2000 Groundwater Quality Annual Report
A.R.S. §49-225.D

The groundwater quality monitoring program conducts ongoing monitoring of the state's groundwater resources to detect the presence of new and existing pollutants, determine compliance with applicable water quality standards, and evaluate the effectiveness of best management practices and control technologies. The data collected assist in answering the following questions:

- What is the condition of Arizona's waters?
- Where, how and why are water quality conditions changing over time?
- Where are the problems related to water quality and what is their cause?
- Are programs to address problems effective?
- Is ADEQ meeting water quality goals and standards?

This report is a compilation of ADEQ's analyses of groundwater quality monitoring data. It includes the number and location of wells sampled for pollutants, well registry numbers (where known), the agency responsible for drawing and analyzing water samples, and the number of samples with detectable levels of pollutants.

Table IV.1. Sampling Results

Distinct Wells Sampled	194
Samples Collected and Tested	691
Individual Parameters Tested	17,601

The results are from well samples collected between July 1, 1999 to June 30, 2000. Self-monitoring data submitted by water systems to ADEQ's Drinking Water Program are not included, but can be found in the drinking water system compliance status report.

ADEQ collected and tested 691 samples in 12 of the state's 51 groundwater basins. These basins include Aqua Fria, Big Sandy, Hualapai Valley, Lower Gila, Lower San Pedro, Phoenix A.M.A., Ranegras Plain, Sacramento Valley, Tonto Creek, Tucson A.M.A., Willcox and Yuma.

The information and data presented summarize water quality results for specific wells, but are not necessarily representative of area-wide or regional groundwater conditions. Entities should research these data further with the assistance of ADEQ before using data in site-specific or aquifer-wide water quality investigations.

Number of Parameters Detected by Water Quality Parameter Groups

VOCs	26
Others	226
Cations/Anions	1784
Metals	595
Nutrients (NO_3)	293
Pesticides	4
Physical (e.g., pH)	1055

This report shows the status of water quality and baseline conditions. The program recently initiated groundwater trend analyses, but the results of that effort are not ready for publication in this report.

This report is submitted in accordance with Arizona Revised Statute (A.R.S. §49-225.D) that requires the submittal of the following information for each fiscal year:

1. The number of wells sampled for pollutants and their locations,

well numbers (if available), and the agencies responsible for drawing and analyzing the samples.

2. The number of samples with detectable levels of pollutants and their locations, well numbers (if available), and the agencies responsible for drawing and analyzing the samples.
3. The number, nature and outcomes of enforcement actions taken listed by category.

Table IV.2 contains data from July 1, 1999 to June 30, 2000, for items one and two listed above. The ADEQ water quality violations and enforcement report presents enforcement actions (see item three).

Number of Exceedances of Reference Levels by Water Quality Parameter Groups

VOCs	2
Others	17
Cations/Anions	21
Metals	–
Nutrients (NO_3)	35
Pesticides	–
Physical (e.g., pH)	35

According to the Environmental Quality Act that became law in 1986, all state agencies must submit to ADEQ the results of any groundwater sampling for pollutants and the results of any groundwater sampling that detects pollutants (A.R.S. § 49-225.B). This report is a compilation and summary of all data gathered by ADEQ between July 1, 1999 and June 30, 2000.

The term "pollutant" is defined in A.R.S. § 49-201 as "fluids, contaminants, toxic wastes, toxic pollutants, dredged spoil, solid waste, substances and chemicals, pesticides, herbicides, fertilizers and other agricultural chemicals, incinerator residue, sewage, garbage, sewage sludge, munitions, petroleum products, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and mining, industrial, municipal and agricultural wastes and any other liquid, solid, gaseous or hazardous substances."

This definition includes substances derived from both anthropogenic and natural sources. Any detection of a volatile organic compound (VOC), pesticide or pathogenic bacteria in groundwater constitutes pollution. Major ions (dissolved minerals), metals and some physical parameters that occur in groundwater naturally are expected at some level in groundwater samples.

If an analyte, or water quality parameter, was detected but did not exceed a standard, the analyte is at a safe level as either a naturally-occurring substance or an anthropogenic pollutant at a concentration level lower than the standard.

The reference levels in the report are the Arizona Aquifer Water Quality Standards (AWQS), EPA Primary Drinking Water Maximum Contaminant Levels (MCLs) and Secondary Maximum Contaminant Levels (SMCLs). Table IV.3 describes AWQSs, MCLs and SMCLs. A groundwater sample is typically analyzed for one or more parameter groups. Table IV.4 identifies the parameter groups and individual chemical constituents comprising each parameter group.

The detections and exceedances of reference levels in groundwater sampled from July 1, 1999 to June 30, 2000 (see Table IV.2) are shown in Table IV.5.

The glossary of terms contains definitions, term explanations and codes used in Table IV.2, including primary water use, laboratory notations, groundwater basins and county codes.

Water Quality Standards

This section discusses federal drinking water and state aquifer water standards, which are useful references in interpreting groundwater sampling results. Water quality standards and guidelines are essential to help protect public health and the environment. The standards used as reference levels in this report to identify when a constituent has polluted groundwater are the Arizona Aquifer Water Quality Standards (AWQS), EPA Primary Maximum Contaminant Levels (MCLs) and EPA Secondary Maximum Contaminant Levels (SMCLs).

Federal primary MCLs are limits for contaminants in drinking water established under the Safe Drinking Water Act. Current 40 CFR Part 142 lists approximately 150 MCLs. EPA determines MCLs primarily based on the health effects of the contaminants, and also consider analytical detection methods and economic factors in their development. Primary MCLs are federally enforceable drinking water standards that ADEQ adopted as enforceable drinking water standards under the Arizona Safe Drinking Water Program.

EPA also establishes SMCLs (40 CFR Part 143), which are set at levels that, in EPA's judgement, protect the public welfare. Standards created by these regulations are those that may adversely affect the aesthetic quality of drinking water, such as taste, odor, color and appearance. Arizona does not enforce SMCLs as they are considered goals and are not federally enforceable.

According to the Environmental Quality Act of 1986, ADEQ must adopt AWQSs "to preserve and to protect the quality of those waters for all present and reasonably future uses." ADEQ may also adopt AWQSs for other chemicals meeting the health impact justification required by the Environmental Quality Act.

ADEQ has also established Narrative Aquifer Water Quality Standards (A.A.C. R18-11-405), which creates an environmental "safety net" that allows ADEQ to regulate pollutant discharges for which EPA has not assigned numeric standards. The narrative standards state:

- *A discharge shall not cause a pollutant to be present in an aquifer in a concentration that endangers human health.*
- *A discharge shall not cause a violation of the surface water quality standard established for a navigable water of the state.*
- *A discharge shall not cause a pollutant to be present in an aquifer that impairs existing or reasonably foreseeable uses of water in an aquifer.*

Groundwater Quality Sampling Results

This table summarizes groundwater quality data ADEQ obtained from FY 2000 sampling activities. The laboratories of the Arizona Department of Health Services and Department of Agriculture analyzed the samples. Although previous reports include data from contributors, including the Arizona Department of Water Resources and U.S. Geological Survey, format interface difficulties preclude these data from inclusion in this report.

Like in any database that compiles groundwater data, this database contains uncertainties, which are primarily due to variations in laboratory quality assurance procedures, well construction details, well depths, sampling conditions, temporal and spatial variability of groundwater quality conditions, and others. Since each sample is collected for specific purposes with its own limitations and restrictions, use of these data requires some assumptions or understanding of these factors.

Summary of Groundwater Quality Data

ADEQ sampled a total of 194 distinct wells one or more times between July 1, 1999 and June 30, 2000, and collected 691 water samples, which were tested for a variety of groundwater quality parameters. ADEQ entered the sampling results into its groundwater quality database and has generated 17,601 analyses.

For analytical purposes, water quality parameters are categorized into 11 groups. Table IV.4 details the water quality parameters that compose each group.

ADEQ delineated 51 groundwater basins in the state, which serve as a general geographical location for sampled wells. Groundwater quality data presented in this report were collected from seven primary well use categories, which are described in "Primary Water Use.

Table IV.5 shows basins, cadastral well locations, primary well use, water quality parameters, concentrations and reference levels where analytical results exceed reference levels. Table IV.6 summarizes the number of detections for each water quality parameter.