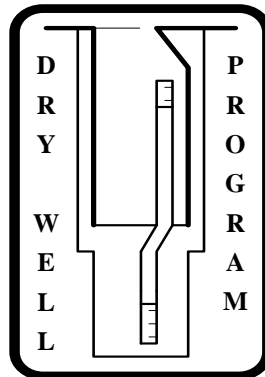




Arizona Department of Environmental Quality

Water Quality Division

DRYWELL INVESTIGATION GUIDELINES



May 2010 Revision

1. INTRODUCTION

Drywells in Arizona are to be used for one purpose only – to intercept storm water, unless exempted under Arizona Revised Statutes (A.R.S.) § 49-250(B)(23). If a drywell receives a discharge other than storm water, an investigation is required. According to A.R.S. § 49-241(B)(5), facilities which add a pollutant to a drywell shall obtain an Aquifer Protection Permit (APP). According to A.A.C. R18-9-102(A), drywells which are used solely to receive storm water runoff must be registered, but are exempt from obtaining an APP, **except those that drain areas in which hazardous substances are used, stored, loaded, or treated.** Thus, an investigation is necessary and an APP is required for drywells draining areas where any hazardous substances (including wastes, products, fuels, etc.) are used, stored, loaded, or treated. Refer to A.A.C. R18-9-C301 and C304 for Type 2.01 and 2.04 General Permit rules. For cases where both motor fuels and hazardous substances are used, stored, or loaded, a Type 2.01 General Permit will be required.

- **REVISIONS (January 2010)**

Major modifications to this document, since the last revision in August 2000, include updating applicable levels listed in Tables I and II, breaking out the Type III and Type VI chromium compounds within the tables, and eliminating the requirement for total petroleum hydrocarbon (TPH) analysis. TPH no longer has an applicable SRL; therefore, it is recommended that benzene, toluene, ethylbenzene, and xylenes (BTEX) be included within the volatile organic compound (VOC) analysis. Also, additional language has been added for clarification purposes and to facilitate understanding of the requirements applicable to drywells.

Additional information about the Drywell Program can also be obtained by accessing <http://www.azdeq.gov/environ/water/permits/drywell.html>.

OBJECTIVE

This document provides guidance for the investigation of a drywell that may have received fluids other than storm water. The Aquifer Protection Program requirements, where applicable, are discussed in the document. This guidance is intended to help drywell owners and/or operators through the investigation process. If the sampling results from the drywell settling chamber sediments exceed the Residential Soil Remediation Levels (r-SRLs) or minimum Groundwater Protection Levels (GPLs), whichever is less, a soil boring is required to determine the extent of contamination and whether or not remediation is necessary.

This document also provides guidance for collecting samples from a soil boring and for selecting appropriate analytical methods. Soil investigations should be completed in accordance with the Department's Remedial Action Rule, Arizona Administrative Code (A.A.C.) Title 18, Chapter 7, and the requirements of the Aquifer Protection Program.



DEFINITIONS

Per A.A.C. R18-9-101(16), a **“Drywell”** is defined as a bored, drilled, or driven shaft or hole in which the depth is greater than the width and is designed specifically for the disposal of storm water. Typical non-permitted drywells are made up of an upper settling chamber and a lower gravel-filled section. An injection pipe may connect the two sections.

Per A.R.S. §49-201(5), **“Clean Closure”** means implementation of all actions specified in a permit, if any, as closure requirements, as well as elimination, to the greatest degree practicable, of any reasonable probability of further discharge from the facility and of exceeding aquifer water quality standards at the applicable point of compliance. Clean closure also means post-closure monitoring and maintenance are unnecessary.

Per A.R.S. §49-201(12), **“Discharge”** means the direct or indirect addition of any pollutant to the waters of the state from a facility. For purposes of the aquifer protection permit program, discharge means the addition of a pollutant from a facility either directly to an aquifer or to the land surface or the vadose zone in such a manner that there is a reasonable probability that the pollutant will reach an aquifer.

“Constituents of Concern” are the chemicals and components of chemicals known to be used, stored, loaded, or treated at the site; chemicals or classes of chemicals that are commonly used, or historically associated with, the type of operation or business conducted at the site; and degradation products or byproducts of chemicals and processes associated with the activities at the site.

2. SCENARIOS WHERE DRYWELL INVESTIGATIONS ARE RECOMMENDED

The six most common scenarios applicable to a drywell are described in the subsections below. If a drywell at your property does not meet any of the following descriptions, please contact Ramona Rodriguez for guidance at 602-771-4686 or rir@azdeq.gov.

For each scenario below, ADEQ recommends collecting and analyzing a sample of the sediment or sludge within the settling chamber for VOCs (including BTEX), polycyclic aromatic hydrocarbons (PAHs), and the 13 total priority pollutant metals plus barium, at a minimum. Any constituents of concern known to have been associated with the past operations of the facility should be added to the analyses. **Laboratory detection limits should be at or below applicable standards.** Note that samples must be analyzed by an Arizona Department of Health Services (ADHS) approved laboratory and by an approved method. Please refer to Sampling Procedures in Section 4 for additional information. **All site investigations conducted as part of a permit application must be submitted to ADEQ in the form of a certification signed, dated, and sealed by an Arizona-registered professional engineer or geologist (A.A.C. R18-9-C301[B][2] and C304[B][2]).**

If ADEQ approval of the investigation is needed, the complete assessment report and data should be submitted to ADEQ under a Clean Closure Application, and permit Notice of Intent (NOI) and Supplemental NOI, if required. Closure applies not only to drywells that will be abandoned, but can also apply to those that will remain in operation. Details on what the Clean Closure report should contain can be found within A.A.C. R18-9-A209(B)(3). **Samples are considered valid only if collected prior to cleanup of the chamber.**

If the contaminant concentrations detected in the settling chamber sediments reflect background levels (as established by ambient soil sampling) or derive from typical storm water discharges, no further investigation will be necessary. Otherwise, further investigation may be required to determine the nature and extent of contamination, as described in Section 3.

A. *Drywells located at sites undergoing property transactions*

Many property transactions, especially those of a commercial or industrial nature, include a Phase I Environmental Assessment (EA) of the property so that both the seller and the buyer are protected against future environmental claims. It is recommended that drywell investigations be included in either the Phase I, or Phase II EA, if required.

B. *Drywells located on non-industrial/non-commercial property*

The Aquifer Protection Program requirements do not typically apply to drywells located at these sites. An example of this type of drywell would be located within a residential drainage basin that is designed to receive only storm water.



C. *Drywells located on industrial or commercial property where hazardous substances are used, stored, loaded, or treated on the facility property but NOT within the surface drainage capture area of the drywell(s)*

Drywell Investigation Screening

An example of this type of facility is a business that stores hazardous chemicals outside, but the drywell is separated by engineering barriers from receiving any potential discharge from the chemical storage area. Engineering barriers may include, but not be limited to, permanent berms, sloping of grades away from the drywell, and approved forms of secondary containment that may be regulated under another agency or program.

The Aquifer Protection Program requirements do not apply to drywells located at these sites, unless there is evidence that the on-site operations have added a pollutant to a drywell. If there is a concern that a drywell is now, or has been, impacted by pollutants a Clean Closure Application should be submitted to ADEQ's APP & Drywell Unit.

Analyte selection for the sediment sample should be based on the substances used, stored, loaded, or treated at the site and should include all applicable constituents of concern. The facility's Material Safety Data Sheets (MSDSs), if available, should be reviewed to determine an applicable list of constituents. If information about chemicals used or waste generated at the site are not available, at a minimum, the analyses should include VOCs (including BTEX), PAHs, and total metals for the 13 total priority pollutant metals plus barium. **Samples are considered valid only if collected prior to cleanup of the chamber.**

Best Management Practices

In general, facility owners and/or operators occupying these sites are required to develop and employ a Best Management Practices Plan (BMPP) to ensure that unauthorized discharges to drywell will not occur. The BMPP should conform to the ADEQ BMPP guidelines and should describe the methods, practices, and employee training used to prevent unauthorized discharges, including structural and non-structural controls, and operation and maintenance procedures. ADEQ may waive the BMPP requirement if adequate justification is provided in writing.

D. *Drywells located on industrial or commercial property where hazardous chemicals are used, stored, loaded, or treated within the surface capture area of the drywell(s)*

Operators of these facilities are required to obtain an APP pursuant to A.R.S. § 49-241(B)(5) and A.A.C. R18-9-102(A). A drywell investigation is required, and a drywell investigation report must be submitted as part of the APP application. The report should include the following information:

Drywell Investigation Screening

A drywell investigation must be performed to determine that pollutants have not been added to the drywell and that compliance with aquifer water quality standards at the point of compliance is maintained. Sampling recommendations as described in Part C above, should be followed. A complete description of the sampling activities including sampling methods, equipment, and sample handling and preservation should be included in the investigation report. Note: For reference, the report details should contain the information provided by A.A.C. R18-9-A209(B)(3). Even though this rule pertains to closure, it is a good guidance reference and will help applicants provide ADEQ with the information needed to make a determination. Some of the information included in this rule is detailed further below.

Best Available Demonstrated Control Technology (BADCT)

In addition to a BMPP as described in Part C, flow control and pre-treatment devices may be necessary to satisfy the BADCT requirements in order to obtain the APP. A list of flow control and pre-treatment devices, along with descriptions, can be found within A.A.C. R18-9-C304(D). ADEQ will evaluate the design drawings of any such device to determine whether the rule requirements have been satisfied. ADEQ does not recommend or pre-approve any such device(s).

Site-Specific Groundwater and Flood Plain Information

An inventory of all wells within one-half mile of the facility should be conducted. General depth-to-groundwater and groundwater flow direction information from the Arizona Department of Water Resources or USGS maps is acceptable only if appropriately constructed groundwater wells do not exist within one-half mile of the facility. Information indicating the location of the facility with respect to a flood plain should be submitted.

Drywell Information

A copy of the drywell drilling log that documents the surface and subsurface lithology should be submitted, if available. Any available information on the design, construction, maintenance and history of the drywell should be provided. At a minimum, information on the diameter, total depth, and construction date of the drywell will be necessary. A minimum of 10 feet is required between the bottom of the drywell and groundwater for drywells requiring a Type 2.01 or 2.04 General Permit. Any drywell not meeting the rule requirements must be permitted under an Individual APP.

Upon submittal of all the above information, ADEQ will determine whether further investigation of the drywell will be required. In general, if the contaminant concentrations in the settling chamber sediments reflect background levels or derive from typical storm water discharges, further investigation will not be necessary. If a contaminant concentration detected in either the initial or confirmation settling chamber sample exceeds the SRL or GPL for that contaminant, further subsurface assessment is required to define the degree and extent of contamination. **The decision for additional characterization will also be**

influenced by the type of contaminants present, disposal history, depth-to-groundwater, and known site-specific lithologic conditions.

Upon completion and approval of the drywell investigation and APP requirements, a permit can be issued for continuing operation of the drywell.

E. Drywell closures at industrial/commercial properties where hazardous substances have been used, stored, loaded, or treated

According to A.R.S. § 49-252, drywells located in these areas can be closed under a Clean Closure Approval without an APP. To demonstrate a clean closure, a drywell investigation must be conducted as described in Part D above, and a Clean Closure Application must be submitted to ADEQ for approval. Drywells are typically decommissioned as part of closure activities, but in some cases the drywell may remain to receive only uncontaminated storm water in the future, if all hazardous substance handling activities are removed from the drainage area. If ADEQ determines that the closure plan meets the definition of clean closure, a Clean Closure Approval will be issued to the owner or operator. If the review of a closure plan indicates that post-closure monitoring or maintenance at the site is necessary, an Individual APP is required.

If a drywell is to be closed and a permit or Clean Closure Approval from ADEQ is required for closure, the drywell should not be decommissioned until ADEQ has reviewed and approved the results of the drywell investigation.

F. Injection Wells

A drywell is considered an injection well, if it is constructed or used for the purpose of injecting fluids other than storm water into the subsurface. An Individual APP is required for any drywell that does not meet the rule requirements for a General Permit. Clean closure of these wells may be pursued if the requirements for clean closure are met. **Sampling requirements for injection well investigations may be more comprehensive than for drywell investigations. All injection well investigations should be pre-approved by ADEQ.**

3. ADDITIONAL DRYWELL INVESTIGATION REQUIREMENTS

A. *Soil Boring*

If analytical results from a sample of the settling chamber sediments exceed the r-SRLs or minimum GPLs, and background concentrations are not considered, a soil boring is required. The soil boring should be drilled hydraulically downgradient from the drywell at a distance of no more than 5 feet from the edge of the drywell. If the drywell is undergoing closure, the soil boring may be advanced through the center of the drywell shaft, provided all settling chamber sediments are removed prior to drilling and a sample of the native soil beneath the drainage rock can be obtained.

Soil samples should be collected at 5-foot intervals and at any distinct changes in lithology, starting at the depth of the bottom of the settling chamber and continuing to a total depth of at least 10 feet below the bottom of the drywell injection pipe. The boring should be advanced to deeper levels and sampled, if warranted, based on professional judgment or if visual examination or field screening equipment indicate the presence of contamination.

All collected soil samples should be analyzed for all constituents of concern that were detected in the drywell chamber sediment above applicable r-SRLs and GPLs. If the constituents of concern include VOCs, the soil samples should be analyzed for VOCs even if no VOCs were detected in the drywell chamber sediment. In some cases, indicator parameters such as BTEX may be used to reduce the number of analyses. Decisions should be based on site-specific conditions, and a rationale should be provided. Please contact the ADEQ APP & Drywell Unit Manager for assistance in determining the appropriate analyses.

Upon completion of soil sampling, the boring should be properly closed to ensure that contaminant migration will not occur.

B. *Site-specific Conditions*

1. During drilling, certain lithologic conditions (such as extremely coarse-grained materials) may result in auger refusal or otherwise prohibit adequate sample recovery for laboratory analysis. Contaminants detectable in settling chamber sludge may be absent in coarse-grained sediments but detectable in fine-grained layers or the underlying groundwater. Professional judgment should be exercised when determining sample locations and defining the extent of contamination.
2. Soil gas sampling is recommended when VOC analysis is required and the cobble and gravel content of the soils results in low, or no, sample recovery.
3. If groundwater is encountered during drilling, groundwater samples should be collected according to current EPA, ADEQ, and ADHS requirements and analyzed for all constituents of concern.

C. *Groundwater Investigation*

ADEQ may request groundwater sampling if soil sampling is inadequate to determine the extent of impact (e.g., B.1. above), the drywell shaft is completed in or close to the water table, or impact to groundwater is suspected. In this case, sample results should be compared against applicable aquifer water quality standards. Note that specific instructions with respect to the detection limits should be provided to the laboratory on the Chain-of-Custody. **Laboratory detection limits should be at or below applicable standards.**

4. DRYWELL REMEDIATION

Upon completion of the drywell investigation, the settling chamber sediments should be removed and disposed of according to all applicable federal, state, and local regulations. For cases where GPLs are not exceeded, but SRLs are exceeded, conditional closure can be approved through APP. Most facilities falling into this category either undergo voluntary soil remediation under ADEQ's Voluntary Remediation Program or obtain a Declaration of Environmental Use Restriction (DEUR). Further assessment to determine that aquifer water quality standards have/will not be violated at the point of compliance may be necessary.

If the drywell is to be decommissioned, the abandonment should follow the ADEQ Drywell Decommissioning Guidelines, available on ADEQ's web site. **If a permit or clean closure approval from ADEQ is required for closure, the drywell should not be abandoned until ADEQ has reviewed and approved the results of the drywell investigation.** If the installation of a new drywell is necessary to replace the decommissioned drywell, the guidance manual for design, installation, operations, maintenance, and inspection of drywells should be followed.

Sampling Procedures

A description of the sampling procedures, including sampling equipment and sample handling and preservation, should be submitted. Sampling procedures should be consistent with current EPA, ADEQ, and ADHS requirements. Sludge, sediment, and soil sampling methods for VOCs should be consistent with ADHS approved methods such as methanol field extraction or use of an Encore© device and under applicable holding times. Drywell sediment samples for VOC analysis should be collected as discreet samples from as deep within the settling chamber sediments as possible so that losses due to volatilization will be minimized. All other sediment samples should be composited from several locations within the settling chamber sediments, whenever possible.

Analytical results must include the method of sample analysis, and relevant quality assurance/quality control (QA/QC) data. In general, at least one duplicate sample and one type of blank must be obtained for every ten field samples. If there are less than ten field sampling points, one duplicate sample and one blank must be obtained. Chain-of-Custody documentation and proof of laboratory certification should be provided. The laboratory must be certified by ADHS for each specific method used.

Analytical Methods

The most common analyses performed on drywell sediments and soils include VOCs (including BTEX), semi-VOCs, PAHs, and 13 total priority pollutant metals plus barium using one or more of the following method(s)¹:

1. 8015AZ (C₁₀-C₃₂ hydrocarbons) - BTEX by EPA 8021B, and PAHs analyses by EPA 8270 or 8310 may be required, depending on the type of petroleum products used and the concentrations detected.

2. EPA 8260B or EPA 8021B (VOCs) - EPA 8260B should be used when all the potential contaminants at a site have not been identified. EPA 8021B should be used for specific contaminants only, such as BTEX.
3. EPA 8270 (semi-VOCs) - This method should be used where semi-VOCs are suspected. For PAH only, EPA 8310 should be used.
4. EPA 6000 and 7000 series for **total metals**- Arsenic, barium, cadmium, chromium, lead, and mercury are common contaminants. Other metals with aquifer water quality standards include antimony, beryllium, nickel, selenium, and thallium. Metals such as copper, silver, and zinc should be requested, if they are possible indicators of an unauthorized discharge. (Basically, the 13 total priority pollutant metals plus barium is the best way to cover the metals analysis, unless you already know what the contaminant stream contains.)

¹The analytical method used must be a method approved by ADHS. Any approved analytical method for each parameter may be used as long as the substituted method provides detection limits which are adequate to meet applicable regulatory limits. Methods other than those mentioned above may be required.

Drywell Investigation Screening Process

The following tables of minimum GPLs and corresponding SRLs are presented to assist drywell owners and/or operators in determining that whether further investigation of the drywell is necessary. If either standard is exceeded in the settling chamber sediments, a soil boring is necessary. For contaminants that are not listed, contact the ADEQ APP & Drywell Unit Manager for assistance. **Please note soil borings may be required for injection well investigations regardless of the concentrations detected in the settling chamber sediments.**

Demonstration of Technical Capability

All documents submitted to ADEQ that fall within the statutory definition of engineering practice or geologic practice are to be prepared by a qualified preparer and sealed by an appropriate registrant of the Arizona State Board of Technical Registration according to the applicable laws and rules.

Drywell owners or facility operators should contact Ramona Rodriguez of the ADEQ APP & Drywell Unit, at (602) 771-4686, to obtain further information, if necessary, to ensure that all regulatory concerns are addressed.

Additional information about the Drywell Program can also be obtained by accessing <http://www.azdeq.gov/environ/water/permits/drywell.html>.

Table I. Minimum GPLs and SRLs for Organic Contaminants

Analyte	CAS No.	Minimum GPL (mg/kg)	SRL(s)* (mg/kg)
Benzene	71-43-2	0.71	0.65 (ca)
Carbon Tetrachloride	56-23-5	1.6	0.25 (ca) / 2.2
1,2-Dichlorobenzene	95-50-1	72	600
1,3-Dichlorobenzene	541-73-1	9.3	530
1,2-Dichloroethane (1,2-DCA)	107-06-2	0.21	0.28 (ca)
1,1-Dichlorethylene (1,1-DCE)	75-35-4	0.81	120
cis-1,2-Dichloroethylene (cis-1,2-DCE)	156-59-2	4.9	43
trans-1,2-Dichloroethylene (trans-1,2-DCE)	156-60-5	8.4	69
1,2-Dichloropropane	78-87-5	0.28	0.34 (ca)
Ethylbenzene	100-41-4	120	400
Chlorobenzene (Monochlorobenzene)	108-90-7	22	150
Styrene	100-42-5	36	1500
Tetrachloroethylene (PCE)	127-18-4	1.3	0.51 (ca)
Toluene	108-88-3	400	650
Chloroform	67-66-3	6.8	0.94 (ca)
1,1,1-Trichloroethane (TCA)	71-55-6	1	1200
Trichloroethylene (TCE)	79-01-6	0.61	3.0 (ca) / 17
Xylenes (Total)	1330-20-7	2200	270
Alachlor	15972-60-8	0.11	6.8 (ca)
Atrazine	1912-24-9	0.11	2.5 (ca)
Carbofuran	1563-66-2	2.1	310
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	0.015	0.53 (ca) / 1.5
1,2-Dibromoethane (Ethylene dibromide [EDB])	106-93-4	0.0033	0.029 (ca)
Endrin	72-20-8	45	18
HCH (gamma) or Lindane	58-89-9	0.088	0.5 (ca)
2,4-Dichlorophenoxyacetic Acid (2,4-D)	94-75-7	6.7	690
Trichlorophenoxypropionic Acid (2,4,5-TP) or Silvex	93-72-1	42	490

* Note that SRLs are from Appendix A of the Arizona Administrative Code, Title 18, Chapter 7. For carcinogens the Residential SRL listed is the 10⁻⁶ value.

“ca” indicates carcinogenic effects

Table II. Minimum GPLs and SRLs for Metals

Analyte	CAS No.	Minimum GPL (mg/kg)	SRL(s) ¹ (mg/kg)
Antimony	7440-36-0	35	31
Arsenic	7440-38-2	290	10
Barium	7440-39-3	12,000	15,000
Beryllium	7440-41-7	23	150
Cadmium	7440-43-9	29	39
Chromium (III)	16065-83-1	590 ²	120,000
Chromium (VI)	18540-29-9	Present ³	30 (ca) / 65
Total Chromium	7440-47-3	590	NA
Lead	7439-92-1	290	400
Mercury	7487-94-7	12	23
Selenium	7782-49-2	290	390
Nickel	7440-02-0	590	1,600
Thallium	7440-28-0	12	5.2

¹ Note that SRLs are from Appendix A of the Arizona Administrative Code, Title 18, Chapter 7. For carcinogens the Residential SRL listed is the 10⁻⁶ value.

² Based upon the total chromium GPL.

³ If hexavalent chromium is present, ADEQ will evaluate the investigation and closure requirements on a case by case basis.

“ca” indicates carcinogenic effects

References

1. EPA-Region IX, *Guidelines for Closure of Shallow Disposal Wells*, 1992.
2. ADEQ, *Policy 0170.000: Implementation of EPA Method 5035 - Soil Preparation for EPA Methods 8015B, 8021B, and 8260B*, 2000.
2. ADEQ, *Best Management Practices Plan (BMPP) Guidance for Drywells*, August 2000.
3. ADEQ, *Clean Closure Guidance and Application for Qualifying Discharging Facilities and Drywells*, revised December 2004.
4. ADEQ, *Quality Assurance Project Plan*, 1991.
5. ADEQ, *Drywell Decommissioning Guidelines*, revised June 2005.
6. ADEQ, *A Screening Method to Determine Soil Concentrations Protective of Groundwater Quality*, September 1996.
7. ADEQ, *Implementation Guidelines for Drywells That Use Flow Control and / or Pretreatment Technologies Under the Aquifer Protection Program General Permit Types 2.01 and 2.04*, May 2009.

