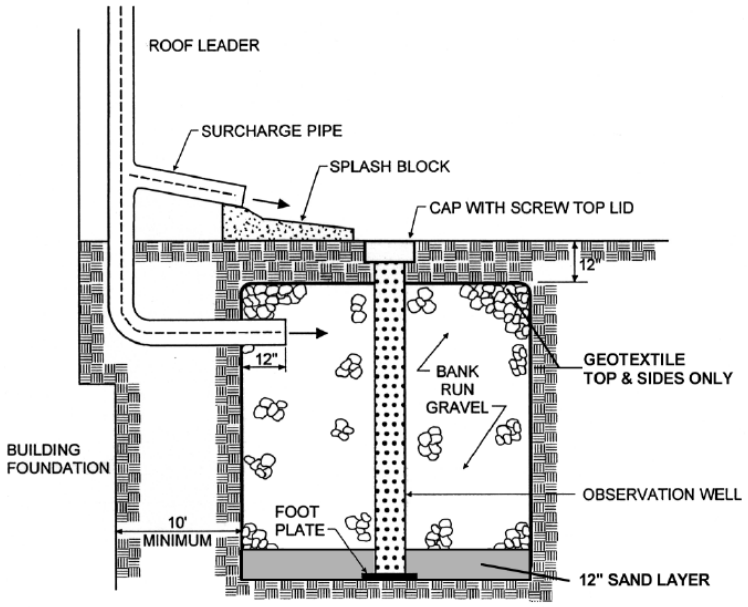
Properly designed and installed Rain Gardens require some regular maintenance.
While vegetation is being established, watering, pruning, and weeding may be required.

- Dead plant material may also need to be removed every year. Perennial plantings may be cut down at the end of the growing season.
- Mulch should be re-spread when erosion is evident and be replenished as needed. Once every 2 to 3 years the entire area may require mulch replacement.
- Rain Gardens should be inspected at least two times per year for sediment buildup, erosion, vegetative conditions, or any other conditions that negatively impact the functionality of the system.
- During periods of extended drought, Rain Gardens may require watering.
- Trees and shrubs should be inspected twice per year to evaluate health.

C.2.b.(2) Dry Wells

Dry wells are effective methods of infiltrating runoff from roof leaders. These facilities should be located a minimum of ten (10) feet from the building foundation to avoid seepage problems. A dry well can be either a structural prefabricated chamber or an excavated pit filled with aggregate. Construction of a dry well should be performed after all other areas of the site are stabilized to avoid clogging. During construction, compaction of the subgrade soil should be avoided, and construction should be performed with only light machinery. Depth of dry wells in excess of three and one half (3 ½) feet should be avoided. Gravel fill should be an average one and one half to three (1.5 – 3.0) inches in diameter.

FIGURE H.3.b
TYPICAL DRY WELL CONFIGURATION



Source: Maryland Stormwater Design Manual

Note: Acceptable geotextiles include Mirafi 140N, Amoco 4547, Geotex 451 or approved equal. Bank run gravel should be 1.5" to 2.5" in diameter (AASHTO #2 stone is preferable).

Example Sizing:

STEP 1 – Determine Area of Total New Impervious Surfaces (A)

STEP 2 – Determine Required Recharge (Infiltration) Volume (Rev)

Infiltrate 1 inch of rainfall per square foot of impervious area
Rev (cubic feet) = 1.0 (inch) * A (square feet) / 12 (inches/foot)

STEP 3 – Sizing of Select Infiltration Method

(Rev) / (0.4) = (Depth) x (Width) x (Length)
Note: Rev is divided by 0.4 to account for the void space in the stone bed

Example:

STEP 1 – Determine Area of Total New Impervious Surfaces

Suppose total impervious surfaces = 1500 square feet

STEP 2 – Determine Required Recharge (Infiltration) Volume (Rev)

Rev (cubic feet) = 1.0 (inch) * A (square feet) / 12 (inches/foot)
Rev = (1.0 inch) * (1500 square feet) / (12 inches/foot)
Rev = 125 cubic feet

STEP 3 – Sizing of Select Infiltration Method

Suppose a bed depth of 3 feet is desired
(Rev) / (0.4) = (Depth) x (Width) x (Length)
(125 cubic feet) / (0.4) = (3 feet) x (Width) x (Length)
(Width) x (Length) = Surface Area = 105 square feet (possibly 15 feet x 7 feet)

Construction Issues:

Several issues should be addressed during construction of this practice to ensure proper function.

- A percolation test should be performed prior to construction to determine the suitability of the site for infiltration. Percolation test instructions can be found at the end of this appendix.
- Do not allow sediment to wash back into the bed during construction. This can clog the bottom layer and limit infiltration capacity.
- Avoid compaction of the bottom. This can limit the infiltration capacity.
- Observation well should be constructed of perforated pipe such that the level of water in the well is the same as the level of water in the bed.
- Geotextile should overlap a minimum of 16 inches at seams.

Maintenance Issues:

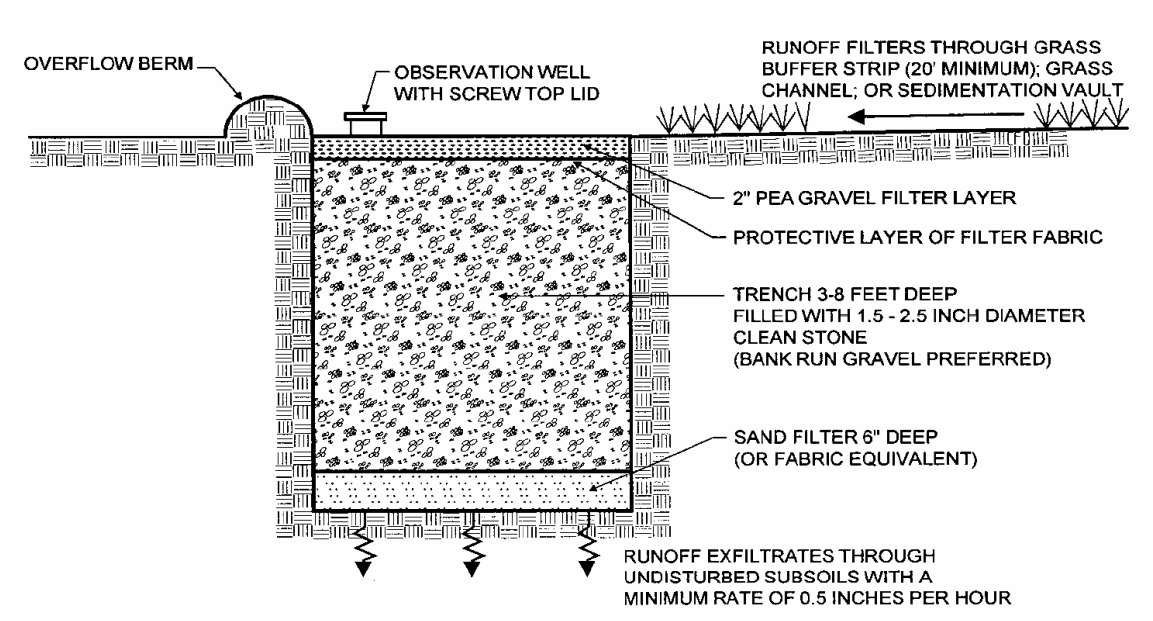
As with all infiltration practices, Dry Wells require regular and effective maintenance to ensure prolonged functioning. The following represent minimum maintenance requirements for Dry Wells:

- Inspect Dry Wells at least four times a year, as well as after every storm exceeding 1 inch.
- Dispose of sediment, debris/trash, and any other waste material removed from a Dry Well at suitable disposal/recycling sites and in compliance with local, state, and federal waste regulations.
- Evaluate the drain-down time of the Dry Well to ensure the maximum time of 72 hours is not being exceeded. If drain-down times are exceeding the maximum, drain the Dry Well via pumping and clean out perforated piping, if included. If slow drainage persists, the system may need replacing.
- Regularly clean out gutters and ensure proper connections to facilitate the effectiveness of the dry well.
- Replace filter screen that intercepts roof runoff as necessary.
- If an intermediate sump box exists, clean it out at least once per year.

C.2.b.(3) Infiltration Trenches

An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. Runoff is stored in the void space between the stones and infiltrates through the bottom and into the soil matrix. Infiltration trenches perform well for removal of fine sediment and associated pollutants. Pretreatment using buffer strips, swales, or detention basins is important for limiting amounts of coarse sediment entering the trench which can clog and render the trench ineffective. Construction of an infiltration trench should be performed after all other areas of the site are stabilized to avoid clogging. During construction, compaction of the subgrade soil should be avoided, and construction should be performed with only light machinery.

FIGURE 5
TYPICAL INFILTRATION TRENCH CONFIGURATION



Source: Maryland Stormwater Design Manual

Note: Acceptable filter fabrics include Mirafi 140N, Amoco 4547, Geotex 451 or approved equal. Clean stone should be AASHTO #2 stone.

Example Sizing:

STEP 1 – Determine Area of Total New Impervious Surfaces (A)

STEP 2 – Determine Required Recharge (Infiltration) Volume (Rev)

Infiltrate 1 inch of rainfall per square foot of impervious area
Rev (cubic feet) = 1.0 (inch) * A (square feet) / 12 (inches/foot)

STEP 3 – Sizing of Select Infiltration Method

(Rev) / (0.4) = (Depth) x (Width) x (Length)
Note: Rev is divided by 0.4 to account for the void space in the stone bed

Example:

STEP 1 – Determine Area of Total New Impervious Surfaces

Suppose total impervious surfaces = 2500 square feet

STEP 2 – Determine Required Recharge (Infiltration) Volume (Rev)

Rev (cubic feet) = 1.0 (inch) * A (square feet) / 12 (inches/foot)
Rev = (1.0 inch) * (2500 square feet) / (12 inches/foot)
Rev = 208.3 cubic feet

STEP 3 – Sizing of Select Infiltration Method

Suppose a bed depth of 3 feet is desired
(Rev) / (0.4) = (Depth) x (Width) x (Length)
(208.3 cubic feet) / (0.4) = (3 feet) x (Width) x (Length)
(Width) x (Length) = Surface Area = 173.6 square feet (possibly 34 feet x 5 feet)

Construction Issues:

Several issues should be addressed during construction of this practice to ensure proper function.

- A percolation test should be performed prior to construction to determine the suitability of the site for infiltration. Percolation test instructions can be found at the end of this appendix.
- Do not allow sediment to wash back into the bed during construction. This can clog the bottom layer and limit infiltration capacity.
- Avoid compaction of the bottom. This can limit the infiltration capacity.
- Observation well should be constructed of perforated pipe such that the level of water in the well is the same as the level of water in the bed.
- Filter fabric should overlap a minimum of 16 inches at seams.

Maintenance Issues:

As with all infiltration practices, Infiltration Trenches require regular and effective maintenance to ensure prolonged functioning. The following represent minimum maintenance requirements for Infiltration Trenches:

- Filter layer should be inspected and cleaned at least 2 times per year.

Percolation Test Procedure

The following procedure will aid in determining the infiltration rate of the soil at a proposed infiltration practice. The infiltration rate determines how quickly water will drain from the infiltration practice. It is not recommended that infiltration practices be constructed in soils with an infiltration rate less than 0.1 inches/hour.

1. Dig a hole 6 inches in diameter and 8 inches deep at the location of the proposed infiltration practice.

2. Fill the hole with water to a depth of 6 inches, wait 30 minutes.

3. Refill the hole to a depth of 6 inches, wait 30 minutes.

4. If the hole is empty use a time interval of 10 minutes for the following steps. If the hole still has water in it, use a time interval of 30 minutes for the following steps.

5. Refill the hole to a depth of 6 inches.

6. Every time interval (either 10 minutes or 30 minutes, see step 4) record the distance the water level drops. Refill the hole to a depth of 6 inches each time.

7. Continue taking readings until you reach 8 readings or until the readings stabilize (whichever comes first). The readings have stabilized when there is a difference of ¼ inch or less of drop between the highest and lowest readings of 4 consecutive readings.

8. The percolation rate is the final reading taken.

9. Determine the reduction factor from your final reading.

Final Reading	Reduction Factor
0 – 0.2 in/hr	3.0
0.2 – 1.5 in/hr	2.9
> 1.6 in/hr	2.6

10. Determine the infiltration rate.

Infiltration Rate (in/hr) = Percolation Rate (in/hr) / Reduction Factor