Dry Wells

Uses, Regulations, and Guidelines in California and Elsewhere

Dry Well Description and Challenges to Use

Dry wells are gravity-fed excavated pits lined with perforated casing and backfilled with gravel or stone (Fig. 1). Dry wells penetrate layers of clay soils with poor infiltration rates to reach more permeable layers of soil, allowing for more rapid infiltration of stormwater. They can be used in conjunction with low impact development (LID) practices to reduce the harmful effects that traditional stormwater management practices have had on the aquatic ecosystem. Dry wells not only aid in stormwater runoff reduction, but they can also increase groundwater recharge, are economical, and have minimal space requirements.

Figure 1. Idealized drawing of stormwater infiltration using a dry well

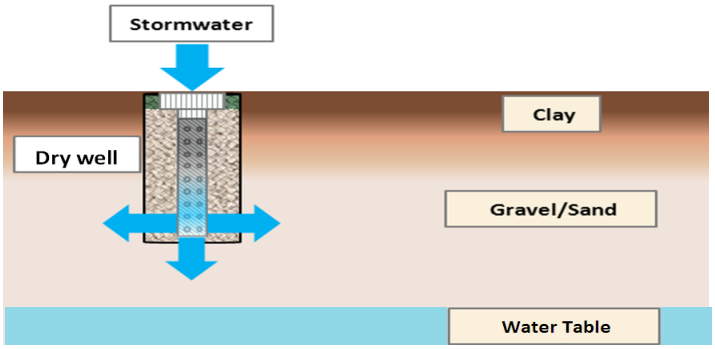


Figure 2. Dry well installed to receive runoff flowing through a lawn (Source: R. Pitt)

In California, dry wells are used frequently in the southern part of the State but with caution in northern California due to the concern that they might provide a conduit for contaminants to enter the groundwater. Regional Water Quality Control Boards' Stormwater Management Plans often differ in technical specifications for dry well construction. The CA Department of Water Resources' well water regulations imply that dry wells should be constructed to water well standards. Varying design and technical specifications, poorly disseminated information about studies of the risks of using dry wells, and lack of clarity on the need to register or permit dry wells has left many reluctant in some parts of California to use dry wells.

U.S. Environmental Protection Agency (EPA) - Region 9 Regulations

Dry wells and other buried infiltrative devices are subject to the U.S. Environmental Protection Agency (US EPA) Underground Injection Control (UIC) regulations. A dry well is a Class V injection well, defined as a conduit for non-hazardous fluids that is deeper than it is wide. Dry wells can be used for stormwater infiltration as long as they are: 1) registered with the EPA using their online form on the UIC Region 9 website, and 2) do not threaten drinking water sources by ensuring that runoff entering the dry well does not exceed primary drinking water standards (Maximum Contaminant Levels or MCL; 40 CFR part 144.82). A permit is not required.

The EPA's UIC Program was established in 1979 as part of the Safe Drinking Water Act. In California, the EPA maintains 'primacy' over the UIC program, unlike most other states who set guidelines and overseeing Class V wells. California has primacy only for wells that are used to inject oil and gas waste products (Class II wells). However, the EPA specifically allows the Regional Water Quality Control Boards and/or local governments to set requirements or standards that are more stringent than EPA regulations (posted at: *http://www.epa.gov/region9/water/groundwater/uic-pdfs/calif5d-muniguide.pdf*).

The US EPA has not imposed design requirements for dry wells in California; that responsibility is left to local authorities. However, the following design practices are encouraged:

- Site evaluation prior to construction to assess geological conditions, the ability of the subsurface to infiltrate stormwater, proximity to public supply wells, and local use of hazardous chemicals,
- Incorporation of a pretreatment feature to remove sediment and associated pollutants,
- Maintenance of minimum distance, commonly 10 feet, from the bottom of the dry well to the water table, and
- Incorporation of any measures, such as siting and design requirements, needed to protect drinking water.

The Role of the California Regional Water Quality Control Board

The State Water Resources Control Board and the Regional Water Quality Control Boards in California can prescribe requirements for discharges into California waters or on to the land. Although not widely used, under California's Porter-Cologne Act, Regional Boards can require that a Waste Discharge Report be submitted when dry wells used for stormwater management are constructed. The requirements must take into consideration the beneficial uses (water supply, irrigation, etc.) of the affected water and the water quality objectives necessary to protect these beneficial uses, as well as the need to prevent a nuisance.

California's Anti-Degradation Policy

When evaluating the risk and benefits of using dry wells, California's anti-degradation policy (State Water Resources Control Board Resolution No. 68-16) is also considered. The anti-degradation policy protects high quality water (water that is higher in quality than that prescribed by the Water Boards' plans and policies). Degradation of high quality water is permitted only if the discharge provides a maximum benefit to the people of the State, does not violate the Boards' Basin Plans and policies, and when the discharge is controlled by the best practicable treatment. The maximum benefit to the State is determined on a case by case basis taking into account the beneficial uses of the water, economic and social costs, the environmental aspects of the proposed discharge, and the implementation of feasible alternative treatment or control methods. Factors to be considered when evaluating the use of dry wells for stormwater management could involve determining if they:

- Provide an additional source of water to augment the water supply,
- Reduce the negative effects of stormwater runoff flowing to surface waters, and
- Minimally impact groundwater quality.

Consideration and interpretation of these and related factors are the basis on which the State's anti-degradation policy is applied to dry well use and siting.

Typical Dry Well Guidelines at the Local Level

Dry Wells and California Water Well Protection Policies

Throughout California, county environmental management departments are charged with implementing California DWR regulations (Bulletins 74-81, 74-90) to protect wells used to supply drinking water, groundwater monitoring wells, etc. These regulations are designed to prevent contamination of groundwater through improperly constructed or decommissioned wells. County staff regularly inspect wells and the area around them to evaluate compliance with regulations. These regulations apply to "waste" and, if stormwater is classified as such, then Bulletin 74 would apply to dry wells. Yet, the process that dry wells are designed to facilitate, namely the infiltration of stormwater, is stymied if the rules identified in Bulletin 74 prohibits surface water from entering injection wells. Currently, individual county environmental health departments in California use their best professional judgment to evaluate how to manage this challenge. Within the State, some communities follow DWR's guidelines while others do not, deferring to the guidance of the US EPA Region 9.

Local Guidelines

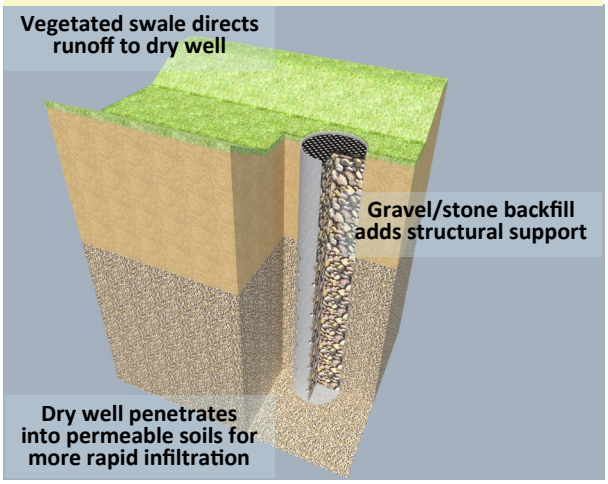
Many requirements and design specifications for dry wells come from guidelines linked to the NPDES (National Pollution Discharge Elimination System) permits, issued by the State or Regional Water Boards. In a few locales, city or county requirements also exist. In Los Angeles County, for example, information on placement and design of dry wells must be submitted as part of the permitting process for new development. Not all cities and counties have such requirements. In some cases, inclusion of dry wells in local Low Impact Development Design Guidelines serves as a 'de facto' source of guidance for local municipalities and the development community. For example, a number of cities in the SF Bay Area (San Mateo, Santa Clara, etc.) include dry wells as one LID tool that can be used to reduce the effects of hydromodification.

Local Guidelines (continued)

Design specifications differ by city/county, with some standards varying significantly. Local authorities should be consulted for specific guidelines. The following list includes some of the common standards of the California Standard Urban Stormwater Management Plans and LID Manuals (documents related to NPDES permits):

- Building setback: 10 – 20 feet minimum,
- Water table: 10 feet vertical separation between dry well bottom and seasonal high water table,
- Public supply wells: 100 feet minimum setback,
- Separation (center to center): 100 feet minimum,
- Penetration: 10 feet minimum into permeable porous soils,
- Dry well surface inlet: 3 inch minimum above bottom of retention basin,
- Restriction of use near vehicle maintenance sites, industrial areas, and other high risk locations, and
- Should not be used at sites with a slope >15%. (For example, San Diego does not recommended sites with slopes >40%).

Figure 3. Example dry well system design



There are no commonly applied monitoring or design requirements in California. The role of the vadose zone in the attenuation of contaminants is not a design or siting consideration. A challenge for some in the development community is gaining an understanding of local practices in order to meet stormwater runoff management requirements (i.e., hydromodification requirements) associated with NPDES permits.

Dry Well Regulations in Other States

Most states have assumed responsibility for overseeing dry well programs in their state. Some have minimal requirements while others have a complex set of standards and monitoring requirements. Two of the states with the most well defined programs are those in Oregon and Washington. Some of the common characteristics of these two programs are the requirement that runoff entering the dry well have concentrations of contaminants below the MCL, the regulatory standard for contaminants in drinking water. The following table summarizes key aspects of the programs in these two states:

Issue	Oregon	Washington
Design & Pretreatment	Pretreatment reqd. (vegetated or structural) for all except those with roof-runoff only; spill containment system must be incorporated into system; runoff entering UIC must be < MCL. Vadose zone modeling of stormwater contaminants required for most UICs.	Need for pretreatment based on pollutant load and vadose zone treatment capacity except for roof runoff; runoff < MCL as it enters UIC; spill containment if UIC at industrial or commercial site.
Siting	> 500 feet from any water well, none allowed where soils already contaminated, > 5 feet vertical separation from water table, commonly used in roadway right of ways.	Prohibited in vehicle servicing/washing facilities, areas with hazardous materials, others specified; > 100 feet from drinking water wells; restrictions on slopes > 25%, setback 100 feet upslope and 20 feet downslope from buildings.
Monitoring	Required in most circumstances, measured in stormwater as it enters UIC. Includes metals, volatiles, semi-volatiles, combustion by-products, coliform, etc.	Not generally required.
Permitting or Registration	Registration for rooftop runoff; others must obtain permit from local or state government.	Registration required for all but roof-runoff only UICs; permits integrated into stormwater permit.
Other points of interest	Stormwater management plan must be prepared, operations and maintenance plan frequently required.	

Regulations in Other States (continued)

Pennsylvania, New Jersey, and Arizona, and Hawaii are a few of the others states with dry well regulations and guidelines. In New Jersey, some communities require dry well installation for all new and major remodels related to residential construction. They are typically designed to temporarily store and infiltrate roof runoff. Dry wells in New Jersey are prohibited in industrial or other areas where toxic chemicals might be used. In contrast, in Pennsylvania dry wells are permitted in industrial areas with restrictions, but not along roadways. Arizona requires dry wells in all new development to control runoff produced by the 100 year storm over 24 hours. The regulations of these states vary with respect to dry well design, use of pretreatment, separation from drinking water sources, distance from the water table, and other factors.

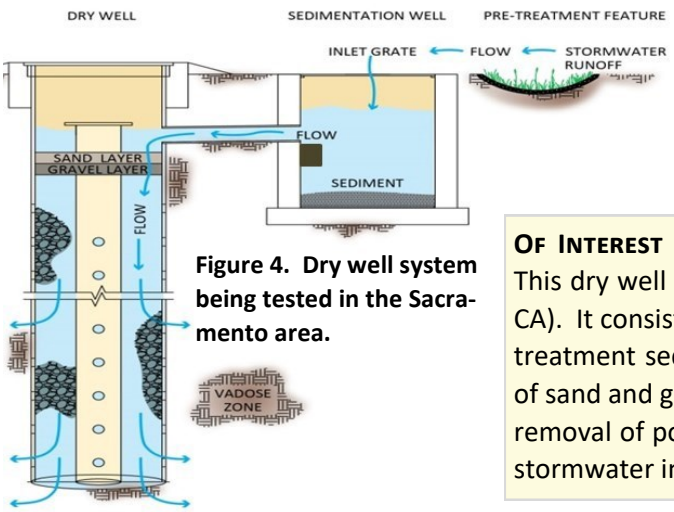


Figure 4. Dry well system being tested in the Sacramento area.

OF INTEREST Most dry wells are not holes in the ground filled with rocks. This dry well system (left) is being tested in the Sacramento area (Elk Grove, CA). It consists of 3 parts: a vegetated pretreatment feature, a structural pretreatment sedimentation well, and the dry well itself, which contains layers of sand and gravel above the rocks. The goal of this design is to maximize the removal of pollutants, reduce clogging of the dry well, and promote efficient stormwater infiltration.

Conclusions

Currently, there are no uniform State regulations or guidelines for dry wells in California. However, the Regional Water Quality Control Boards have the discretion to issue waste discharge requirements and to interpret and apply the antidegradation policy to the construction of new dry wells. Therefore, most regulations and guidelines occur at the city or county level and vary by region. Available information suggests that dry wells can be used safely if careful site evaluations are performed to determine if a dry well is suitable for the location. They can be an alternative to typical storm drainage systems that provide numerous benefits, including reducing localized flooding, recharging the aquifer, supporting the implementation of LID practices in areas with clay soils, thereby minimizing the damaging effects of hydromodification on aquatic resources.

Useful Links and References

General Information

US EPA Class V Injection Well Info: *https://www.epa.gov/uic/class-v-wells-injection-non-hazardous-fluids-or-above-underground-sources-drinking-water*

US EPA Region 9 Injection Well Guidelines

http://www.epa.gov/region9/water/groundwater/uic-pdfs/calif5d-muniguide.pdf

Forms and Registration

EPA Region 9 Injection Well Registration

http://www.epa.gov/region09/water/groundwater/injection-wells-register.html

Information about programs in other states:

Oregon: *http://www.deq.state.or.us/wq/uic/uic.htm*

Washington: *http://www.ecy.wa.gov/PROgrams/wq/grndwtr/uic/index.html*

References

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The Los Angeles and San Gabriel Rivers Watershed Council. 2005. Los Angeles Basin Water Augmentation Study, Phase II Final Report. Los Angeles, CA. Posted at: http://watershedhealth.org/Files/document/265_2005_WAS%20Phase%2011%20Final%20Report_2005.pdf

This factsheet was prepared by the California Office of Environmental Health Hazard Assessment, working with the City of Elk Grove, on the Elk Grove Dry Well project to investigate the risks associated with the use of dry wells. Written by Nelson Pi, Ary Ashoor, and Barbara Washburn. For more information, contact Barbara Washburn at barbara.washburn@oehha.ca.gov or Connie Nelson at cnelson@elkgrovecity.org.
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