Dry Well

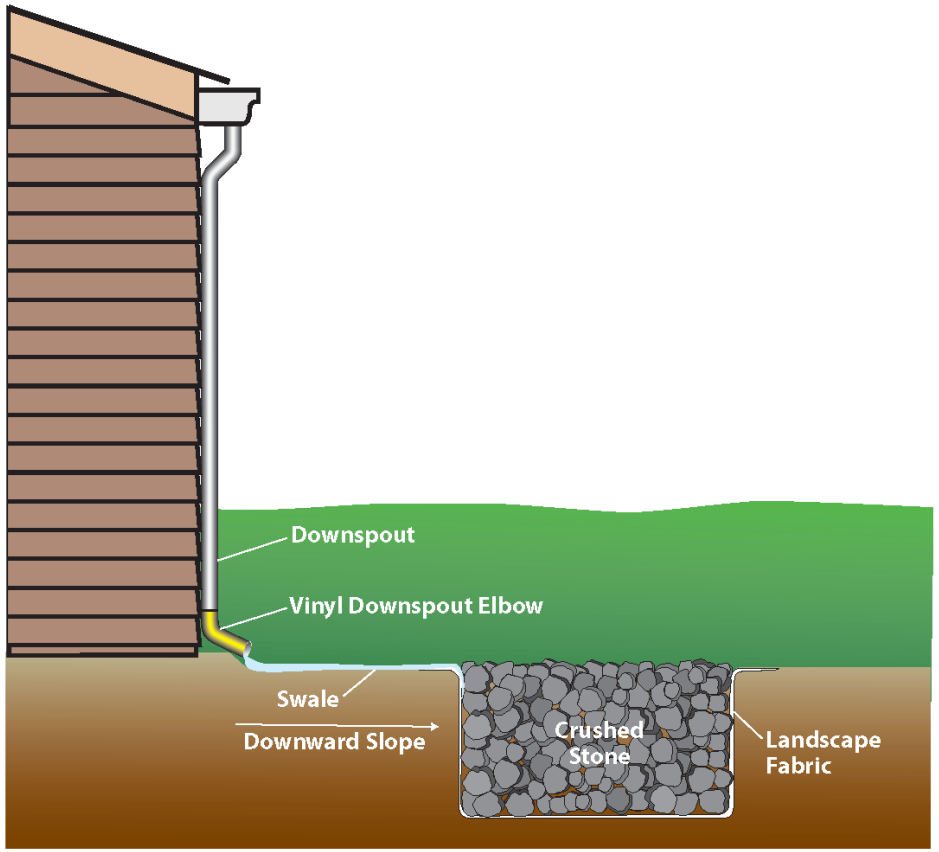
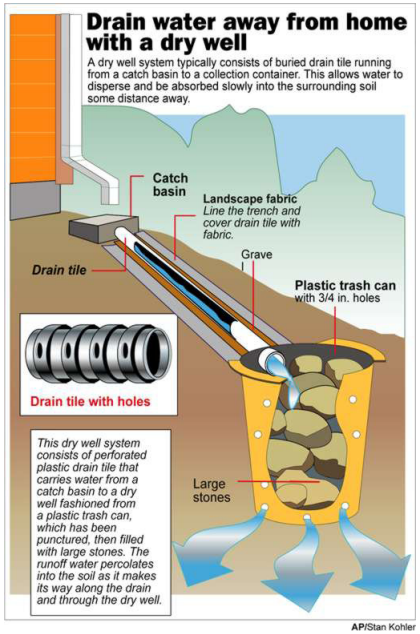


Image: Philadelphia Water Department

A Dry Well, sometimes called a seepage pit, is a subsurface storage facility that temporarily stores and infiltrates stormwater runoff from the roofs of residential structures. Roof leaders connect directly into the Dry Well, which may be either an excavated pit filled with uniformly graded stone, wrapped in geotextile or a prefabricated storage chamber or pipe segment. Dry Wells discharge the stored runoff via infiltration into the surrounding soils. In the event that the Dry Well is overwhelmed in an intense storm event, an overflow mechanism (surcharge pipe, connection to larger infiltration area or rain garden, etc.) will ensure that additional runoff is safely conveyed downstream.

By capturing runoff at the source, Dry Wells can dramatically reduce the increased volume of stormwater generated by the roofs of structures. Though roofs are generally not a significant source of runoff pollution, they are still one of the most important sources of new or increased runoff volume from developed areas. By decreasing the volume of stormwater runoff, Dry Wells can also reduce runoff rate and improve water quality.

A Dry Well is simply a variation on the infiltration BMPs described here, including the Subsurface Infiltration Bed BMP or the Infiltration Trench BMP. Often, prefabricated plastic "well" structures can be purchased and installed by a homeowner.



Benefits

Costs

Benefits

- improved water quality
- reduced runoff volume and rate
- increased groundwater recharge
- visibly unobtrusive

Approximate Costs

The construction cost of a Dry Well/Seepage Pit can vary greatly depending on design variability, configuration, location, site-specific conditions, etc. Typical construction costs in 2003 dollars range from $4 - $9 per cubic foot of storage volume provided (SWRPC, 1991; Brown and Schueler, 1997). Annual maintenance costs have been reported to be approximately 5 to 10 percent of the capital costs (Schueler, 1987). The cost of gutters is typically included in the total structure cost, as opposed to the Dry Well cost.

A Dry Well typically contains the following components:

1. **Stone** shall be 2-inch to 1-inch uniformly graded coarse aggregate (AASHTO size No. 3), washed clean.

2. Nonwoven **Geotextile** shall consist of needled nonwoven polypropylene fibers and meet the properties of such products as Mirafi 140N, Amoco 4547, or Geotex 451.

3. **Topsoil**

4. **Pipe** shall be continuously perforated, smooth interior, with a minimum inside diameter of 4 inches. 12 gauge aluminum or corrugated steel pipe may also be used in Seepage Pits.

5. Gutters and splashboards shall follow manufacturer's specifications.

Ease of Development/Construction

Dry Wells are suitable for most residential applications and typically consist of 18 to 48 inches of clean washed, uniformly graded aggregate with 40% void capacity (AASHTO No. 3, or similar). Dry Well aggregate is wrapped in a nonwoven geotextile, which provides separation between the aggregate and the surrounding soil. At least 12 inches of soil is then placed over the Dry Well. Open space overlying infiltration beds can be vegetated with native grasses, meadow mix, or other low-growing, dense vegetation. These plants have longer roots than traditional grass and will likely benefit from the moisture in the Dry Well, improving the growth of these plantings and potentially increasing evapotranspiration. (Note that fertilizer use above any infiltration facility should be minimized.)

An alternative form of Dry Well is a subsurface, prefabricated chamber. A variety of prefabricated Dry Wells are currently available on the market.

All Dry Wells should be able to convey overflows to downstream drainage systems. System overflows can be incorporated either as surcharge (i.e. overflow) pipes extending from roof leaders or via connections to larger infiltration areas.

Though roofs are generally not a significant source of runoff pollution, they can still be a source of particulates and organic matter, as well as sediment and debris during residential construction. Measures such as roof gutter guards, roof leader clean-out with sump, or an intermediate sump box can provide pretreatment for Dry Wells by minimizing the amount of sediment and other particulates that may enter it. In the Trout Creek Watershed, woodland areas generate a large amount of leaf litter which accumulates in the gutter during the Fall and Winter. A removable filter with a screened bottom should also be installed in the roof leader below the surcharge pipe (if required) in order to screen out leaves and other debris.

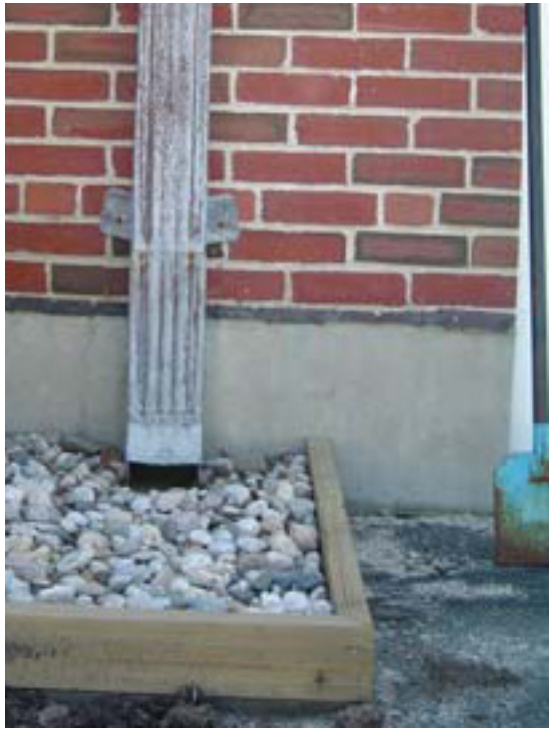


Image: Maine Department of Environmental Protection

Dry Wells should be allowed to drain-down within 72 hours. Longer drain-down times reduce Dry Well efficiency and can lead to low-oxygen conditions, odor and other problems.

Dry Wells are generally constructed in the following sequence:

1. Protect Dry Well area from excessive compaction prior to installation.

2. If Dry Wells are part of a larger construction project, install Dry Wells during the later phases in order to prevent sedimentation and/or damage from construction activity. As necessary, install and maintain proper erosion and sediment control measures during construction.

3. Excavate Dry Well bottom to a uniform, level, and uncompacted subgrade free from rocks and debris. Do NOT compact subgrade. To the greatest extent possible, excavation should be performed with the lightest practical equipment. Excavation equipment should be placed outside the limits of the Dry Well.

4. Completely wrap Dry Well with nonwoven geotextile. (If sediment and/or debris have accumulated in Dry Well bottom, remove it prior to geotextile placement.) Geotextile rolls should overlap by a minimum of 24 inches within the excavated area. Fold back and secure excess geotextile during stone placement.

5. Install continuously perforated pipe, observation wells, and all other Dry Well structures. Connect roof leaders to structures as required.

6. Place uniformly graded, clean-washed aggregate in 6-inch lifts, lightly compacting between lifts. Fold and secure nonwoven geotextile over aggregate, with minimum overlap of 12-inches.

7. Place 12-inch lift of approved Topsoil over trench, as indicated on plans. Seed and stabilize topsoil.

8. As necessary, connect surcharge pipe to roof leader and position over splashboard.

9. Follow maintenance guidelines, as discussed below.

Adequate inspection and maintenance access to a Dry Well should be provided. Observation wells not only provide the necessary access to a Well, but they also provide a conduit through which pumping of stored runoff can be accomplished in the even of reduced infiltration.

Aesthetics

Aesthetics
Since Dry Wells are typically installed underground and near residential structures, they do not impact site

aesthetics. Therefore, if a visually unobtrusive stormwater control device is desired, Dry Wells make for an excellent choice.

Township Review
In most cases, there should be no need for special Township review, permitting actions, and so forth when Dry Wells are developed – unless the area being disturbed was quite large, thereby qualifying as an action which triggers related permits, reviews, approvals.

Site Constraints
Dry Wells are sized to temporarily retain and infiltrate stormwater runoff from roofs of structures. A dry well usually provides stormwater management for a limited roof area. Care should be taken not to hydraulically overload a Dry Well based on bottom infiltration area and contributing roof drainage area.

Dry Wells are not recommended when their installation would create a significant risk for basement seepage or flooding. In general, 10 feet of separation, preferably down-slope, is recommended between Dry Wells and building foundations. However, this distance may be shortened at the discretion of the designer or homeowner. Shorter separation distances may warrant an impermeable liner to be installed on the building side of the Dry Well. The longer dimension of Dry Wells should parallel the slope where slopes exceed 5%. In addition, Dry Wells should be kept away from steep human-made grades. The bottom of a Dry Well should be at least two feet above seasonal high-water table and bedrock or be shown to be otherwise capable of handling expected drainage volumes.

Variations
Intermediate "Sump" Box – Water can flow through an intermediate box with a high outflow to allow any sediment or leaf litter to settle out. Water would then flow through a mesh screen and into the dry well.

Drain Without Gutters – For structures without gutters or downspouts, runoff is designed to sheetflow off a pitched roof surface and onto a stabilized ground cover (surface aggregate, pavement, or other means). Runoff is then directed toward a Dry Well via stormwater pipes or swales.

Prefabricated Dry Well – There are a variety of prefabricated, predominantly plastic subsurface storage chambers on the market today that can replace aggregate Dry Wells. Since these systems have significantly greater storage capacity than aggregate, space requirements are reduced and associated costs may be

defrayed. Provided the recommended installation guidelines are followed, prefabricated chambers can prove just as effective as standard aggregate Dry Wells.

Maintenance
As with all infiltration practices, Dry Wells require regular and effective maintenance to ensure prolonged functioning. The following represent minimum maintenance requirements for Dry Wells:

Maintenance

- Inspect Dry Wells at least four times a year, as well as after every storm exceeding 1 inch.
- Dispose of sediment, debris/trash, and any other waste material removed from a Dry Well at suitable disposal/recycling sites and in compliance with local, state, and federal waste regulations.
- Routinely evaluate the drain-down time of the Dry Well to ensure the maximum time of 72 hours is not being exceeded. If drain-down times are exceeding the maximum, drain the Dry Well via pumping and clean out perforated piping, if included. If slow drainage persists, the system may need to be replaced.
- Regularly clean out gutters and ensure proper connections to facilitate the effectiveness of the dry well (crucial) for long-term success.
- Replace filter screen that intercepts roof runoff as necessary (crucial) for long-term success.
- If an intermediate sump box exists, clean it out at least once per year.