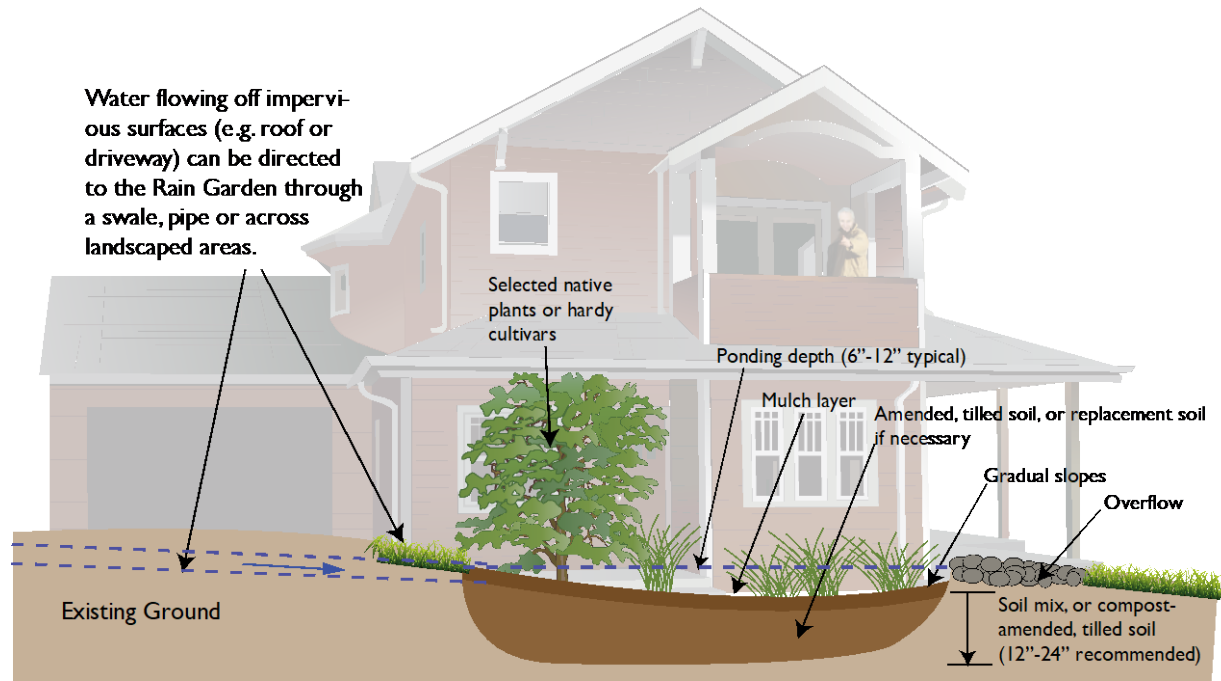




## Overview



## Where NOT to Locate a Rain Garden



- ① Within 10 feet of a building foundation
- ② Over Utilities
- ③ Near the edge of steep slopes or bluffs
- ④ Near an existing or reserve septic drainfield or tank
- ⑤ In low spots that do not drain well
- ⑥ Within 2 feet of high ground water level
- ⑦ Under a tree, or in other areas that would require disturbing healthy native vegetation
- ⑧ Where there is high groundwater during the winter
- ⑨ Near Wells- Stay back 50 feet from confined wells, or 100 feet from unconfined wells



## Recommended Maintenance for Rain Gardens

Maintenance Tasks	Frequency
<ul style="list-style-type: none"> <li>Water often during the first 2 months, and then as needed during first growing season (April-October), depending on rainfall</li> <li>Expect up to 10% of the plant stock to fail in the first year, and plan accordingly for replacement plants</li> </ul>	<p>Upon establishment Small herbaceous plants will require more watering</p>
<ul style="list-style-type: none"> <li>Check and repair eroded areas</li> <li>Check inlets and overflow areas for debris or leaves that are blocking flow</li> </ul>	<p>After heavy rains in first 6 months Periodically in subsequent years</p>
<ul style="list-style-type: none"> <li>Remove weeds by hand</li> </ul>	<p>Monthly for first growing season Every 3 months in subsequent years</p>
<ul style="list-style-type: none"> <li>For meadow type Rain Gardens consisting of grasses, mow the Rain Garden in early spring</li> <li>For other types of plantings, check for winter damage and add mulch to bare spots as desired (2-3 inches). Do not let mulch touch base of plants.</li> <li>Cut back perennials and remove dead growth</li> <li>High winter wildlife value perennials/grasses can be left until they start sprouting in the spring</li> </ul>	<p>February or March</p>
<ul style="list-style-type: none"> <li>Add reinforcement planting to maintain the desired vegetation density</li> <li>Prune trees and shrubs</li> <li>Thin herbaceous plants as desired</li> <li>Remove excess leaf matter after all leaves have fallen in the fall</li> </ul>	<p>Fall</p>
<ul style="list-style-type: none"> <li>Remove invasive plants using recommended control methods</li> <li>Remove any dead or diseased plants</li> <li>Stabilize bare areas draining to the Rain Garden, especially if there is erosion</li> <li>Remove trash</li> </ul>	<p>As needed</p>
<ul style="list-style-type: none"> <li>Remove accumulated sediment at inflow points</li> </ul>	<p>Annually</p>



## Infiltration Trenches and Dry Wells

### What is it?

**Infiltration Trenches and Dry Wells** are gravel-filled trenches and pits, respectively, that temporarily store stormwater runoff and allow it to seep into the ground. The primary functional structure of an Infiltration Practice is the below-ground gravel reservoir, as the water infiltrates into the soils through the base of the practice. The underlying soils must allow water to percolate through. Infiltration Trenches are typically open-topped, and Dry Wells are typically covered over with a layer of soil and planted with grass to blend in.

### Do:

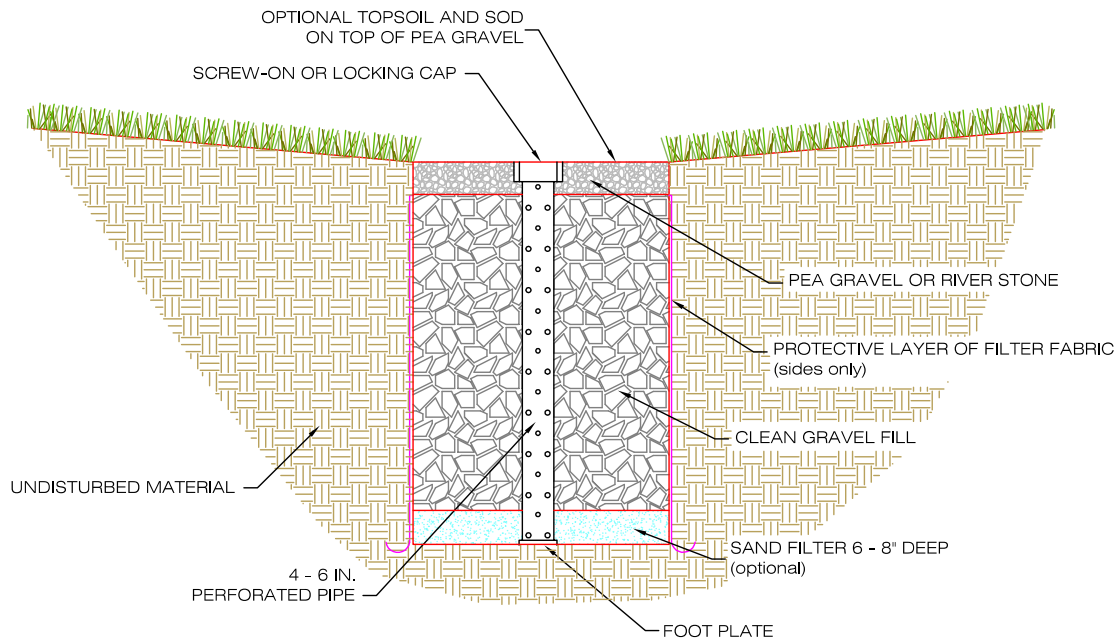
- Locate any utilities present when planning location of Dry Wells
- Plan for removal, disposal or use of excess soil
- Size the Infiltration Trench or Dry Well properly, and plan carefully for overflows
- Call Pennsylvania One Call to locate any utility lines before digging
- Scarify (roughen) the bottom of the trench or basin
- Place gravel in 4-12 inch layers

### Don't:

- Install close to building foundation, especially if uphill from building
- Locate near water wells or septic fields
- Use filter fabric on the bottom of the excavation
- Compact the soils in the trench
- Rush if the excavation is near utilities – a little extra time could save a lot



## Overview



## Where NOT to Locate an Infiltration Practice



- ① Within 10 feet of a building foundation
- ② Over Utilities
- ③ Near the edge of steep slopes or bluffs
- ④ Near an existing or reserve septic drainfield or tank
- ⑤ In low spots that do not drain well
- ⑥ Within 2 feet of high ground water level
- ⑦ In areas that would require disturbing healthy native soils and vegetation like under existing tree canopy
- ⑧ Where there is high groundwater during the winter
- ⑨ Near Wells- Stay back 50 feet from confined wells, or 100 feet from unconfined wells



## Recommended Maintenance for Infiltration Practices

Maintenance Tasks	Frequency
<ul style="list-style-type: none"> <li>• Ensure the contributing drainage area is stabilized, and repair any areas that are eroding</li> <li>• Check downspouts and channels leading to the trenches, and remove any accumulated debris</li> </ul>	Quarterly
<ul style="list-style-type: none"> <li>• Check observation wells (if any) 3 days after a rain event with ½ inch of rainfall or greater.</li> <li>• Treat the practice for clogging if standing water is still present after 3 days</li> <li>• If no observation wells are included, but the practice is very shallow, observe ponding by removing some pea gravel at the surface of the trench</li> </ul>	Twice/year
<p>(Clogging troubleshooting)</p> <ul style="list-style-type: none"> <li>• If the Infiltration Trench starts to drain slowly, remove the top pea gravel or topsoil/turf layer. If filter fabric is present, this may be the source of the clogging. Remove this layer of filter fabric. Check to see if the trench will draw down and replace the overlying material with clean pea gravel or topsoil.</li> <li>• If a Dry Well does not drain properly, dig down to check inflow points for excessive leaves or debris.</li> </ul>	Once/year or as needed
<p>(Overhaul)</p> <ul style="list-style-type: none"> <li>• If the Infiltration Trench or Dry Well is clogged from the bottom, and water stands on the surface, then the practice will need to be reconstructed. If the issue is the underlying soils, the practice should be replaced with a Rain Garden or Conservation Landscape.</li> </ul>	Once/year or as needed

Infiltration Practices should be designed and constructed by a contractor with experience and knowledge about this practice. The design and construction details provided in this chapter may allow homeowners to better understand the practice, but not to construct this practice without the help of an experienced contractor.



## Permeable Hardscapes

### What is it?

**Permeable Hardscapes** use alternatives to traditional paving materials that allow water to seep into the ground rather than become runoff. The surface materials used can be pavers that have spaces between them to allow water to flow through, or in some cases, porous concrete or asphalt. After infiltrating through the surface layer, rainfall seeps into a thick layer of gravel below. This gravel stores and then slowly routes the water into the ground or to a stable outfall. Permeable Hardscapes at the residential and small commercial or institutional scale are typically used for walkways, patios, or parking spots.

### Do:

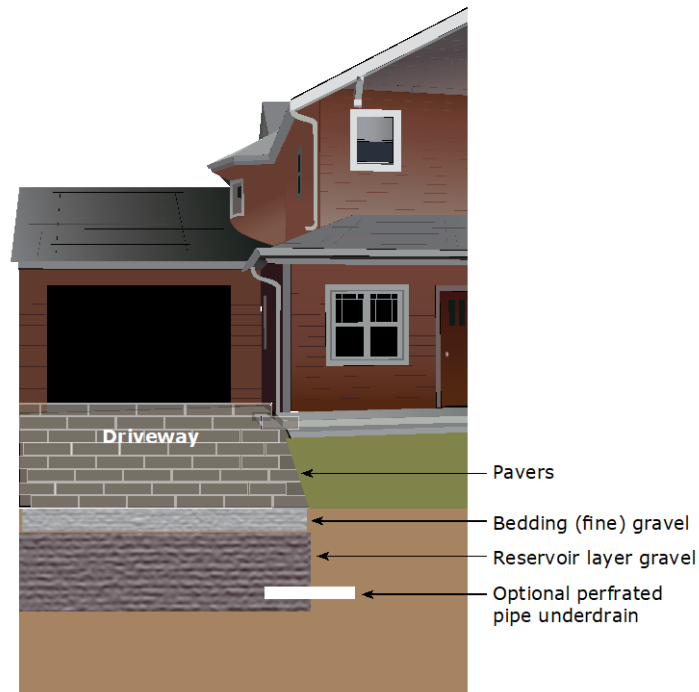
- Test soil to determine suitability for Permeable Hardscape (needs infiltration rate 1 inch/hour or more)
- Add underdrain if soils infiltrate slowly, or if the drainage area is large
- Add a grass filter strip or other pre-treatment of incoming water to minimize maintenance and chances of failure
- Rake, till, or otherwise scarify the bottom surface of the excavation to improve infiltration
- Check levels and elevations carefully and frequently during installation
- Make sure the edges around the installation are solid. If the surroundings slump or get washed away, so will the hardscape!

### Don't:

- Locate next to building foundation, water well, septic field
- Direct runoff toward a building foundation
- Send too much water to Permeable Hardscape, especially from *pervious* surfaces. Too much fine sediment = clogging
- Ignore manufacturer specifications and recommendations – each product may have different requirements
- Pressure-wash the spaces between pavers to clean sediment. Instead, use light vacuuming.

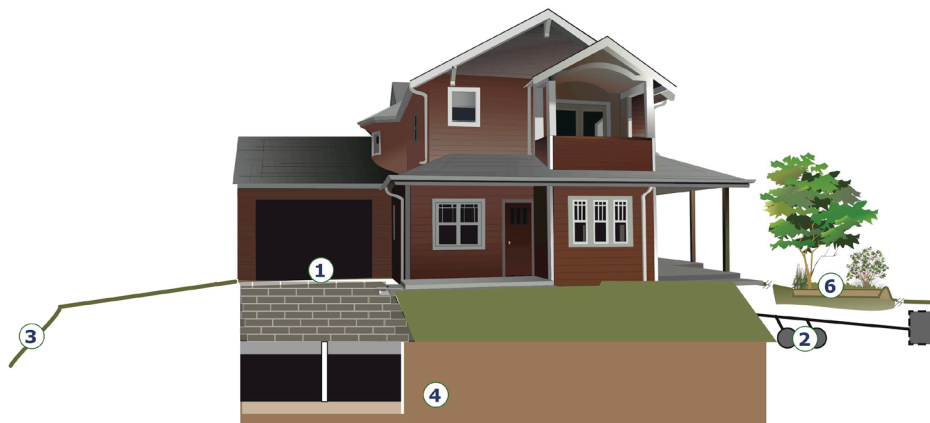


## Overview



Existing soils that allow infiltration at 1 inch per hour minimum if soils do not have a lot of clay, preferably 2 inches per hour.

## Where NOT to Locate a Permeable Hardscape



- ① Close to building foundation 5 feet downhill, 25 feet uphill (for projects less than 1,000 square feet)\*
- ② Over utilities or septic systems
- ③ Near the edge of loose or steep slopes or bluffs
- ④ Over impermeable soils
- ⑤ Where a lot of water runs onto the Permeable Hardscape from upstream.
- ⑥ Under trees or over tree roots

\*For projects closer than these setbacks, impermeable liners and/or custom drainage systems may be used, with experienced professional guidance and installation.



## Recommended Maintenance for Permeable Hardscapes

Maintenance Tasks	Schedule
<ul style="list-style-type: none"> <li>• Sweep the surface if sand or debris accumulates</li> <li>• Leaf blowers can also be used, but make sure debris is removed from the pavement surface</li> <li>• Agitate with a rough brush and vacuum the surface with a wet/dry vac if the joints fill with sand</li> <li>• Remove and replace clogged blocks in segmented pavers</li> <li>• Hire a vacuum sweeper to restore the surface for moderate or larger applications</li> <li>• Repair any structural damage to the paver surface (e.g., cracking, broken pavers, sinkholes)</li> </ul>	<p>As needed, particularly at change of seasons when leaves, winter sanding, and other debris may accumulate</p>
<ul style="list-style-type: none"> <li>• Repair and stabilize any areas that are eroding or washing dirt or debris onto the surface</li> <li>• Check downspouts and channels leading to the Permeable Hardscape and remove any accumulated debris</li> </ul>	<p>Quarterly, if other areas drain to the hardscape</p>

Permeable Hardscapes should be designed and constructed by a contractor with experience and knowledge about this practice. The design and construction details provided in this chapter may allow homeowners to better understand the practice, but not to construct this practice without the help of an experienced contractor.





## Vegetated Channels

### What is it?

A vegetated channel, also called a vegetated swale or bioswale, is a wide and shallow stormwater channel used to convey and slow down stormwater runoff, filter pollutants, and in some cases infiltrate runoff into the subsurface. For infiltration of runoff, the underlying soils must allow water to percolate through. Vegetated channels should be used for longitudinal slopes of 1% to 6% with check dams potentially utilized for slopes on the higher end of the acceptable slope range. Check dams are obstructions often made of stone that slow down stormwater flows by creating small pools that temporarily store runoff.

### Do:

- Locate any utilities present when planning the location of Vegetated Channels
- Plan for the appropriate removal, disposal, or use of excess soil
- Size the Vegetated Channel properly, and carefully plan for overflows and where the runoff will ultimately be directed
- Use Pennsylvania One Call to locate any utility lines before digging
- Scarify (roughen) the soil at the bottom of the Vegetated Channel

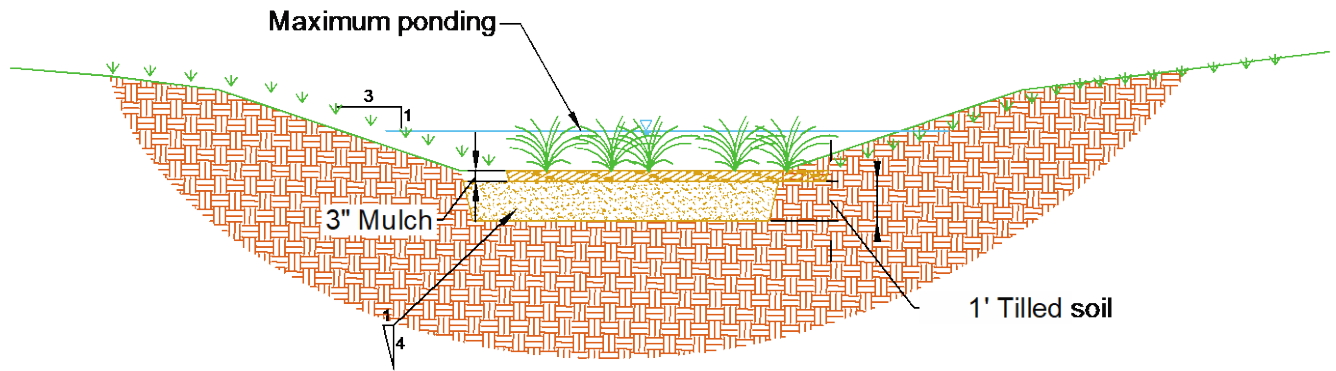
### Don't:

- Install close to building foundation, especially if uphill from building
- Locate near water wells or septic fields
- Use filter fabric on the bottom of the excavation
- Compact the soils at the bottom of the Vegetated Channel
- Rush if the excavation is near utilities – a little extra time could save a lot

Vegetated Channels should be designed and constructed by a contractor with experience and knowledge about this practice. The design and construction details provided in this chapter may allow homeowners to better understand the practice, but not to construct this practice without the help of an experienced contractor.



## Overview



## Where NOT to Locate a Vegetated Channel



- ① Within 10 feet of a building foundation
- ② Over Utilities
- ③ Near the edge of steep slopes or bluffs
- ④ Near an existing or reserve septic drainfield or tank
- ⑤ In low spots that do not drain well
- ⑥ Within 2 feet of high ground water level
- ⑦ Under a tree, or in other areas that would require disturbing healthy native vegetation
- ⑧ Where there is high groundwater during the winter
- ⑨ Near Wells- Stay back 50 feet from confined wells, or 100 feet from unconfined wells