

Soakage Trench

<u>Stormwater Management Goals Achieved</u>	<u>Acceptable Sizing Methodologies</u>
Pollution Reduction.....	NA ¹
√ Flow Control.....	PRES
√ Destination.....	PRES

This facility is classified as an Underground Injection Control structure (UIC).

SIM=Simplified Approach, PRES= Presumptive Approach, PERF= Performance Approach

Notes: 1) Soakage trenches can be used to manage stormwater runoff and, with a minimum 18-inch layer of sand for filtration, may be used to meet some pollution reduction requirements.

A soakage or “infiltration” trench is a shallow trench in permeable soil that is backfilled with sand and coarse stone and lined with filter fabric. The trench surface may be covered with grating, stone, sand, or a grassed cover with a surface inlet.

Soakage trenches can be used to provide a stormwater destination by collecting and recharging stormwater runoff into the ground. The use of soakage trenches is highly dependent on soil type and height of the groundwater table.

Note: DEQ has identified soakage trenches as "Class V Injection Wells" under the federal Underground Injection Control (UIC) Program. These facilities must be classified as exempt, authorized by rule, or authorized by permit by DEQ. Since the UIC Program states that these types of wells can have a direct impact on groundwater, pollution reduction is required before disposing stormwater into them. All soakage trenches must be registered with DEQ. Designers shall design all underground injection systems to quality for DEQ Rule Authorization.

More information about the UIC Program can be found in **Section 1.4.4** or at DEQ's website at: [Http://www.deq.state.or.us/wq/groundwa/uichome.htm](http://www.deq.state.or.us/wq/groundwa/uichome.htm)

For technical questions call DEQ- UIC Program at 503-229-5945. City staff will file all registration forms with DEQ.

Soakage trenches are recognized as a stormwater destination and, with a minimum 18-inch layer of sand for filtration, may be used to meet pollution reduction requirements as described below.

- 1) **Soakage trenches used only for destination shall meet the following requirements:**

Soakage Trench

- a) **Residential roof area (only) runoff** requires neither the sand layer nor pre-treatment.
 - b) **Residential runoff from pavements** requires the sand layer but do not require pre-treatment.
 - c) **Commercial roof area (only) runoff** requires neither the sand layer nor pre-treatment
 - d) **Commercial runoff from pavements** require both the sand layer and pre-treatment.
- 2) **Soakage trenches designed to meet pollution reduction standards shall meet the following requirements:**
- a) **Residential roof area (only) runoff** requires the sand layer but does not require pre-treatment.
 - b) **Residential runoff from pavements** requires the sand layer but do not require pre-treatment.
 - c) **Commercial roof area (only) runoff** requires the sand layer but does not require pre-treatment.
 - d) **Commercial runoff from pavements** requires both the sand layer and pre-treatment.

Soakage Trench Design and Sizing Method

Soil conditions are critical to the success of soakage trenches. Because of this, the use of soakage trenches must be pre-approved by the City. Supporting geotechnical evidence and a documented infiltration test will be required to demonstrate that soakage trenches will work in the project area. Soakage trenches shall be sized in accordance with **the Presumptive Approach**, once City approval has been given for on-site infiltration.

General Requirements:

Maximum area to be served:	15,000 square-feet per trench
Soils requirements: (NRCS classification)	A or B; C soils may be approved if drawdown times are met
Maximum ground slopes	20 percent
Soil test requirement	ASTM D 3385-88 or City approved methodology

- (1) If designed as the only stormwater destination, the soakage trench shall infiltrate the entire flood control design storm without overflow.
- (2) Soakage trenches shall not be accepted in soils with a tested infiltration rate of less than 0.5 inches per hour.

Soakage Trench

Public Facilities:

- (3) Public underground injection systems are approved as a temporary solution to stormwater management in areas having no piped system available within 500 feet. The designer shall prepare a long range stormwater management plan and construct the necessary facilities for future connections.
- (4) Public facilities require utility concurrences prior to final plan approval.
- (5) Clear notes and/or graphics shall be provided in the construction plans stating the dimensions and locations for each facility.
- (6) Public facilities within rights of way shall be constructed a minimum of 36 inches below the ground surface.
- (7) Stormwater shall be directed through an approved sedimentation or pollution control manhole before entering the injection facility.
- (8) A standard cleanout or manhole is required at the end of each run of an injection facility.
- (9) Public utility easements adjacent to public facilities in rights of way shall be increased to 9 feet instead of the standard 7 feet.

Location:

- (10) All trenches shall be constructed on native soil and shall not be subject to vehicular traffic and construction activities that will compact the soil, thus reducing permeability, prior to constructing the facility.
- (11) There shall be no less than 4 feet of depth of filtration medium and/or undisturbed soil between the bottom of the facility's drain rock layer and any impervious layer (hardpan, solid rock, etc.) or seasonal high groundwater level.
- (12) Soakage trenches shall not be located near slopes of 20% or greater without geotechnical evidence the facility will not cause slope failures.
- (13) Soakage trench areas shall be clearly marked before site work begins to avoid soil disturbance during construction.
- (14) Soakage trenches should be located down slope of structures, and are required to be setback at least 10 feet from structures and 5 feet from property lines and/or public utility lines.
- (15) Soakage trenches shall be located a minimum of 500 feet away from any domestic drinking water wells, and a minimum of 500 feet or the distance of a 2-year travel time, whichever is smaller, away from public drinking water supply wells.

Soakage Trench

Soakage Trench Sizing:

- (16) Hydraulic calculations shall be performed using either the Rational Method or a hydrograph-based method such as the Santa Barbara Urban Hydrograph (SBUH).
 - a) When using the Rational Method, the required storage capacity of the facility shall be determined by subtracting the volume of water that can exfiltrate out of the facility within the required drawdown period from the volume runoff from the contributing basin for each facility design.
 - b) When using SBUH, a 3.6 inch, 24-hour storm with NRCS type 1A rainfall distribution shall be used. The design professional may also use the NRCS TR-55, HEC-1, or SWMM.
 - c) Regardless of methodology used, the measured infiltration rate shall be the lesser of 6 inches per hour or the measured infiltration rate divided by 2.
- (17) The sand layer may be included in the sizing of the storage volume.
- (18) Drawdown time when full shall not exceed 10 hours.

Trench:

- (19) The bottom of the drain rock portion of the soakage trench shall be no less than 4 feet above the seasonal high groundwater elevation.
- (20) The bottom of the soakage trench shall be flat, or clay check-dams may be used to prevent water from collecting near the downstream end.
- (21) Special design considerations shall be given at property corners (or where utilities must make property connections). A gap in the trench design or utility sleeves going through the soakage trench shall be included in the design as needed for utility crossings.
- (22) Drain rock shall have filter fabric between the medium and native soils or backfill.
- (23) A soil scientist, or suitably trained person working under the supervision of an Oregon licensed professional engineer, shall inspect the soil after the system is excavated, before trenches are filled with drain rock, to confirm that soils remain in suitable condition to perform at anticipated infiltration rates.
- (24) At least 12" minimum of backfill shall be placed over the trench.

Drainage Rock:

- (25) Drainage rock shall be a minimum of 12" of 2 ½ inch to ¾ inch coarse aggregate.

Soakage Trench

Filter Medium (Sand):

- (26) Medium meeting OAR 340-71-295 (3)(e) will be required. Sieve analysis of the medium sand is required to be made by a qualified party and a report provided to City inspector at the time of inspection. Analysis to comply with ASTM C136, Standard Methods for Sieve Analysis of Fine and Coarse Aggregate and in conjunction and accordance with ASTM C-117, Standard Test Method for Materials Finer than No.200 Sieve in Mineral Aggregates by Washing.

Sieve #	% Passing
3/8	100%
#4	95-100%
#8	80-100%
#16	45-85%
#30	15-60%
#50	3-15%
#100	4% or less

Pipe:

- (27) The number and distribution of the holes in the dispersion pipe shall adequately allow the stormwater runoff to exit the pipe while maintaining a maximum hydraulic head elevation 6 inches below the gutter elevation. Designers using pre-fabricated perforated pipe shall follow the manufacturer's recommendations and provide a sufficient length of pipe to adequately disperse the water. All design calculations and/or manufacturer's recommendations shall be submitted with the design application.
- (28) The pipe covered with filter fabric shall be laid flat on top of the sand and parallel with the contour of the finished surface grade.
- (29) The solid pipe from the downspout or pretreatment facility to connection with perforated pipe must be installed at a minimum 0.002 foot per foot slope.
- (30) Pipe must have a minimum cover of 12" measured from top of pipe to finished grade.

Filter Fabric:

- (31) Approved drainage fabric shall be placed on the sides and top of the drainage rock.
- (32) Filter Fabric must be one of the following types/brands: LINQ 125EX; LINQ TYPAR3201; TNS E040; TNS R035; TNS R040; TNS R042; AMOCO 4535; Marafi 140NL.

Soakage Trench

Checklist of minimal information to be shown on the permit drawings:

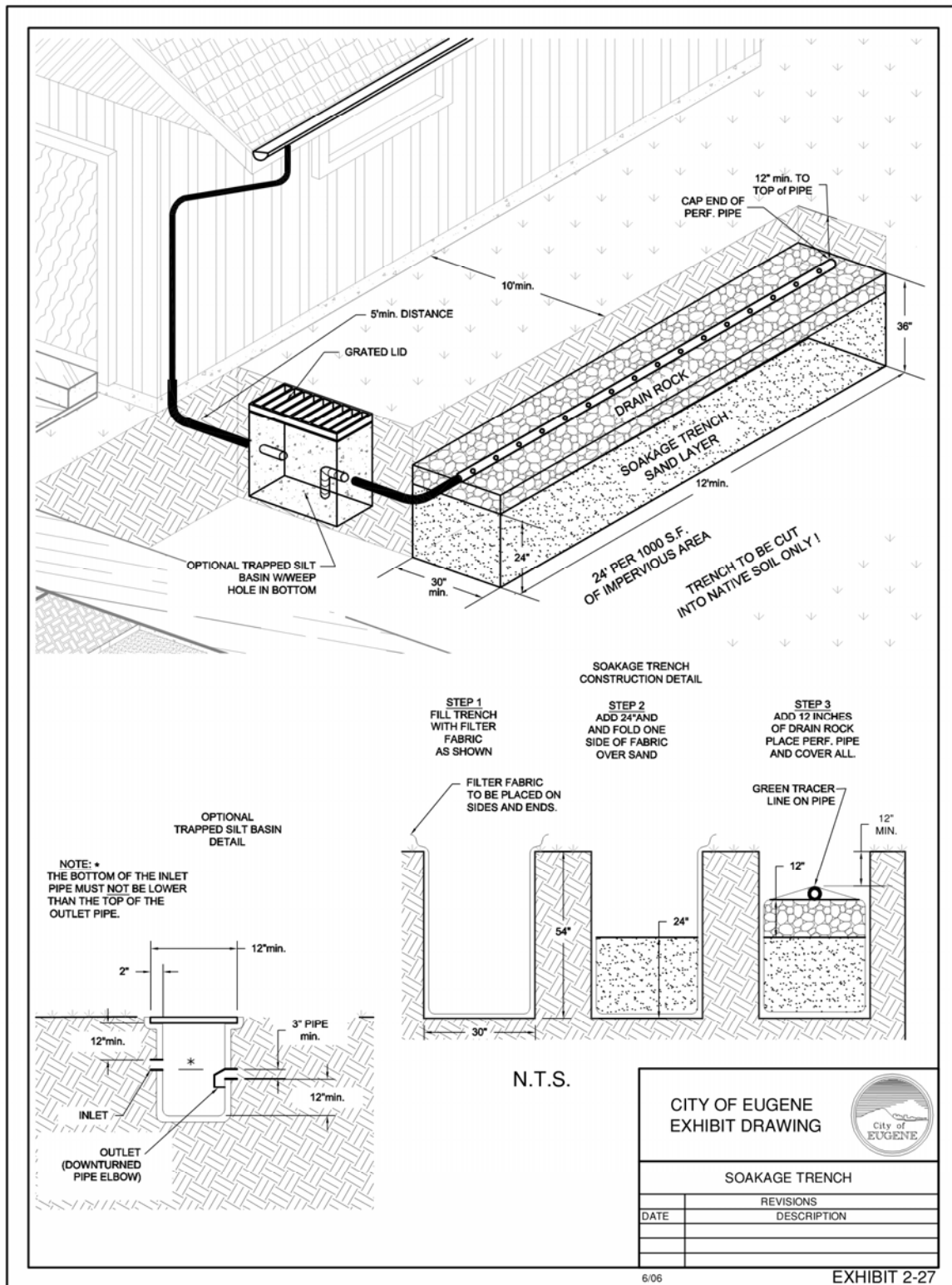
- 1) Facility dimensions and setbacks from property lines and structures
- 2) Profile view of facility, including typical cross-sections with dimensions
- 3) Drain rock specification
- 4) Sand specification
- 5) Filter fabric specification
- 6) All stormwater piping associated with the facility, including pipe materials, sizes, slopes, and invert elevations at every bend or connection.
- 7) Groundwater and bedrock elevations.
- 8) Soil units encountered.
- 9) The longitude and latitude for each facility.
- 10) The total impervious surface drained for each facility.

Inspection Requirements and Schedule:

The following table shall be used to determine which stormwater facility components require City inspection, and when the inspection shall be requested:

Facility Component	Inspection Requirement
Trench grading	
Piping	Call for inspection
Filter fabric	
Sand layer	
Drain rock	

Soakage Trench



Soakage Trench

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