6.4 Infiltration Trench

Overview

Description

Infiltration trenches are appropriate in areas with well-drained (Type A or B) native soils. An infiltration trench is a long, narrow excavation backfilled with stone aggregate and lined with filter fabric. Runoff is stored in the void space between the stones and infiltrates through the bottom and into the soil matrix.

Figure 6-27. Infiltration Trench (Source: CASQA, 2003)

Note that this section primarily applies to shallow infiltration systems (that are wider than they are deep); for systems that are deeper than they are wide (such as infiltration wells) and subsurface infiltration systems, additional requirements may apply (see Section 6.11). For both shallow and deep system guidance on infiltration, refer to Appendix E.

Infiltration trenches perform well for removal of fine sediment and associated pollutants. Pretreatment using swales, vegetated filter strips or detention basins is important for limiting amounts of coarse sediment entering the trench, which can clog and render the trench ineffective. Infiltration practices, such as infiltration trenches, remove suspended solids, particulate pollutants, coliform bacteria, organics, and some soluble forms of metals and nutrients from stormwater runoff. Pollutants are filtered out of the runoff as it infiltrates the surrounding soils. Infiltration trenches can also provide groundwater recharge and preserve base flow in nearby streams.

Best uses
- Limited space
- Adjacent to paved surfaces
- Landscape buffers

Advantages
- May increase groundwater recharge
- Achieves treatment via infiltration into existing soils
- No surface outfalls

Limitations
- Susceptible to clogging if not maintained - leading to system failure
- Infiltration of soils must exceed 0.5 in./hr.
- Cannot be used with certain site conditions (see Appendix E)

Siting

- Infiltration trenches should not be used where there are poorly draining soils, high groundwater tables, contaminated soils, fill soils, steep slopes, or in proximity to wells or septic systems.
- For strategies and examples of how to retrofit sites and parcels to include infiltration trenches, see **Sections 3.2 and 3.3 of the GI Design Guide**.
- Remember that stormwater control measures should be located in areas that can be accessible at any given time for the purpose of operation and maintenance and inspections. Infiltration trenches should not be located on inaccessible private property such as residential backyards.
- A permit may be required from San Mateo County Environmental Health if the system is more than 10 feet deep or if groundwater is encountered during excavation.[34]

Table 6-6: Recommended locations for infiltration trenches

Locations	Infiltration Trench
Parking Lot	●
Roof	
Driveway	●
Podium-level	
Close to building	
Away from Buildings	●
Underground	[33]

[33] Subsurface infiltration systems are covered in a separate section (see section 6.11)

[34] https://www.smchealth.org/gpp

Design and Sizing Guidelines

Drainage Area and Setback Considerations

- Infiltration trenches work best when the upgradient drainage area slope is less than 5 percent. The downgradient slope should be no greater than 20 percent to minimize slope failure and seepage.
- In-situ/undisturbed soils should have a low silt and clay content and have permeability greater than 0.5 inches per hour. In-situ testing is required to confirm permeability of trench site. Infiltration trenches are not recommended for use in Type C or D soils.
- A 10-foot separation between the bottom of the trench and the seasonal high groundwater level is required to prevent potential groundwater contamination.
- Trenches should also be located at least 100 feet upgradient from water supply wells.
- A setback of 18 feet from building foundations is recommended, or a 1:1 slope from the bottom of the foundation, unless a smaller setback is approved by geotechnical engineer and allowed by local standard.

Treatment Dimensions and Sizing

- The infiltration trench should be sized to store and infiltrate the water quality design volume.
- A site-specific trench depth can be calculated based on the soil permeability, aggregate void space, and the trench storage time. The stone aggregate used in the trench is normally 1.5 to 2.5 inches in diameter, which provides a void space of 35 to 40 percent. A minimum drain time of 6 hours should be provided to ensure satisfactory pollutant removal in the infiltration trench, and a maximum of 48-72 hours drain time is required to ensure capacity for runoff from successive storm events. Trench depths are usually between 3 and 8 feet, with a depth of 8 feet most commonly used.
- The trench surface may consist of stone or pervious pavement with inlets to evenly distribute the runoff entering the trench. The basic infiltration trench design utilizes stone aggregate in the top of the trench to promote filtration; however, this design can be modified by substituting pea gravel for stone aggregate in the top 1-foot of the trench. Typically, there is about 35 to 40% void space within the rock.
- Use trench rock that is 1.5 to 2.5 inches in diameter or pea gravel to improve sediment filtering and maximize the pollutant removal in the top 1 foot of the trench.
- Place permeable filter fabric around the walls and bottom of the trench and 1 foot below the trench surface. The filter fabric should overlap each side of the trench in order to cover the top of the stone aggregate layer. The filter fabric prevents sediment in the runoff and soil particles from the sides of the trench from clogging the aggregate.
- An observation well is recommended to monitor water levels in the trench. The well can be 4 to 6-inch diameter PVC pipe, which is anchored vertically to a foot plate at the bottom of the trench.

Inlet to the Treatment Measure

- Ideally runoff should enter the trench via sheet flow from the paved surface - spreading the flow. Runoff can be captured by depressing the trench surface or by placing a berm at the down gradient side of the trench. Underground inlets can also be used, but care must be taken to pretreat inflows to remove sediment to reduce the risk of clogging.
- To prevent clogging of the system with sediment, a vegetated buffer strip at least 5 feet wide, or other means of pretreatment, should be located adjacent to the infiltration trench to capture sediment particles in the runoff before runoff enters the trench. If a buffer strip or swale is used, installation should occur immediately after trench construction, using sod instead of hydroseeding to prevent erosion. The buffer strip should be graded with a slope between 0.5 and 1.5 percent so that runoff enters the trench as sheet flow.
- If runoff is piped or channeled to the trench, a level spreader should be installed to create sheet flow.

Vegetation

- Infiltration trenches should be kept free of vegetation. If vegetation on the surface is desired, a different treatment measure (e.g., linear bioretention area) should be selected.
- To avoid accumulation of leaves and other debris that can lead to sediment production and clogging, trees and other large vegetation should be planted away from trenches such that drip lines do not overhang infiltration beds.

Construction and Maintenance Plans

Construction Requirements

- If the area tributary to the infiltration trench contains disturbed soil or stockpiles, it must be fully developed, stabilized and protected from erosion with vegetation, temporary pavement, liners or rock mulch before constructing the infiltration trench. High sediment loads from unstabilized or protected areas will quickly clog the infiltration trench. During project construction, runoff from unstabilized or protected areas should be diverted away from the infiltration trench into a sedimentation control BMP until the final tributary area landscaping or other non-erosive surface is established.
- When excavating, avoid spreading fines of the soils on bottom and sides. Remove any smeared soiled surfaces and provide a natural soil interface into which water may percolate.
- Minimize compaction of existing soils. Protect from construction traffic.
- ***For additional construction guidelines, see Chapter 4 of the GI Design Guide***. Specifically, see Sections 4.3 through 4.9 of the GI Design Guide for construction strategies for dealing with slopes, overflows, poor soils, utilities, runoff capture, etc.

Remember

Maintenance Considerations for All Treatment Measures

- See Chapter 8 for specific maintenance guidance. Specifically, see Section 8.3.4 for maintenance concerns specific to infiltration trenches.
- A Maintenance Agreement should be provided and should state the parties' responsibility for maintenance and upkeep.
- Prepare a maintenance plan and submit with Maintenance Agreement. Maintenance plan templates are in Appendix G.

Typical Design Details

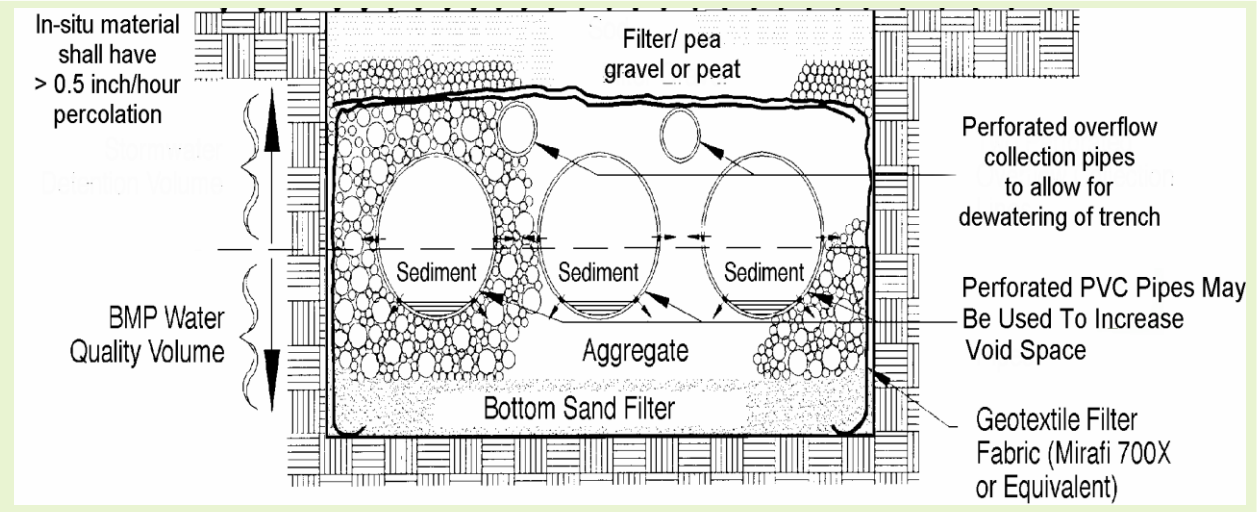

Figure 6-28: Infiltration trench cut-away view

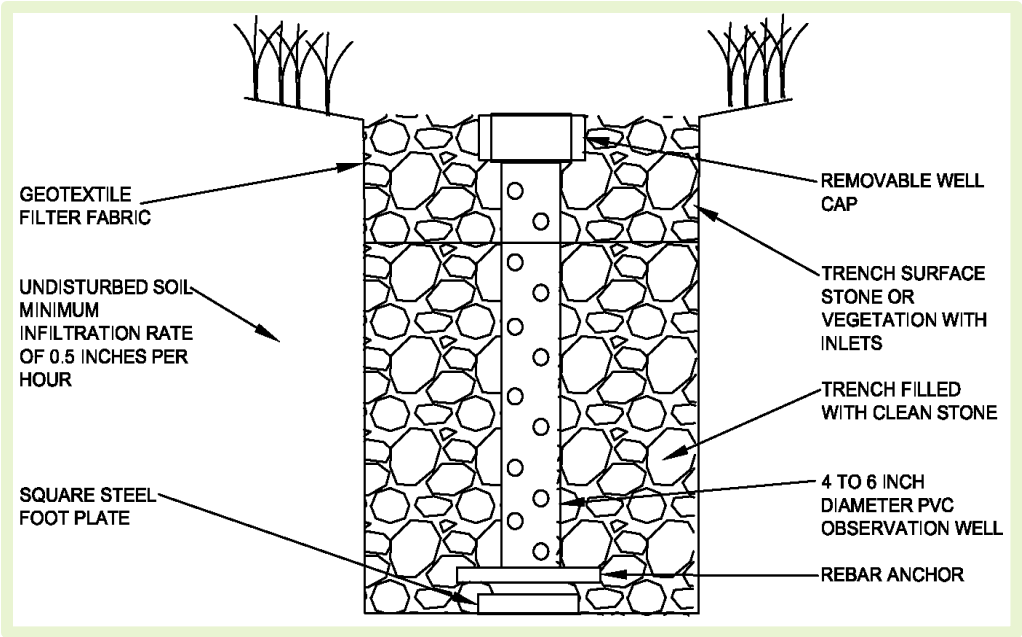

Figure 6-29: Cutaway view: Infiltration Trench with Observation Well