Artificial Drainage of Illinois Septic Field Areas
Illinois Soil Classifiers Association Interim Guidance
July, 2014

PURPOSE

Artificial drainage of septic field areas lowers the level and frequency of saturated conditions in and near effluent discharge lines. Drainage can help achieve separation distances between effluent discharge lines and the seasonal high water table (SHWT) required by the Illinois Department of Public Health's *Private Sewage Disposal Code* (Sewage Code). Existing research on this topic is limited, so this guide has largely been compiled from existing standards in County ordinances and surrounding states.

BACKGROUND INFORMATION

Prior to determining whether artificial drainage is necessary, documentation of site conditions and preliminary septic system design is required. Site documentation should include a soil evaluation report, topographic data, property boundaries, well locations, and any unique site limitations. The soil evaluation report must contain SHWT depths, soil loading rates, and locations of limiting layers within the soil profiles examined. Proposed depth of effluent lines, configuration and extent of these lines, and whether aerobic pretreatment will be utilized are some of the items needed from the septic design.

DEFINITIONS

Seasonal High Water Table means the highest level to which the soil is saturated, as determined by direct observation or as may be estimated by a Soil Classifier.

Limiting Layer means a horizon or condition in the soil profile or underlying strata that includes an estimated high water table, whether perched or regional; masses of loose rock fragments, including gravel, with insufficient fine soil to fill the voids between the fragments; and rock formation, other stratum or soil condition that is so slowly permeable that it effectively limits downward passage of effluent.

Depth to Restrictive Permeability is the average depth to a soil horizon or bedrock that has a 0.00 soil loading rate or a rating of NR (not recommended) as shown by the soil evaluation report.

Perimeter Drain is a perforated drain tile that encircles the septic field and outlets down slope through a non-perforated tile (Fig. 1a).

Segment Drain is an extension of an interceptor or perimeter drain that extends between sections of a split septic field (Fig. 1b). Segment drains supplement drainage efficiency in large septic fields or where soil permeability is moderately slow (Soil Design Groups IX, X, and XI).

Interceptor Drain is a drain tile located upslope from the septic field, and consists of a perforated tile extending beyond the septic field width and then outlets through a non-perforated tile that runs down slope on one side of the septic field (Fig. 2).

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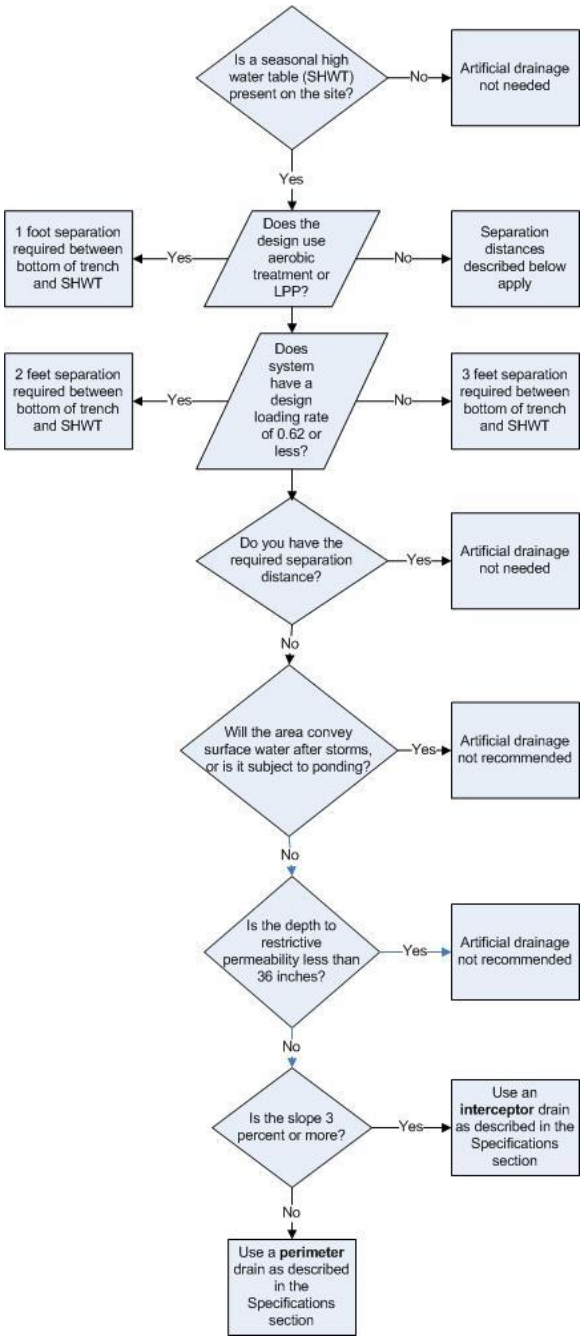
DESIGN PROCESS

The following column contains a flowchart guiding the user through the initial part of the design process. Some knowledge of septic system design parameters is assumed of the user, primarily extracting data from the soil evaluation report and the ability to assign the proper soil loading rate for the septic design chosen as defined by the Sewage Code.

Please note where the term "convey surface water" is used in the flowchart, it refers to areas where concentrated flow of surface water occurs after rain events or snow melt. The term "subject to ponding" refers to very poorly drained soils. Drainage may be used as a supplement on systems placed in Design Group IX, X, and XI soils, but drainage must utilize segment drains with the intervals described below in the Tile Placement Requirements section. Drainage of soils in Design Group XII is not recommended due to the limited permeability of these soils.

Advancing through the flowchart, the user should be able to determine that drainage of the septic field area is not needed, not recommended, effective with an interceptor drain, or effective with a perimeter drain.



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SPECIFICATIONS

General Requirements

1. The minimum size and grade of drain tile used should be 4-inch single-wall corrugated, perforated HDPE pipe conforming to ASTM F405. Non-perforated tile conforming to the same standards should be the minimum used for outlet tiles.
2. Well-graded pit run gravel with less than 5 percent fines passing the #200 sieve and no aggregate more than 1.5 inches in diameter should be used for gravel backfill around the drainage tile. Ideal material will contain a mixture of medium and coarse sand with fine and medium gravel. Crushed limestone is less desirable but can be substituted if the aggregate is washed.
3. Polystyrene drainage bundles such as EZ Flow or similar synthetic products may be used in lieu of gravel and tile provided their drainage capability equals or exceeds that of gravel.
4. Drainage tile installed in soils with predominant textures of fine sand (fs), very fine sand (vfs), loamy fine sand (lfs), loamy very fine sand (lvfs), very fine sandy loam (vfsl), or silt (si) as shown by the soil evaluation report should be wrapped in geotextile fabric to minimize siltation within the tile. Fabric should have an effective opening size between 0.2 and 0.85 millimeters.
5. The drain tile outlet should be metal or PVC a minimum of 2 feet in length that is equipped with a rodent guard.
6. Gravity discharge from the outlet is strongly preferred, and the outlet pipe should be placed to encourage free flow of water in all seasons.
7. If a gravity-flow outlet cannot be achieved, the drain should flow into a vault of sufficient size to maximize the life of the sump pump or equivalent removing and discharging water from the vault. Commercially available sewage basin assemblies equipped with 2-inch ejector pumps, or other methods meeting pump requirements of the State Code, are suitable. Pump discharge must be located downslope from the septic field, and initially flow into a gravel or stone receiving area to prevent erosion.
8. Discharge from gravity or pumped drains must not create wetness or erosion problems for adjacent property owners.
9. Any existing drainage tiles encountered in the proposed septic area during construction should be rerouted around the area.
10. Effluent lines should be placed as shallow as practicable when a SHWT is present to minimize possible interaction with groundwater.

Tile Placement Requirements

1. Drain tile trench should have a minimum width of 8 inches.

2. A minimum of 3 inches of gravel should be placed in trench bottom prior to installation of drainage tile.
3. Outlet tiles do not require gravel, and can be backfilled with native material.
4. Drainage tile should be placed so that no sags occur that may impede drainage. Minimum slope on drain tile is 0.2 foot per 100 feet of run (0.2%).
5. Buried, open ends of drainage tile should be capped to prevent siltation within tile.
6. The center of all tiles in drainage system shall be placed a minimum of ten feet from the center of any septic field lines.
7. If the shallowest depth to restrictive permeability is 36 to 42 inches below the surface, the drain tile trench bottom should extend 6 inches into the restricted permeability zone. In these instances, septic lines must lie at-grade or within 12 inches of the surface. If the shallowest depth to restrictive permeability is 42 inches or more, the drain tile trench bottom should extend 6 inches into the restricted permeability zone or lie 3 feet below the bottom of the deepest septic field trench, whichever is shallower.
8. Drain tiles installed parallel to effluent lines should not lie more than 50 feet apart in soils with design loading rates in Design Groups IX or X, or 30 feet apart in Design Group XI. Segment drains may be used to achieve proper intervals (Fig. 1b). Drain tile interval should not exceed 65 feet for soils in Design Groups II-VIII.

Perimeter/Segment Drain Requirements

1. Drain tile trench should be backfilled with gravel or equivalent to a depth at least 6 inches above the shallowest SHWT depth shown by the soil evaluation report. The remainder of the trench may be backfilled with native material. Backfilling with gravel or equivalent to within 6 inches of the soil surface and capping with topsoil to final grade is recommended for soils in Design Groups IX, X, and XI.
2. Segment drains may be used in conjunction with both perimeter and interceptor drains. Ten-foot setbacks to septic field lines must be observed with segment drains.
3. Since local conditions and unique site characteristics vary considerably, final perimeter drain design should be left to the discretion of local Health Departments.

Interceptor Drain Requirements

1. Center of drain tile should lie a minimum of 10 and a maximum of 15 feet upslope from the center of the nearest effluent line.
2. Drain tile trench should be backfilled with gravel or equivalent to within 6 inches of the surface and capped with topsoil to final grade.

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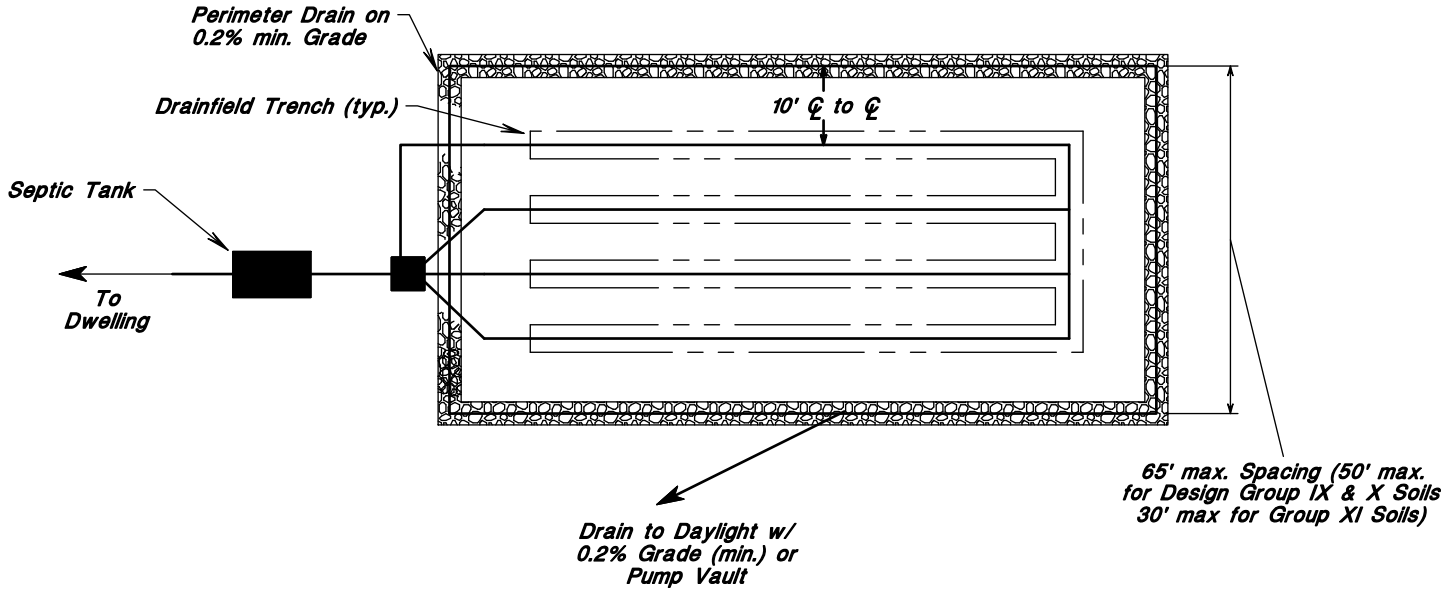
Perimeter Drain
Plan View (NTS)

Note: Divert all sources of runoff from eavespouts, concrete areas, patios, etc. or other concentrated flows away from the drainfield area.



Perimeter Drain
Cross Section (NTS)

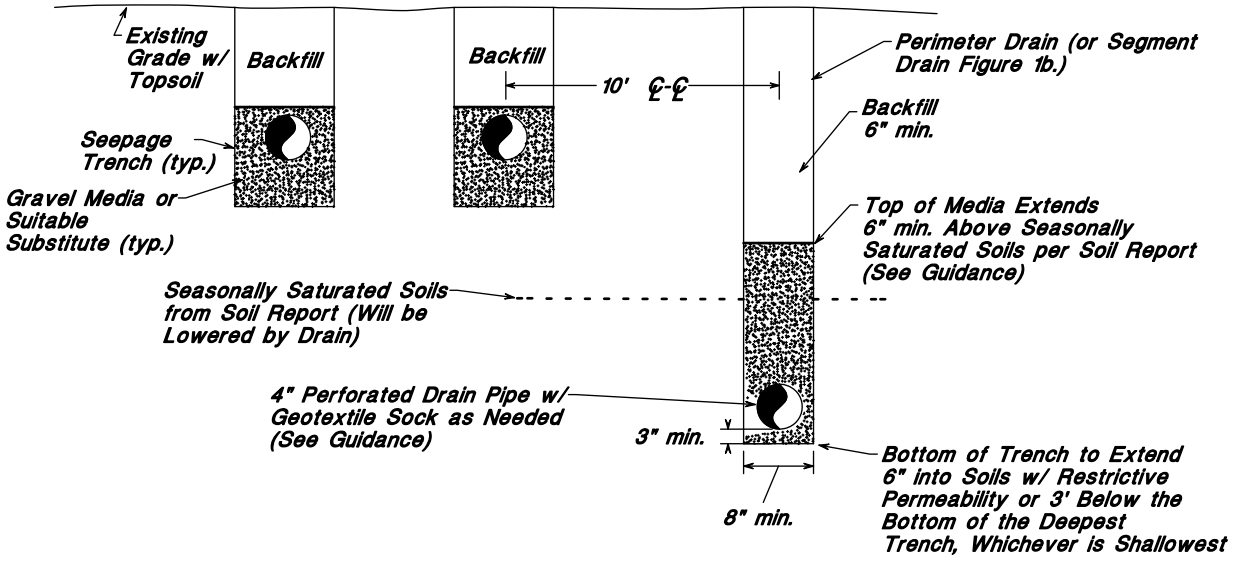


Figure 1a.
Perimeter Drains
For Wastewater Treatment and Disposal

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Perimeter Drain with Segment Drain
Plan View (NTS)

Note: Divert all sources of runoff from eavespouts, concrete areas, patios, etc. or other concentrated flows away from the drainfield area.

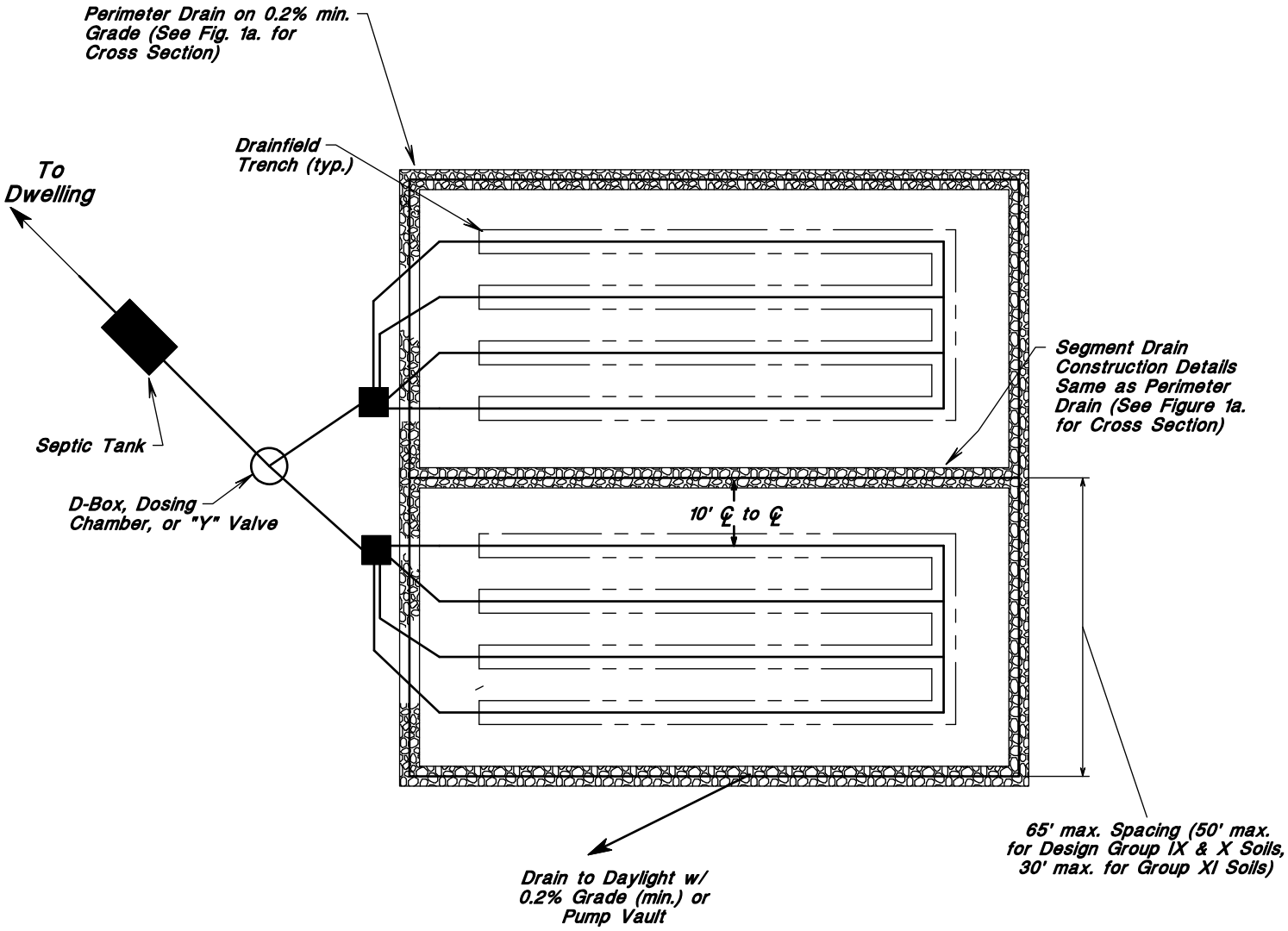

Figure 1b.
Perimeter and Segment Drains For Wastewater Treatment and Disposal

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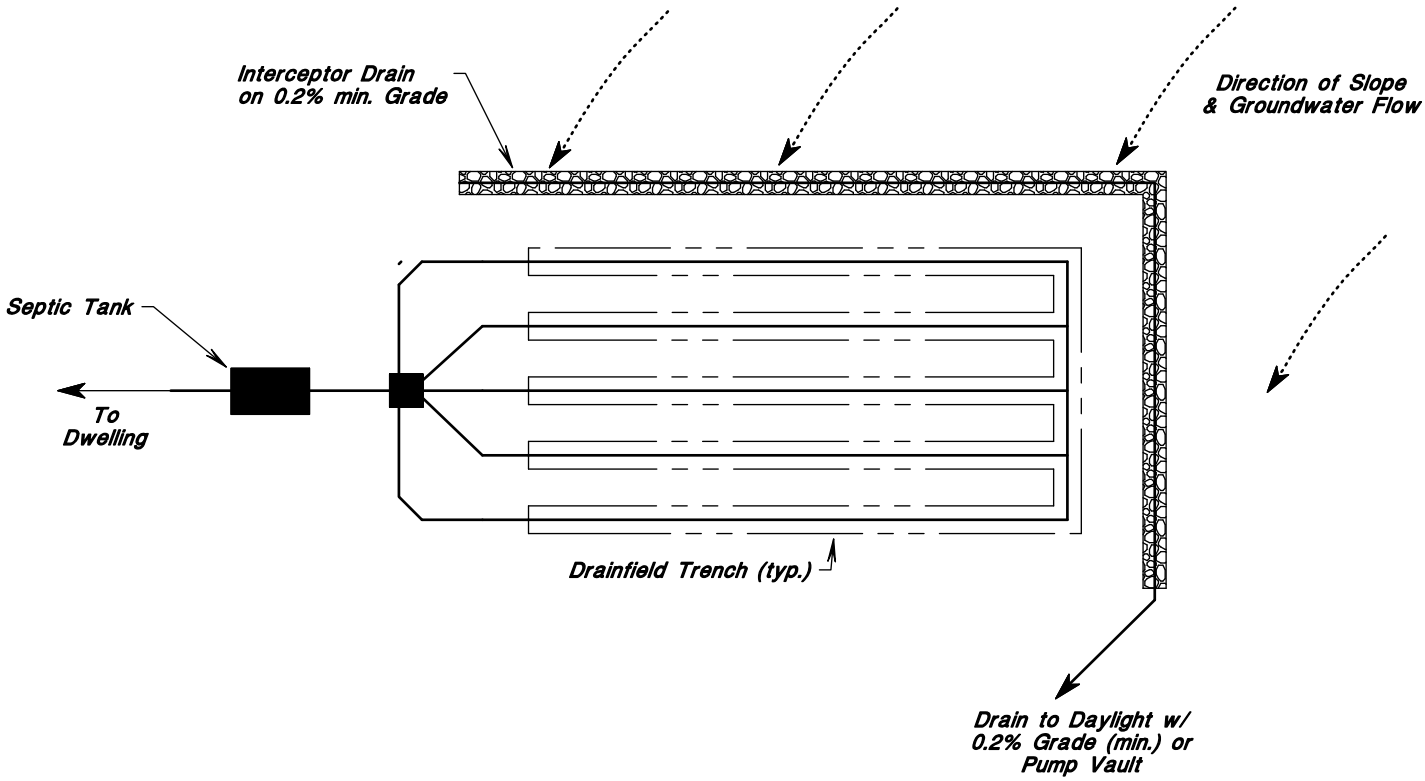
Interceptor Drain Plan View (NTS)

Note: Divert all sources of runoff from eavespouts, concrete areas, patios, etc. or other concentrated flows away from the drainfield area.



Interceptor Drain Cross Section (NTS)

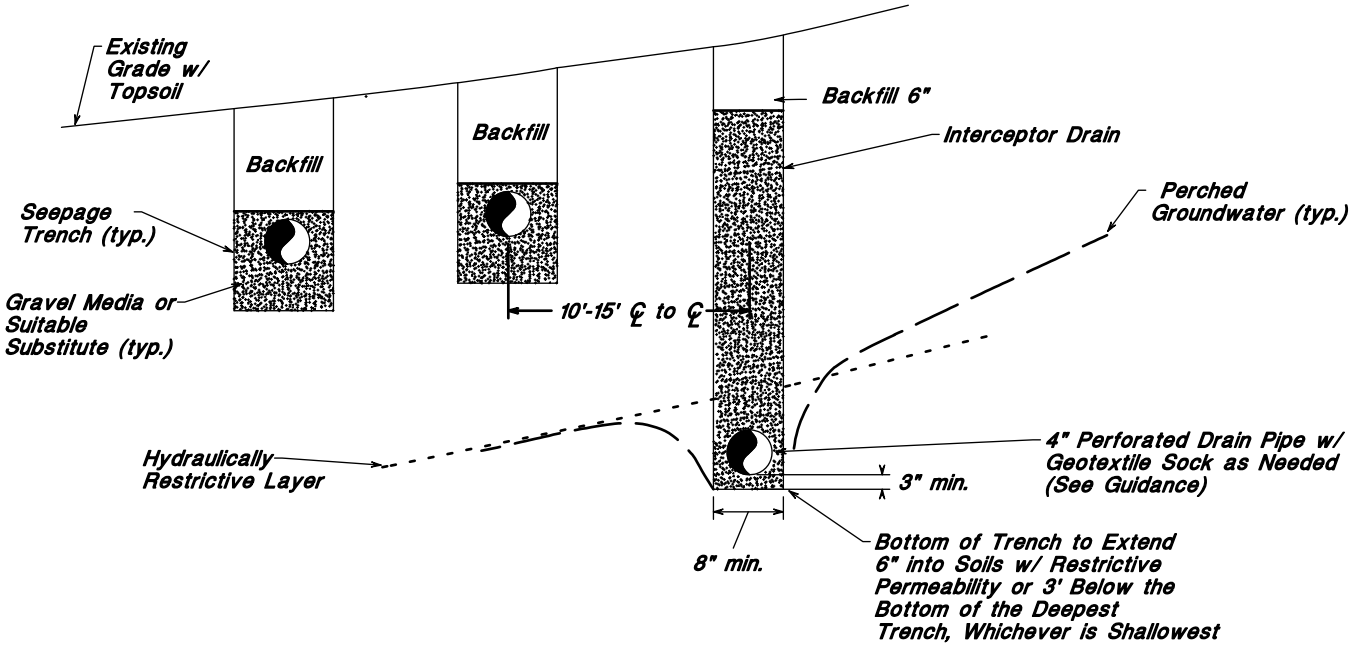


Figure 2.
Interceptor Drain
For Wastewater Treatment and
Disposal on Sloping Sites with
Perched Groundwater
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