4.1-c  INfiltration Trench

Alternative Names: Soak Away Pit, Infiltration Tube, Drywell, Subsurface Infiltration System

Example of an infiltration trench with a non-flammable border.

DESCRIPTION

Infiltration trenches are gravel filled holding areas that receive and store stormwater runoff from impervious surfaces such as roofs, driveways, and parking lots. Detained stormwater slowly infiltrates through the bottom and sides of the trench into the surrounding sub-soil. Trenches are typically filled with clean, washed angular gravel that is ¾ to 1½ inches in diameter. Infiltration trenches promote stormwater infiltration, reduce discharge of stormwater to receiving waters and drainage systems and provide pollutant removal.

BMP DESIGN APPROACH

- Pollutant Source Control
- Hydrologic Source Control
- Stormwater Treatment

SCALE OF APPLICATION

- All SFR and MFR < 1 acre
- MFR 1-5 Acre and CICU < 5 acres
- MFR and CICU > 5 acres and all WQIPs

TYPE OF APPLICATION

- Temporary
- Permanent
**APPLICABILITY**

- Widely applicable for storage of runoff from roof tops. Pretreatment is required when runoff is conveyed to an infiltration trench from driveways, small parking areas or road segments.

- Not appropriate for soils with infiltration rates less than 1”/hr, areas with seasonally high groundwater (e.g., SEZ), or where groundwater contamination is a concern.

- Site infiltration trenches on relatively flat terrain (less than a 5 percent slope). Infiltration trenches may be sited on steeper terrain by designing flatter storage cells that step down the steeper slope or through the use of subsurface drains.

- Avoid placing within 600 feet of a drinking water source.

- Avoid placing infiltration trenches in locations sloping towards foundations.

**Advantages**

- If properly installed and maintained, infiltration trenches can significantly reduce or eliminate the discharge of runoff from impervious surfaces to receiving waters or drainage systems.

- Reduces the peak loading of receiving waters and storm drain systems.

- Design is adaptable to fit easily along the margins, perimeter, and unused sections of developed sites and under roof eaves.

- Installation is relatively easy and inexpensive.

- Reduces localized flooding or ponding problems while avoiding the need to construct a drainage system.

- Recharges the groundwater.

**Disadvantages**

- Without pretreatment, applicability is limited to sites with low fine sediment loads. If inflowing pollutant loads are high as may be the case with driveways and parking lots, frequent maintenance is necessary to maintain effectiveness. Once clogged, restoration typically requires rebuilding the infiltration trench.

- Clogged systems with standing surface water can become a nuisance due to mosquito breeding and ice formation during the winter.

**DESIGN CONSIDERATIONS**

- Size standard infiltration trenches to retain at least the 20-yr/1-hr volume generated from the tributary impervious area.

- Where space is limited, consider use of prefabricated subsurface storage chambers instead of gravel-filled infiltration trenches to increase stormwater storage capacity. Prefabricated systems are rigid structures that are wrapped with geotextile fabric, placed into the trench, and then backfilled with gravel. Refer to Section 4.1-d for more details regarding Subsurface Infiltration Systems.

- Consult the NRCS Tahoe Basin Soil Survey (NRCS 2007) or the BMP Calculation Spreadsheet (found at: www.tahoebmp.org) for design guidance. The BMP
Calculation Spreadsheet estimates potential depths to groundwater, restrictive layers, and soil permeability rates for every parcel in the Lake Tahoe Region.

- On-site measurements of the Ksat are typically recommended over values estimated in the BMP Calculation Spreadsheet for designing an infiltration trench.
- Depth to seasonal high groundwater, bedrock, or a restrictive layer shall be at least 1 foot below the bottom of the trench.

- Pretreatment of runoff is necessary for large parking lots, commercial sites, and industrial sites when a significant potential exists for discharge of contaminants to groundwater or surface water (e.g., heavy metals or hydrocarbons).

- Where stormwater runoff may have high sediment loads, include a pretreatment device (e.g., sediment trap) at the inlet of an infiltration system for removal of coarse sediment and debris. For applications where a pretreatment device is not possible at the inlet to the system (roof dripline trench), perforated piping with inspection ports embedded in the gravel may be used to provide maintenance access. Improving the ease of maintenance can promote maintenance, thereby extending the effective life on an infiltration trench.

- For soils with slower infiltration rates, consider lining the bottom of the trench with 6 inches to 1 foot of sand. This technique provides a layer of soil that may infiltrate better than the native soils during freezing conditions.

- On slopes greater than 5 percent baffles, headers, or terraces (noncombustible materials) to provide a level bottom to the infiltration trench. Alternatively, use a rock lined ditch or subsurface drain to collect and convey runoff to a more appropriate location for infiltration.

- When the ground slopes toward the foundation install a subsurface drain to convey runoff to a more appropriate location for infiltration.

- An alternative to the gravel dripline trench is a roof dripline planter bed (See Roof Dripline Planter Beds Figure). Ensure that the plantings are dense, irrigated, low-growing, non-woody vegetation that comply with fire defensible space guidelines of the local fire protection district.
This infiltration trench is too steep and is acting as a conveyance rather than infiltration system. A subsurface drain could be added and connected to a subsurface infiltration system at the bottom.

**INSTALLATION CONSIDERATIONS**

- Install infiltration trenches after fine sediment sources have been minimized
- Install infiltration trenches after other site construction activities to avoid clogging the trench.
- Avoid excessive compaction of the bottom of the trench during construction. Use lightweight equipment to excavate the trench to protect the Ksat of the underlying soil. Place excavated material downslope from the trench in a stable location to avoid washing material back into the trench should a runoff event occur.
- Excavate the system to the required size with enough extra width and length for placement of a border.
- The bottom of the trench shall be flat to provide uniform infiltration across the surface area of the trench.
- Consider wrapping the system with non-woven geotextile fabric to reduce sediment accumulation throughout the infiltration trench. This should extend the effective life of the infiltration trench and reduce the need to rebuild a clogged system.
  - Preferred Method: Excavate the trench and place geotextile fabric in the trench with enough remaining fabric to overlap the top of the gravel. Place gravel in the trench to within 3 inches of the final grade. Overlap the top of the gravel with the fabric. Add a final layer of gravel over the fabric to the final grade.
Alternative Method: Excavate the trench and place gravel to within 3 inches of the final grade. Place a layer of geotextile fabric over the gravel and add more gravel to reach the final grade.

Using Fabric: When overlapping geotextile fabric, provide a maximum overlap of 1 foot from the upstream sheet to the downstream sheet to create a shingled effect. When laying out geotextile fabric for installation, provide sufficient material to compensate for perimeter irregularities and for overlapping.

Use gravel that is angular, washed, and uniformly graded to ¾ to 1½ inches in diameter. This specification will provide roughly a 30-40 percent void space for storage or runoff.

If gravel aggregate is not washed prior to delivery, wash on site to remove dirt and fines before placement into the trench. Ensure that dirt and fines washed from the gravel are contained on site and do not enter a drainage system.

Install a containment border around the system. If the trench is within 5 feet of a structure use noncombustible border and baffle materials such as larger rocks.

Ensure the surrounding surface is stable. This will reduce the potential for erosion to occur if the capacity of the infiltration trench is exceeded during a runoff event.

Ensure that runoff from impervious areas will flow into and not bypass the system.

Vehicles shall not park or drive on an infiltration trench. Install parking barriers next to infiltration trenches constructed near vehicle parking areas.

**INSPECTION/MAINTENANCE CONSIDERATIONS**

Infiltration trenches shall be inspected at a minimum semiannually (in the spring and fall) and after major storm events. Inspect infiltration trenches are flow obstruction, sediment accumulation, standing water, and safety hazards and spills. An inspection and maintenance log, writing utensil and a camera among other things will help keep track of inspection and maintenance activities. Use the following Table for more specific information on inspection and maintenance activities.

**EFFECTIVENESS CONSIDERATIONS**

An appropriately sized infiltration trench that is adequately maintained is a highly effective BMP for runoff reduction from development. However, the rate of fine sediment delivery to the trench will dictate the frequency of maintenance; a higher the rate of delivery requires increased frequency of maintenance. Routine maintenance is necessary to prolong the effectiveness of infiltration trenches, because once clogged, restoration typically requires rebuilding the system.
<table>
<thead>
<tr>
<th>INSPECTION AND MAINTENANCE ACTIVITIES</th>
<th>SUGGESTED FREQUENCY</th>
<th>INSPECTION EQUIPMENT</th>
<th>MAINTENANCE EQUIPMENT</th>
</tr>
</thead>
</table>
| Inspect for signs that stormwater runoff is properly accessing the infiltration feature. It may be necessary to pour water on the impervious surface the feature is designed to capture.  
  ▪ Repair any blocked or diverted conveyances.                                                      | Before and during major storms | Water source          | Trash bag  
  Shovel |
| Inspect the feature for standing water.  
  ▪ If water has not fully infiltrated after 96 hours then rehabilitate the infiltration feature (described below).  
  ▪ Contact your local vector abatement office for specific instructions on controlling mosquitoes until rehabilitation can be performed. | 96 hours after major storms |                       | Tools suggested per qualified individual |
| Inspect for trash and debris (especially pine needles).  
  ▪ Remove trash and debris from infiltration feature.                                               | Monthly (April–Oct)  |                      | Leaf rake  
  Trash bag |
| Inspect for invasive weeds.  
  ▪ Remove invasive weeds monthly during the first two growing seasons. Thereafter, weed annually, or as needed. | Monthly during first growing season and annually thereafter | Invasive Weeds Inspector | Tools as needed to control infestation |
| Inspect for upslope or adjacent contributing sediment sources to reduce the accumulation of sediment in the infiltration feature.  
  ▪ Stabilize contributing erosion and bare soil areas to prevent sediment entry into infiltration feature. | Spring               |                      | Soil Amendment, Seeds/Plants, Irrigation, Mulch, Erosion Control  
  Blanket, Riprap, or Coir Logs |
| Inspect for sediment and debris accumulation in the infiltration feature especially at the inlet.  
  ▪ If there is visual evidence of sediment at the top of the trench.  
  ▪ When dry, remove gravel, sieve gravel to remove sediment, clean or replace the underlying fabric, replace cleaned gravel and dispose of sediment in a TRPA approved stable on-site location or out of the Lake Tahoe Region. | Semi-annually (spring and fall) and after major storms | Shovel  
  Sieving screen  
  Trash bag |
| Inspect site for unusual or unsafe conditions (snowplow damage, structural damage, dumping, vandalism, etc.).  
  ▪ Repair structural components as necessary.                                                       | Annually in spring    |                      | Tools as needed |
| Inspect infiltration feature for signs of compaction caused by vehicle traffic. Compaction will compromise performance and cause the feature to fail.  
  ▪ May need to aerate compacted soil below gravel to rehabilitate infiltration function.  
  ▪ Install parking barriers to exclude vehicle entry if signs of vehicle-caused compaction exist.   | Annually in fall      |                      | Parking barrier Installation tools |
| Monitor ongoing effectiveness and determine whether another BMP type or additional BMPs could improve long-term effectiveness and improve benefits to costs versus the existing infiltration feature.  
  ▪ Analyze Inspection and Maintenance Log for trends and recurring issues.  
  ▪ Prepare a plan that more effectively addresses stormwater capture, reduces long term maintenance costs, and improves overall effectiveness and safety of the BMP. | Every 5 years          | Qualified Inspector or Consultant | Qualified Inspector or Consultant |
Infiltration Trench Figure

**NOTES:**

1. LENGTH, WIDTH, AND DEPTH OF INFILTRATION TRENCHES SHALL BE DESIGNED TO STORE THE 20-YEAR 1-HOUR STORM EVENT. THE BMP CALCULATION SPREADSHEET AVAILABLE AT WWW.TAHOEBMP.ORG MAY BE USED TO SIZE INFILTRATION TRENCHES.

2. PROPRIETARY PRODUCTS MAY BE USED TO PROVIDE ADDITIONAL STORAGE CAPACITY RELATIVE TO DRAIN ROCK. INSTALL PER MANUFACTURER'S SPECIFICATIONS.

3. FIRE DEFENSIBLE SPACE GUIDELINES FOR LAKE TAHOE RECOMMEND A 5' NON-COMBUSTIBLE ZONE AROUND THE BUILDING PERIMETER. SEE "LIVING WITH FIRE" AT WWW.LIVINGWITHFIRE.INFO

---

THE TAHOE REGIONAL PLANNING AGENCY (TRPA) SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS DETAIL.
**Infiltration Facility Figure**

1. Size the infiltration facility to accommodate drainage area. Size as specified by BMP designer.
2. Proprietary products may provide additional storage capacity. Install per manufacturer’s specifications.
3. Do not drive or park on infiltration facilities.
4. Install pretreatment sediment trap when infiltrating flows with high coarse sediment loads.
5. Containment borders within the 5’ non-combustible zone shall be made of non-flammable materials.
6. Baffles need to extend beyond bottom of trench to prevent undercutting.

---

**NOTES:**

---

THE TAHOE REGIONAL PLANNING AGENCY (TRPA) SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS DETAIL.
Roof Dripline Planter Beds Figure

IRRIGATED, HERBACEOUS VEGETATION

PLANTER BED SHALL EXTEND 12” BEYOND ROOF DRIPLINE

NON-FLAMMABLE BORDER

SCOUR PROTECTION

OVERFLOW OUTLET

RAISED PLANTER BED

IRRIGATED, HERBACEOUS VEGETATION

PLANTER BED SHALL EXTEND 12” BEYOND ROOF DRIPLINE

NON-FLAMMABLE BORDER

AT GRADE PLANTER BED

THE TAHOE REGIONAL PLANNING AGENCY (TRPA) SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF ELECTRONIC COPIES OF THIS DETAIL.
Armored Dripline Figure

<table>
<thead>
<tr>
<th>TRENCH WIDTHS</th>
<th>RAFFLE SPACING ON DRAIN ROCK ARMOR</th>
<th>SLOPE %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 STORY</td>
<td>18&quot; MIN</td>
<td>N/A</td>
</tr>
<tr>
<td>2 STORY</td>
<td>24&quot; MIN</td>
<td>0-10</td>
</tr>
<tr>
<td>3 STORY</td>
<td>30&quot; MIN</td>
<td>10</td>
</tr>
</tbody>
</table>

Structure → Dripline

5' Non-Combustible Zone

Border

Min. 3" Layer of Washed Rock Greater Than 3/4" Diameter (Larger Angular Rock Should Be Used On Steeper Slopes)

Notes:
1. The soil must be armored with a single continuous layer of rock. Native rock can be substituted if available.
2. Fire Defensible Space Guidelines for Lake Tahoe recommend a 5' Non-Combustible Zone around the building perimeter. See "Living With Fire" at www.livingwithfire.info
3. Containment borders within the 5' Non-Combustible Zone shall be made of non-flammable materials.
4. Regularly scheduled maintenance is necessary to maintain full function. Maintenance includes inspection, removal and proper disposal of pine needles and accumulated sediment.
5. Drip lines installed on slopes greater than 10% should be designed with baffles or larger rocks. An alternative practice is to construct a swale or subsurface drain to collect and convey runoff to an infiltration system located a minimum of 10’ away from the foundation.

The Tahoe Regional Planning Agency (TRPA) shall not be responsible for the accuracy or completeness of electronic copies of this detail.