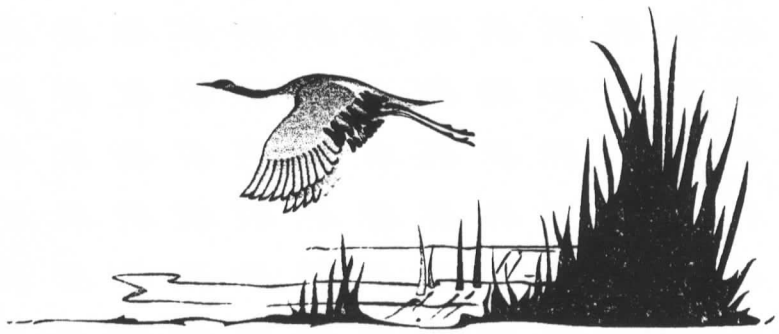
SOURCE WATER ASSESSMENT PLAN

FINAL DRAFT



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PREAMBLE

The Safe Drinking Water Act was amended by Congress in 1996 bringing about several changes to the manner in which the goal of ensuring safe drinking water is accomplished. Among these changes is the creation of the Source Water Assessment Program. This program requires Arizona to assess the waters (called source water) from which public water systems draw from to provide drinking water. Once implemented, the Source Water Assessment Program will benefit water systems by providing information necessary for setting risk based monitoring requirements and encouraging the protection of the source waters at the local level. Acronyms used in this plan and the glossary are provided in Appendix A and B, respectively.

Evaluating land use activities surrounding source waters is the first fundamental step of the Source Water Assessment Program. The Source Water Assessment Program will provide an inventory of major adjacent land use activity information which will be useful at the local level for making existing and future planning and zoning policy decisions. Local governments set policy relating to land use and zoning, an activity not undertaken by state or Federal government. In addition, local citizens and local governments are better able to decide what protection methods are most suited for their water sources. Because only local governments can effectively use these options, Congress has allowed local governments to determine if a protection program is needed and what methods of protection are most appropriate.

The United States Environmental Protection Agency continued to emphasize "local" input by requiring states to provide for extensive public participation during the development and implementation of the Source Water Assessment Plan. The Arizona Department of Environmental Quality (ADEQ) convened citizen and technical advisory committees to help develop the plan for gathering the baseline information and distributing it to citizens, local municipalities, and water system owners. To this end, several public meetings and public hearings were held across the state to facilitate public participation. The most significant factor in this plan has been public input into development of the plan.

Throughout the development of this plan the need to strike a balance between pursuing an approach that is both protective and applicable statewide has been kept in mind. Elements of the plan include:

- a site-specific effort to define where source waters exist for each water system.

- a less extensive, yet more appropriate, list of adjacent land uses, taking into consideration historical occurrences of contamination in Arizona.
- an extensive public communications effort including public education.
- an appeal process to ensure concerns/disagreements have been appropriately addressed.

The scope of the final reports of the Source Water Assessment Program will include:

1. Regulated aspects of drinking water systems:
   a. Water providers that are regulated are considered.
   b. Chemicals that require testing and have a Maximum Contaminant Level or action level under the regulations are considered.

2. Adjacent land uses where the above chemicals are commonly used are considered:

   a. Previous analytical results for regulated contaminants are considered.
   b. Chemical not regulated under the drinking water laws have not been considered. (See Appendix D for a list of regulated chemicals).

3. Hydrogeologic information obtained from other public entities as well as information provided by water systems include:

   a. The extent of protective stratigraphy based on the best information available. If unknown, the report will state that it is unknown.
   b. Time of travel, soil characteristics, and similar information estimates based on previous analyses and studies.
   c. Any additional information made available to ADEQ which could affect the susceptibility determination.

4. Identified Adjacent Land Use include:

   a. Facilities where the use of regulated chemicals is common.
   b. Whether the land use has an accepted Best Management Practice (BMP) or requires a permit for the activity.
   c. If a BMP exists, or a permit is required, are those being implemented.

The assessment reports should be read with the above scope in mind. Where information is lacking or completely unavailable, communities may wish to use these areas as starting points for a more complete assessment and as a beginning of Source Water Protection in their area. ADEQ anticipates these Source Water Assessment reports will be valuable for water systems by providing the necessary information for setting risk-based monitoring requirements and encouraging source water protection efforts at the local level.

INTRODUCTION

The safe drinking water amendments of 1996 placed a strong emphasis on the goal to establish a nationwide effort to protect drinking water sources. As part of that goal, the legislation provided for a preliminary assessment of drinking water sources and an inventory of surrounding adjacent land use (ALUs). This nationwide effort will result in the first comprehensive look at the nation's drinking water sources from an assessment perspective. One of the outcomes of this nationwide assessment will be information that public water systems (PWSs) can use to help determine appropriate monitoring frequencies and to protect their sources of drinking water.

In conjunction with this nationwide effort, the primary goal of Arizona's Source Water Assessment Program (SWAP) is to benefit PWSs. SWAP results will be used to provide the basis to individually tailor monitoring requirements for PWSs and an encouragement to implement local source water protection programs. To develop an appropriate preliminary assessment program which will benefit local communities in developing source water protection programs, Arizona has involved, and will continue to involve, the public during the development and implementation phases of the SWAP. Arizona has formed technical and citizen advisory committees, as well as conducted statewide public meetings and hearings.

CHAPTER 1 -- AN OVERVIEW

1.1 BACKGROUND

The amendments of the Safe Drinking Water Act (SDWA) in 1996 required each state to develop and implement a Source Water Assessment Program (SWAP). This required each state to develop a plan following EPA's guidance with the participation of the public. The SWAP plan must be submitted to EPA by February 1999 for approval. The Arizona Department of Environmental Quality (ADEQ) has developed the SWAP plan in conjunction with the Technical and Citizens Advisory Committees as well as EPA. This plan addresses in detail the Arizona SWAP and how ADEQ will implement this program.

1.2 MONITORING REQUIREMENTS FOR SMALL PUBLIC WATER SYSTEMS

Currently, public water systems serving less than 10,000 persons can use a provision of the Safe Drinking Water Amendments of 1996, known as Interim Monitoring Relief (IMR) which relieves small systems from quarterly monitoring for Synthetic Organic Compounds (SOCs) if they meet certain hydrogeologic and specific historical water quality conditions. The IMR option expires on August 6, 1999, and is to be replaced with new federal regulations on monitoring requirements, known as Alternate Monitoring Guidelines. The Alternate Monitoring Guidelines are expected to be promulgated at the federal level in late 1998 and finalized in 1999. Arizona's intent is to have an Alternative Monitoring Program in place as soon as possible after the federal rules become final. A source water assessment must be completed for an individual PWS before it is eligible for the benefits of Alternate Monitoring Guidelines.

1.3 SURFACE WATER SYSTEMS

Arizona requires every surface water system to filter and disinfect prior to distribution of the drinking water. As a requirement under the Surface Water Treatment Rule, Arizona is required to identify all PWSs that use Groundwater Under the Direct Influence of Surface Water (GUDI). These PWSs, if found to be using GUDI, will have to filter and disinfect their waters as if their sources were surface water. At the time the GUDI rule becomes final, those PWSs that are determined to be under the influence of surface water will be delineated and assessed as surface water.

1.4 DATA MANAGEMENT AND ANALYSIS

Data management bears on virtually all aspects of, and is essential to, the successful accomplishment of source water assessment and subsequent protection programs. The organization, manipulation, analysis and interpretation of pertinent data for the assessment reports will be accomplished primarily through use of a Geographic Information System (GIS) and other analytical tools such as ArcView. Chapter 2 provides more details on SWAP data management.

1.5 SOURCE WATER ASSESSMENT KEY STEPS

The key steps associated with a source water assessment are:

1. Delineation of the boundaries of the source water assessment areas (SWAAs) which are defined as the areas providing source waters to the PWS. The delineated SWAA also defines the zone through which contaminants, if present, are likely to migrate and reach a drinking water well or surface water intake within a specified period of time (Arizona's plan uses a five year time of travel).
2. Determination of the sensitivity of the hydrogeologic setting within the SWAA to the migration of chemicals of concern to a well or surface water intake.
3. Completion of an inventory of Adjacent Land Uses (ALUs) within the SWAA. ALUs are those facilities or land use activities where chemicals or contaminants, regulated under the SDWA are commonly used or present, including Surface Water Treatment Rule and microorganism Cryptosporidium, and excluding those which have no MCL.
4. Conducting an evaluation of each ALU and ranking them based on their Best Management Practices and permitting status.
5. Making a susceptibility determination of each source water based on its overall risk to contamination. The susceptibility determination combines both the hydrogeologic sensitivity evaluation and ALU evaluation within the delineated areas.
6. Making the assessment reports available to the public.

1.6 PUBLIC PARTICIPATION

Public participation is an important component of Arizona's SWAP. By participating in the planning and implementation phases of the assessment process, citizens and stakeholders are able to voice their concerns and express their needs and desires for the

SWAP. Additionally, citizens will obtain useful information regarding their drinking water sources and can utilize this information effectively in their communities. Participation will also provide communities with an incentive to develop locally sponsored source water protection efforts.

Chapter 4 addresses in detail Arizona's public participation strategy. Arizona has employed the use of a Technical Advisory Committee (TAC), a Citizens Advisory Committee (CAC), public workshops and public hearings. Written responses to the public comments made during the development of SWAP plan can be found in the Appendix to this document. Chapter 4 also describes in general how Arizona will disseminate the final assessment results to the public as well as the strategy and priorities of the SWAP's implementation plan.

1.7 Source Water Protection and Remediation Programs

Source Water Protection is a worthwhile endeavor for Arizona. ADEQ has had a United states Environmental Protection Agency (EPA) approved Wellhead Protection (WHP) program for several years as well as numerous other "source water protection" programs. Each of these programs are described in detail in Chapter 5.

1.8 Source Water Assessment Strategic Planning

The SWAP has been integrated into the ADEQ/EPA five year Joint Strategic Plan. This will assure that the program is linked strategically to the other existing and new water quality programs. The strategic plan plays a pivotal role in matching resources with water quality program activities. The Strategic Plan will also serve as a mechanism to evaluate the progress and effectiveness of the SWAP

CHAPTER 2 -- INFORMATION COLLECTION AND MANAGEMENT

2.1 DATA MANAGEMENT AND ANALYSS

Data management and analysis affects virtually all aspects of, and is essential to, the successful accomplishment of SWAP. ADEQ will also use data from other ADEQ programs, other state agencies and federal agencies. Although ADEQ cannot assure all data quality from these other sources, conflicting data from these other sources will be reviewed before completing the assessment reports. ADEQ will provide an opportunity, through its review process, to PWSs, ALUs and the public to provide corrections to any information prior to disseminating the final assessment reports. The review process is described in chapter 5.

2.2 ELECTRONIC DATA ACQUISITION

SWAP will require a variety of data including locations and characteristics of public water supply sources, points of entry, ALUs, and descriptions of watersheds, hydrogeologic settings and aquifer parameters. Much of this required information is available within ADEQ water protection and remedial programs as well as programs within other federal, state, and local agencies. Additional data will be gathered through ADEQ field data collection activities and contractor services.

Locational data is an important aspect of many department programs, such as compliance, enforcement, permitting, sampling, assessments, and others. ADEQ developed an effective Global Positioning System (GPS) program to accurately determine the location of features such as wells and ALUs, consisting of portable receivers and a base station to compute and calibrate locations from signals received from a network of 24 satellites.

2.3 FIELD INFORMATION COLLECTION

Various types of information will be collected in the field. This data includes GPS locations of drinking water wells, points of entry, surface water intakes, and ALUs within the SWAAs. Prior to the field activities, ADEQ will be sending each affected water system a "Source Water Information Form." A copy of this form can be found in Appendix C to this report. The systems will be asked to complete one copy of the form for each well or surface water intake they have. The forms will seek information on the location and identification of each water source, and physical information about the well and its hydrologic setting. Copies of well tests and study results will be requested as well. Field personnel will pick up these forms when they visit the site to do the GPS work. Field personnel will also do a search for ALUs near each source.

2.4 DATABASE INTEGRATION

Many of the databases used by ADEQ reside on stand alone computers, are available only to local workgroups, or use data formats that cannot be accessed or manipulated by ARC/Info or ArcView. Many of these local databases contain information related to ALUs that can be used in the source water assessment process. The department is moving toward the goal of integrating these databases and making them available to all department programs by the implementation of the Arizona Unified Repository Informational Tracking of the Environment (AZURITE) process. AZURITE will not be completed within the time frame required for the implementation of the SWAP. Therefore, the ALU data from each database will be extracted and stored in a GIS compatible format for use in the SWAP.

The data fields in each local database will be identified as to their applicability to the source water assessment process and a subset of the local database fields will be extracted for use with ARC/Info. Important fields include location (latitude/longitude, Universal Transverse Mercator, cadastral), type of facility, and typical chemicals handled or used at this type of facility. If these fields do not exist in the local databases, they will be added to INFO tables created from text files. ADEQ will be able to compile information on all ALUs by accessing local databases or through collection of data in the field.

The most significant ADEQ databases are programmed in Oracle and can be queried by ARC/Info. These databases include the drinking water database, the groundwater database, the drywell database, and the aquifer protection permit tracking database. These databases will not have to be converted to INFO tables to access their data. In addition, these databases are able to house data that will be collected in the field. The groundwater database has tables and fields that can accommodate all well, geologic and hydrologic information required for the source water assessments.

Following field work, each INFO facility table will be updated with locational and ancillary data. New facilities will be added to the duplicate INFO facility table, and well, geologic, and hydrologic data will be added to the existing Oracle databases.

2.5 GEOGRAPHIC INFORMATION SYSTEM USE

The organization, manipulation, analysis and interpretation of pertinent data for the assessments will be accomplished primarily through use of a Geographic Information System (GIS). GIS is a database management system comprised of components for acquiring, processing, storing and managing spatial data and related attribute information on a geographic basis.

ARC/Info and ArcView will be used to help perform the source water assessments. Once geographical locations and ancillary well, geologic, and hydrologic data have been obtained for drinking water wells, surface water intakes, and ALUs, the data will be converted to GIS covers for analysis. Well, geologic, and hydrologic data will be analyzed to determine aquifer sensitivity. ALU data will be analyzed using ARC/Info to determine aquifer susceptibility based on criteria outlined in the site specific assessment. Quality Assurance/Quality Control will be performed by ADEQ staff hydrologists to ensure that the assessments are adequate.

Use of a GIS will also facilitate the presentation and sharing of the assessment reports with stakeholders, the public, and local governments. To provide maximum accessibility and use of data, analyses, and results, all information products will be designed for dissemination in electronic form. The output of a GIS can be tabular and graphic. Access via ADEQ's Internet Home Page will probably be the preferred mechanism of distributing assessment reports in the future. Results will also be made available in hard copy format upon request.

CHAPTER 3 - HYDROGEOLOGIC ASSESSMENT PROCESS

3.1 INTRODUCTION

The hydrogeologic assessment process includes the delineation of the Source Water Assessment Area (SWAA) for a groundwater well or surface water intake, and the determination of the sensitivity of the hydrogeologic setting within the SWAA to the migration of chemicals. Chemicals that may be released from an ALU have the potential to migrate to a groundwater well or surface water intake. For a groundwater well, migration may be restricted by the presence of low conductivity zones within the hydrogeologic setting. All surface waters are considered hydrogeologically sensitive because they are open to the atmosphere, and thus have no protective barrier to the direct introduction of chemicals. The sensitivity assessment process for both ground and surface waters in Arizona were developed based on the specific hydrogeologic conditions existing within the state.

3.2 ARIZONA HYDROGEOLOGIC PROVINCES

Arizona's geography is very diverse and has been subdivided into three hydrogeologic provinces; the Basin and Range, the Plateau Uplands, and the Central Highlands. The provinces, and their corresponding hydrologic conditions, are briefly summarized below. For a map showing the boundaries of each province (see Appendix G).

3.2.1 The Basin and Range Province

The Basin and Range Province makes up the southern portion of the state and is characterized by steep fault-block mountain ranges separated by broad alluvial valleys. The mountains have a general north-to-northwest trend. Altitude of the land surface in the basins' valleys range from less than 150 feet along the Colorado River to over 3,600 feet on the southeastern part of the state. Mountains range from less than 1,500 feet in the southeastern part of the state to over 10,000 feet in the Pinaleno Mountains near Safford. Sediment thicknesses in the center of a basin can range from 1,000 to 10,000 feet. Depth to water can range from near the surface to over 400 feet.

The alluvial sediments contain various thicknesses of gravel, sand, and clay that control conductivities and well yields. Conductivities in gravel and sand zones can be quite high. Coarse-grained strata within the alluvial basins may yield several thousand gallons per minute to individual wells. Silt and clay layers can form low conductivity zones that may also act as confining layers. Wells that penetrate fine-grained strata may yield only a few gallons per minute.

Low conductivity clay and silt layers above an aquifer can protect aquifers from chemicals that are released to the surface or subsurface. However, since clay and silt are deposited by meandering streams, their depositional pattern is often in the form of lenses which may not, in some cases, form a continuous protective layer. Pathways through protective layers can also be created by drilling activities. Caliche soils may also form a barrier to the movement of chemicals. Caliche deposits are formed when calcium carbonate minerals in the near surface are dissolved and reprecipitated in a dense layer below the surface. Caliche deposits can be discontinuous, fractured, or punctured by wells and do not always ensure protection.

3.2.2 The Plateau Uplands Province

Located in the northern part of the state, the Plateau Uplands Province is characterized by thick sequences of flat-lying sedimentary rocks punctuated by volcanic mountain peaks rising to over 12,000 feet. Consolidated sedimentary rocks attain a maximum thickness of more than 10,000 feet. Limestone, dolomite, sandstone, and shale beds are major aquifers in some areas. Alluvial deposits are aquifers only in relatively short reaches of major stream valleys. Volcanic rocks may contain aquifers of local importance. Stream alluvium aquifers exist as thin layers with a shallow depth to groundwater.

Although sandstone and limestone aquifers contain large volumes of groundwater, the yields to individual wells in unfractured rocks are low. Large yields to wells are only obtained from extensively fractured rocks especially along major faults. Such fractured rock terrains typically are not protected from releases of chemicals to the surface or subsurface. Individual wells can range from several hundred to more than 1,500 gallons per minute.

In volcanic terrains, porosity and permeability is determined by such features as lava tubes, flow breccia, rubble, and shrinkage cracks as well as fractures and joints due to regional tectonic stresses. Under such conditions chemicals can travel readily from the surface to impact groundwater resources.

3.2.3 The Central Highlands Province

Located between the Plateau Uplands and the Basin and Range is the Central Highlands Province. The Central Highlands are similar to the Plateau Uplands in that they contain aquifers in consolidated bedrock which yield usable quantities of water only where highly fractured. The mountain masses consist chiefly of dense igneous and metamorphic rocks. Wells located in floodplain alluvium may also yield usable quantities of water, however, such alluvial deposits typically occupy only a thin layer of material with a shallow depth to water. Wells located in fractured bedrock or floodplain alluvial aquifers can be highly vulnerable to releases of chemicals at the surface or subsurface.

3.3 SURFACE WATER SOURCES

Arizona is primarily drained by the Colorado River, which forms the western boundary of the state. Major tributaries to the Colorado River include the Little Colorado, Virgin, Verde, Salt and Gila Rivers. Due to water reclamation and flood control projects, dams now control the flows of the Colorado, Verde, Salt and Gila Rivers. Canal systems have been developed in the central and southern portions of the state to help distribute the stored surface water for eventual use as irrigation and drinking water. The largest canal, the Central Arizona Project, diverts water from the Colorado River at Lake Havasu, and diverts water through Phoenix and south to Tucson. Surface water intakes are located along these rivers, canals, and reservoirs. Other smaller lakes, streams and springs are found throughout the state and are also used as a drinking water source. There are approximately 77 surface water systems in Arizona.

Arizona is divided into surface water hydrologic units (drainage areas) by the US Geologic Survey and each unit is assigned a code. These areas are known as hydrologic unit code areas, or HUCs. There are approximately 85 HUCs within the state and each represents a watershed (see Appendix G).

3.3.1 Surface Water Delineation

The EPA's SWAP Final Guidance recommends that states include in their delineation of their surface SWAAs, all of the drainage areas or watershed upstream of a surface water intake or to the boundary of the state's borders. The HUCs will be used to define the watershed above each surface water intake.

A segmented delineation approach was chosen for surface waters. Segment A is where the ALU inventory will take place. Segment B will be the remainder of the watershed. Segment B will be delineated so that the public will be aware of the boundaries of their watersheds.

3.3.1.1 Rivers, Streams and Canals

Segment A for rivers and streams will be a 500-foot protection zone delineated on each side. In addition, this 500-foot protection zone will extend upstream from the surface water intake including contributing perennial and intermittent tributaries. The upstream delineated area will stop 10 miles upstream or at the state boundary, whichever is closer (See Figure 3.1).

Segment A for canals will also be a 500-foot protection zone delineated on each side. In addition, this 500-foot protection zone will extend 10 miles upstream from the surface water intake or the state boundary. On the other hand, the Central Arizona Project (CAP) canal will not be delineated because it is completely lined. Concrete prevents intrusion of chemicals from

the subsurface. In addition, CAP is built with drainage systems designed to direct stormwater runoff over and away from the canal. However, because Lake Pleasant feeds into CAP canal, Lake Pleasant will be delineated and taken into consideration for all CAP surface water intakes located downstream from Lake Pleasant.

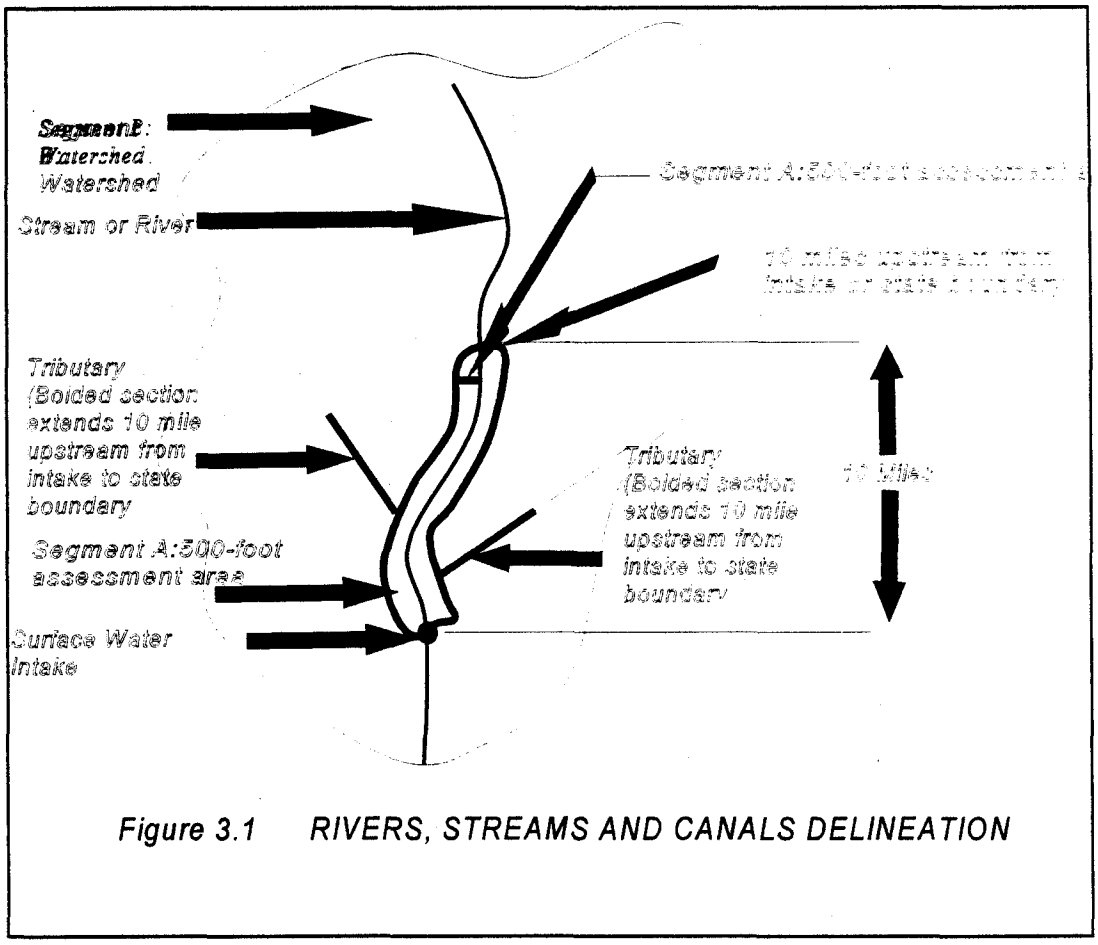


Figure 3.1 RIVERS, STREAMS AND CANALS DELINEATION

3.3.1.2 Lakes and Reservoirs

Segment A will be a 500-foot protection zone delineated around lakes and reservoirs. In addition, this 500-foot protection zone will extend 10 miles upstream from the surface water intake including contributing perennial and intermittent stream(s). The extension upstream of the delineated area will stop 10 miles or at the state boundary, whichever is closer (See Figure 3.2).

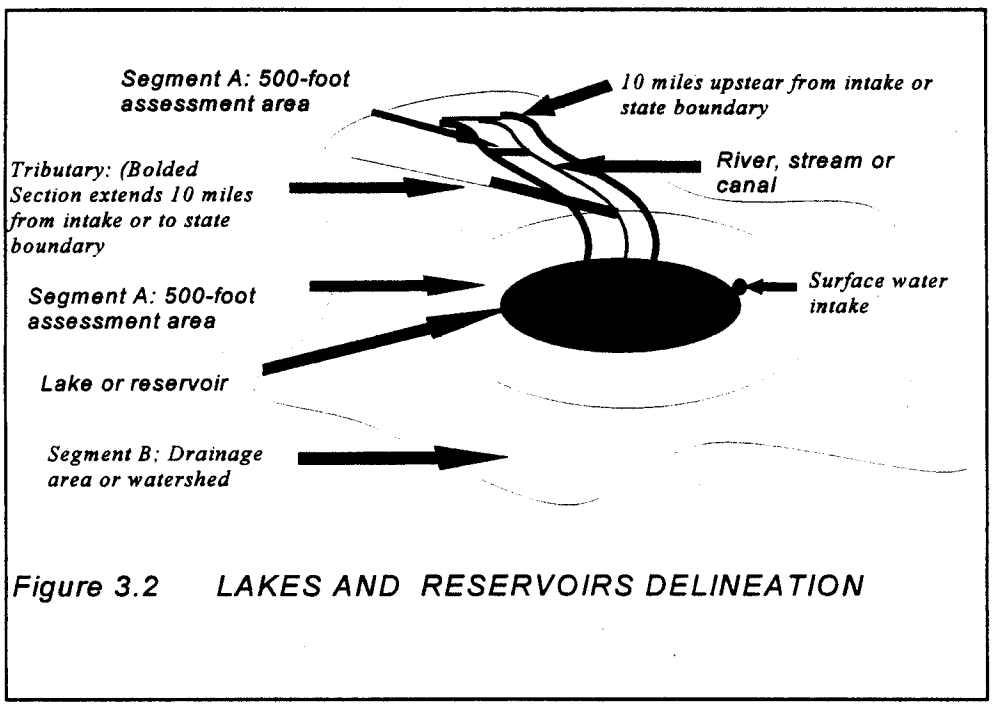


Figure 3.2 LAKES AND RESERVOIRS DELINEATION

3.3.2 Surface Water Sensitivity

Surface water sources are normally open to the atmosphere and are not protected hydrogeologically against chemical spills and runoff. Therefore, all surface water sources are deemed hydrologically sensitive for the purposes of the SWAP.

3.4 GROUNDWATER SOURCES

The majority of the Arizona's drinking water wells are located in the alluvial aquifers located in the southern part of the state. Since most of these wells are also in Active Management Areas (AMAs), it is very likely that enough existing hydrogeologic data will be available to delineate SWAAs using the methods described below. Since EPA guidance for SWAP recommends the department to use existing data to perform the assessments, staff will not collect new field data in regards to aquifer characteristics except for establishing well locations (latitude and longitude) with global positioning equipment. All of the aquifer data will be collected from either existing sources or reported by the well owner.

3.4.1 Groundwater Source Delineation

Groundwater source water areas are considered either non-sensitive or sensitive. Each type will be delineated differently.

3.4.1.1 Non-Sensitive Groundwater Sources Delineation

PWS wells that are determined to be non-sensitive will have a minimum delineated SWAA. The delineated SWAA will be defined by a 100-foot radius around the well (See Figure 3.3). In no case will a well have a source water boundary closer than 100 feet from the well. The rationale for the 100-foot distance is based on current ADWR and ADEQ rules which a 100-foot setback from a drinking water well (regardless of the "sensitivity" of the aquifer).

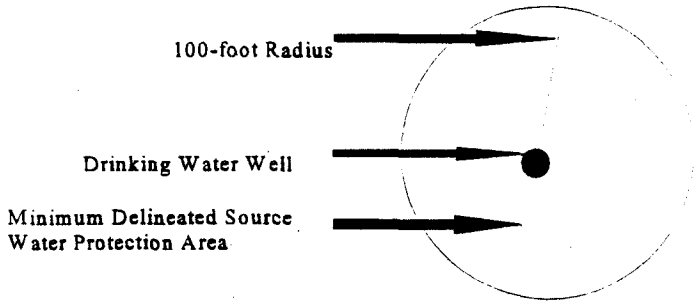


Figure 3.3 MINIMUM GROUNDWATER SOURCE DELINEATION

3.4.1.2 Sensitive Groundwater Sources Delineation

The department will use three methods to delineate sensitive SWAAs for PWS wells. These methods are listed in preferred order of use:

1. Wellhead Protection Area (WHPA) Model
2. Calculated fixed-radius equation
3. Site specific delineation of hydrogeologically complex areas.

Each method will be discussed below, identifying data parameters along with the accepted sources of information. All delineations for groundwater sources will be based on a 5-year time of travel, which is consistent with Arizona's Monitoring Waiver Program.

For transient non-community (TN) water systems that are determined to be sensitive, only the calculated-fixed radius will be used to delineate the source water assessment area. TNs are only required to monitor for nitrates and biological parameters.

3.4.1.2.1 Wellhead Protection Area Model

The most preferred groundwater delineation method is the WHPA, a computer model developed for EPA. WHPA will be used only when site specific hydrogeologic information or information from Arizona Department of Water Resources (ADWR) AMA models and Assured Water Supply Files are available.

The WHPA employs the uniform flow equation to calculate a down-gradient null-point from a pumping well and the lateral boundary of flow. The up-gradient limit of flow is calculated using a particle-tracking technique that calculates a time-related distance along a set of flow lines. This method gives a representation of the capture zone of a well assuming a homogeneous aquifer. The result is an elongated oval (as compared to a circle for the fixed-radius method) that is oriented in the up-gradient direction of groundwater flow relative to the well.

Regardless of the distance calculated for the boundary of the source water assessment area using this method, the boundary will never be closer than 100 feet from the well.

The input parameters or information required for the WHPA model are: annual pumpage, hydraulic gradient, porosity, transmissivity, and aquifer thickness (actual input is the length of the screen interval open to saturated sediments). The sources for this information will generally be as follows:

Annual Pumpage: The amount of groundwater pumped during the last year. This can be obtained from either DWR or the public water provider.

Hydraulic Gradient: The majority of this information will be taken from the most recent water table contour map available for the area.

Porosity: In the absence of site specific porosity values (which would be rare for this parameter), estimated porosity values will be used from the ADWR AMA ground water models or a value of 0.15 will be assigned and used for all of the wells where an ADWR model data do not exist.

Transmissivity: The key input parameter to the model is transmissivity (T). To achieve an estimate for T within the desired one order of magnitude, a modification of the Jacob equation, Q/s=T/2000, will be used, where Q is the equilibrium pumping rate of the

drinking water well, and s is the drawdown in the well measured at the above Q. Q/s is a quantity known as the specific capacity of a well and is a commonly used measure of a well's efficiency. Many PWSs routinely collect and store specific capacity data on their wells. This data can be either found in or estimated from the Source Water Assessment Form (See Appendix C) and/or existing ADWR and USGS publications.

If site specific data are not available (such as test data from ADWR Assured Water Supply or USGS files), then transmissivity values from the ADWR AMA ground water models will be used. If outside of an AMA, transmissivity values from aquifer tests within one mile of the well may be used if appropriate. If site specific data or model transmissivity values are not available for the well, then the source water protection area will be delineated using the calculated-fixed radius equation.

3.4.1.2.2 Calculated Fixed-Radius.

This approach involves determining a circular boundary around a well based on minimal subsurface information. The radius delineates a volume of water that will reach a well in a given period of time. This method will be used when sufficient data to support the use of the WHPA model are not available for the well.

The calculated fixed-radius equation is as follows:

$$r = \sqrt{(Qt/\pi nH)}$$

Q = well's discharge in cubic feet per year
t = time of travel in years
π = 3.1416
n = aquifer porosity (dimensionless)
H = screen length (length open to saturated sediments) in feet
r = radius (defines the boundary of the delineated source water protection area in feet around the well)

This equation produces a circular delineated source water area with the well located in the center. This method needs limited hydrologic data, is relatively quick and easy, and inexpensive. Although not as precise as the WHPA model, it is more precise than an arbitrary fixed-radius model. The values for the parameters of well discharge, aquifer porosity and screen length would be obtained through the same methods as described for the WHPA model above. The calculated fixed-radius delineation method will be used if a reasonable estimate of average yearly pumping data can be obtained. Half-mile fixed-radius (similar to Figure 3.3) will be used only if no

pumping data are available. The half-mile fixed-radius was derived from the calculated fixed-radius using the following assumptions:

Q = 1000 g.p.m. = 7.03 x 10^7 cubic feet/year
t = 5 years
n = 0.15
H = 100 feet
π = 3.14159

$$r = \sqrt{\frac{7.03 \times 10^7 \times 5}{3.14 \times .15 \times 100}} = 2,732 feet$$

3.4.1.2.3 Delineation of Hydrogeologically Complex Settings

Some wells may be located in hydrogeologic settings where the application of the WHPA model, or the calculated fixed-radius equation is either impossible or inappropriate. These wells may be located in hydrogeologically complex areas such as volcanic, karst, fractured rock where transmissivities may be quite rapid over large areas. For those types of situations, the source water area delineation will be based on a delineation of the entire geographic boundary of the specific hydrogeologic terrain. Documentation will be provided as to how the delineated area was developed. These more difficult hydrogeologic settings will have to be dealt with on a case-by-case basis.

3.4.1.2.4 Use of Other Methods

Delineations of SWAAs are not limited to the above methods. If a PWS has existing delineations based on the use of a method of equal or greater sophistication , such as a numerical model, and can document adequate supporting data, then ADEQ will accept such information from the PWS for the delineation.

3.4.2 Sensitivity Determination

A sensitivity determination consists of examining the hydrogeologic characteristics of the source, groundwater quality, and the well's physical integrity. Based on the review, the groundwater source is determined to be either sensitive or not sensitive based on the criteria discussed below.

3.4.2.1 Hydrogeologic Characteristics

Subsurface information is reviewed to determine if the hydrogeology provides a barrier to the migration of chemicals to a PWS well. For wells located in an alluvial basin, an adequate hydrogeologic barrier includes the following for the well to be considered not sensitive:

1. At least a minimum of a combined total of 50 feet of clay between the surface and the top of the screened interval or perforated casing interval; and.

2. Evidence that the clay extends beyond the delineated area.

The 50-foot layer of clay was derived from the following formula: d = Kit

d = distance traveled
K = 0.03 feet/day
t = 5 years = 1.825 days
i = 1
d = 0.03 x 1 x 1.825 = 54.7 feet

The presence of the hydrogeologic barrier will be determined from one of the following:

1. A hydrogeologic report(s) or cross-section of a basin or sub-basin containing the delineated area compiled by either the USGS and/or ADWR;

2. A hydrogeologic report(s) or cross-section of a basin or sub-basin containing the delineated area provided by the PWS. This report must be prepared by a qualified licenced professional demonstrating the existence of a hydrogeologic barrier; or

3. Drillers' logs or other professionally prepared geologic logs. If the public supply well is located in the central valley fill portion of an alluvial basin, there must be at least one geologic log at the public supply well and another near the up-gradient boundary of the SWAA that demonstrates a continuous hydrogeologic barrier in order for the area to be considered non-sensitive.

If the PWS well is located in the margin of the basin where a continuous protective layer cannot be determined, then the SWAA will be considered sensitive.

For wells located in non-alluvial settings, the hydrogeologic setting may be reviewed on a case by case basis. This is necessary because of the diverse hydrogeologic conditions found

throughout the state. If no subsurface information exists, the PWS well will be considered sensitive.

3.4.2.2 Water Quality

A groundwater source will be automatically determined sensitive if the PWS's monitoring results have detected manmade contamination in the past three years regardless of the presence of a protective layer. The above detection levels are defined to be greater or equal the Drinking Water reporting levels and less than half the drinking water MCL for the chemical detected. Manmade contamination excludes any naturally occurring contamination such as fluoride or arsenic.

3.4.2.3 Well's Physical Integrity

Each PWS well's physical integrity will be reviewed based on its most recent Sanitary Survey Inspection. A well will be considered sensitive regardless of the presence of a protective layer or the lack of manmade chemical detection if the sanitary survey shows that the well is vulnerable to contamination. Only those items on the Sanitary Survey Form that are highlighted (See Appendix C) will be used to make this determination. Items such as direct openings into the well will cause an otherwise non-sensitive aquifer to be considered sensitive for the purposes of the SWAP.

In summary, a groundwater source will not be determined sensitive, by ADEQ in its initial assessment, if all four of the following conditions exist:

1. There is a hydrogeologic barrier of at least a minimum of a combined total of 50 feet of clay between, the surface and the top of the screened interval or perforated casing interval, or other identified protective layer;

2. There is evidence that the 50-foot clay or other protective layer extends throughout the delineated area;

3. No manmade contamination has been detected in the past three years based on the detection defined above in Section 3.4.2; and

4. The well must have passed the highlighted items on the most recent Sanitary Survey inspection which relates to the well's integrity (See Appendix C).

If a PWS well does not meet one of the above listed conditions, then its SWAA will be considered sensitive.

3.4.3 SWAP Information Form

A questionnaire was developed with the assistance of the Sub-TAC (See Section 6.2.1.1), which requests information pertaining to the drinking water well(s) (See Appendix C). This questionnaire has been sent to PWSs and the information received will be used to help delineate the SWAAs.

3.4.4 Proposed Data Reliability and Order of Use

Since many sources of information will be used for this program, the following guidelines will need to be developed in regards to the order of use for delineating the source water protection areas. The department will use the data sources in the following order:

1. Compliance Data from the Water Supplier: The department will use compliance data from the water supplier that is supplied to a state or federal agency as required by law. [An example of this type of data is the annual pumpage amounts reported to the Arizona Department of Water Resources (ADWR) for wells located in Active Management Areas(AMA).]

2. Site Specific Data for the Well: The department will use information for field checked wells from the databases of ADWR, USGS and ADEQ; other reliable state and federal files, or any consultant reports prepared and submitted on behalf of the well owner.

3. Hydrogeologic Parameters: The department will use estimates of transmissivity, hydraulic conductivity and other parameters from ADWR AMA ground water models.

4. Construction Information: The department will use construction information from Driller's Reports filed with ADWR (35 and 55 files when matched to the drinking water well).

5. Reported Data: The department will use reported data from the water supplier in absence of any other available data.

3.5 Ground Water Under the Direct Influence of Surface Water

Groundwater under the direct influence (GUDI) of surface water is defined in current drinking water rules. The GUDI rule will outline the process for making determinations of suspected GUDI sources at which time those sources will be delineated as surface water source including the associated groundwater SWAA(s). The delineation for groundwater under the influence of surface water will encompass the upstream delineation of the adjacent surface water source as

well as the delineation of the groundwater source by whatever groundwater delineation method is most appropriate as previously described in Section 34.

A number of water systems have been identified as having one or more sources that are potentially GUDI. A drinking water rule that sets the standard for the final determination on the basis of microscopic particulate analysis or another industry approved is in the final stages of adoption. Once this rule is in place, ADEQ will commence the final determinations for the suspected sources. The GUDI determinations may be made prior to commencing source water assessments.

3.6 WATER SOURCES ORIGINATING OUTSIDE ARIZONA

As mentioned in Section 3.3.1., watershed drainage areas will be delineated up to Arizona's state boundaries. Arizona received a federal grant from EPA to facilitate the exchange of information and delineation as well as assessment methods among Arizona and its neighboring states (California, Nevada and Utah) which share interstate source waters of the Colorado River Basin. A kickoff workshop is scheduled in June 1999 in San Francisco, California to initiate this project. The outcome of this project will be included in Arizona's assessments as appropriate.

In the case of the international boundary with Mexico, Arizona has ongoing participation in the EPA's Border XXI Program through ADEQ's Border Program. The quality of cross-boundary surface and groundwater has been a major topic of discussion in Border XXI. ADEQ will continue to coordinate international water quality issues with Mexico through its Border Program and utilize all water quality studies developed by the Border Program in the SWAP.

CHAPTER 4-- SUSCEPTIBILITY ANALYSIS PROCESS

4.1 ADJACENT LAND USE INVENTORY

ADEQ along with Arizona's Technical and Citizen Advisory Committees define an ALU as any facility or activity where chemicals or contaminants; regulated under the Safe Drinking Water Act and have MCLs, regulated under Surface Water Treatment Rule, and Microorganism Cryptosporidium, are commonly used or present. The list of ALUs and associated chemicals regulated under the SDWA is provided in Appendix H. The inventory of ALUs will be conducted only in the specific areas previously mentioned in the discussions of Delineation.

All groundwater PWSs in Arizona are required to monitor monthly for bacteria and annually for nitrate. In addition, Community and Nontransient, Noncommunity PWSs are required to monitor every three years for VOCs, SOCs, and IOCs; and every four years for radio-chemicals. All surface water PWS are required to monitor monthly for bacteria, quarterly or annually for nitrate, annually for IOCs, once every three years for VOCs and SOCs and every four years for radio-chemicals. Appendix D lists regulated chemicals (VOCs, SOCs, and IOCs) for which PWSs are required to monitor, their possible origins, and their corresponding EPA Testing Methods. The susceptibility analysis will focus on the above chemicals and pathogens excluding those which do not have MCLs.

4.1.1 Use of Existing Databases

Where possible and useful, appropriate portions of existing program databases listed in Table 4.1 will be used as sources of information for SWAP. Where possible, the databases will be presented in their native format and sorted to allow easy access to the information. The databases will be used initially to determine the presence of the facilities within the SWAAs and information on ownership, formal addresses, phone numbers, identification numbers, and facility activities. Other information might be available in the databases such as history of release, permitting status and use of Best Management Practices. Additional information which might be useful during the inventory or the susceptibility analysis will be accessed as needed.

TABLE 4.1 Databases

Database Name	Database Content
Drinking Water Database	Drinking water systems
Hazardous Waste List	HW generators and permitted facilities
Emergency Response System	Emergency response incidents

Database Name	Database Content
ACIDS	Site assessments for superfund/WQARF
Fields	Tracks fields where bio-solids is applied
Solid Waste Facilities	Inventory of solid waste facilities
Underground Storage Tank	Inventory and history for USTs
Concentrated Animal Feeding Operations	Feedlots
Pesticide Operations	Pesticide applications
ADWR Well Registration List	Well lists
Groundwater Basin Summaries	Characterizes groundwater conditions for basins
APP Facility Information System	All facilities in the APP program
Water Body System	Surface water assessment of reaches & lakes (1)
Right-to-Know *	Inventory of hazardous chemicals in AZ.

* From Arizona Emergency Response Commission
(1) Ambient water quality data will be used whenever possible

4.1.2 Use of Global Positioning System

Global Positioning System (GPS) equipment will be used to accurately determine latitude and longitude for each drinking water source and each ALU. GPS equipment used will be compatible with the department's GPS base station and processing software. The horizontal datum NAD 27 will be used to collect the GPS locational data.

4.2 SUSCEPTIBILITY DETERMINATION

A susceptibility determination assesses the risk that ALUs might pose to a drinking water source. The susceptibility determination consists of examining the hydrogeological settings (sensitivity determination) of the source water supplying drinking water to the PWS, as described in Chapter 3, along with evaluating ALUs (ALU evaluation) which are located within the SWAAs.

The ALU evaluation will center around only those ALUs where chemicals or contaminants, regulated under the SDWA are commonly used or present, including Surface Water Treatment Rule and microorganism Crytosporidium, and excluding those which have no MCL. ALUs will either have a high or low rating. In addition, the susceptibility determination will be established on chemical groups. Therefore, based on the ALU ratings, a source water may be susceptible to one chemical group such as VOCs and not susceptible to a different chemical group such as SOCs. Furthermore, if historical water quality within the last three years reveals there is

contamination of a chemical above the trigger level, that source water will be deemed automatically susceptible to that contaminant. Trigger level is defined as a level of contamination equal to or greater than ½ MCL.

4.2.1 Adjacent Land Use Evaluation

The evaluation of an ALU will consist of examining its permitting compliance and/or status, use of best management practices, and remediation status of any reportable releases or spills which occurred within the last three years.

Low: Includes a facility that has not had a reportable release or spill of a regulated chemical under the SDWA within the last three years or a facility that had a reportable release or spill of a regulated chemical within the last three years but has remediated that release or spill AND

(1) The facility is required to have a permit and is in compliance with the permit;
(2) The facility is required to have a permit and does not have a permit but has best management practices in place and is in the process of obtaining a permit; OR
(3) The facility is not required to have a permit but has best management practices in place.

High: Includes a facility that

(1) has had a reportable release or spill of a regulated chemical within the last three years and has not remediated that release or spill;
(2) is required to have a permit and has a permit but is not in compliance with its permit; or
(3) is required to have a permit but has no best management practices in place nor is a permit in process.

The conceptual process of the ALU evaluation is summarized in Tables 4.2 below.

Table 4.2: ALUs Evaluation Conceptual Process

Adjacent Land Use Evaluation			
Permit in compliance, Permit in Process and/or BMPs in Place	Historical Reportable Releases or Spills	Reportable Releases or Spills Remediated	Adjacent Land Use Rating
Yes	Yes	No	High
Yes	Yes	Yes	Low

Adjacent Land Use Evaluation			
Permit in compliance, Permit in Process and/or BMPs in Place	Historical Reportable Releases or Spills	Reportable Releases or Spills Remediated	Adjacent Land Use Rating
Yes	No	N/A	Low
No	Yes	Yes	High
No	Yes	No	High
No	No	N/A	High

4.2.2 Linkage of Sensitivity Determination and ALU Evaluation

The rating of the ALU evaluation will be combined with the sensitivity determination of the drinking water source, both of which will result in the final susceptibility determination. The department will review the sensitivity determination and the rating of the ALU evaluation and make a final susceptibility determination, as illustrated in Table 4.3 based on the following scenarios:

1. If a source water is determined to be hydrogeologically sensitive, the final susceptibility determination will have the same rating as the ALUs evaluation ratings. For example, if the rating of an ALU is low, the risk it poses to drinking water source will be low, or if the rating of an ALU is high, the risk it poses to drinking water source will be high.

2. If a source water is determined to be not sensitive, the final susceptibility determination will be low regardless of the ALU rating. For example, if the rating of an ALU is high, the risk it poses to drinking water source will be low.

However, regardless of the sensitivity determination, if an ALU is located within 100-foot radius from a source water, the ALU will then be determined to pose a high risk to the source water. The 100-foot set back is consistent with ADWR and ADEQ's Drinking Water Regulations. An ALU will be considered to be located within the 100-foot radius from a source water only if a specific activity or facility where chemicals regulated under the Safe Drinking Water Act are commonly used is located within the 100-foot radius. In other words, an ALU will be within the 100-foot radius from a source water only if a chemical storage or handling area, a waste storage or handling area, or other similar activity is located within the 100-foot radius. The conceptual process of the overall susceptibility determination is summarized in Table 4.3 below.

Table 4.3: Susceptibility Determination Conceptual Process

		Adjacent Land Use Evaluation				Susceptibility	
Source Water	Specific Adjacent Land Use	Permit in compliance. Permit in Process or BMPs in Place	Historical Reportable Releases or Spills	Releases or Spills Remediated	Adjacent Land Use Rating	Hydrogeology Sensitivity	Risk to Source Water
Well 1	Gas Station	Yes	Yes	No	High	Yes	High
	Dry Cleaners	Yes	Yes	Yes	Low	Yes	Low
	Service Shop	Yes	No	N/A	Low	Yes	Low
Intake 1	Ranch	No	Yes	Yes	High	Yes	High
	Feedlot	No	Yes	No	High	Yes	High
	Mine	No	No	N/A	High	Yes	High
Well 2	Gas Station	Yes	Yes	No	High	No	Low
	Dry Cleaners	Yes	Yes	Yes	Low	No	Low
	Service Shop	Yes	No	N/A	Low	No	Low
Well 3	Mine	No	Yes	Yes	High	No	Low
	Landfill	No	Yes	No	High	No	Low
	Gas Station	No	No	N/A	High	No	Lo

4.3 Final Source Water Assessment Reports

The assessment reports for each PWS will be in a format easy to read and understand by the average citizen. The narrative will be designed with the assistance of public information experts to ensure the public is made aware of the assessment without being unnecessarily alarmed.

The package will consist of one or more maps illustrating water sources used by each PWS as well as the ALUs located within each SWAA(s). In addition to the map(s), the package will also include a description of the SWAA(s), the watershed (for surface water sources), and the assessment reports in a matrix format. The matrix will show each well or surface intake, each ALU within the SWAA(s) and the outcome of the susceptibility determination as shown in Table 4.3. Additionally, the package will describe the role of permits, best management practices, and provide specific guidance on interpreting assessment reports.

Prior to making any assessment reports available to the public, ADEQ will send the preliminary assessment reports as a draft to all appropriate PWSs and ALUs. This notice will allow PWSs and associated ALUs to either agree with the department's decision and prepare for inquiries from the public or request for a review of the draft preliminary assessment reports in accordance with the review process set forth in Chapter 5 prior to public dissemination.

CHAPTER 5--REVIEW PROCESS

5.1 ASSESSMENT REPORTS REVIEW PROCESS

The department will identify the preliminary assessment reports as a draft document and send copies of it to the appropriate PWSs and ALUs prior to dissemination to the public. Any PWS or ALU may file a request for review of the reports within 30 days after receipt of the draft preliminary assessment reports. The request for review shall be in writing and shall specify which portions of the draft preliminary assessment reports are being disputed and the nature of the dispute. The request for review may include whatever documentation (e.g., site-specific hydrogeological study) is necessary to support any requested changes to the draft preliminary assessment reports. If a request for review is filed, the department and the requestor will have 90 days from the time the request is filed to resolve the request. Additional supporting documentation may be submitted by the requestor at any time during the first 45 days of the 90-day review.

The review process may result in the following modifications to the draft preliminary assessment reports:

1. Changing the sensitivity determination of a source water if a site-specific hydrogeological study, prepared by a qualified licensed professional, reveals that the hydrogeological setting adequately protects the aquifer against any release, at the ground surface, of any regulated chemical for five years,

2. Changing the ALU ranking from higher susceptibility to lower susceptibility if the ALU meets the conditions of lower susceptibility as described in Chapter 4,

3. Removing an ALU from the map if the ALU does not exist in the SWAA(s), and/or

4. Removing an ALU from the map if a site-specific hydrogeological study, prepared by a qualified licensed professional, reveals that the 5-year time of travel zone of contribution excludes that ALU.

When the department reviews the documentation submitted by the requestor and makes changes, as appropriate, to the draft preliminary assessment reports, the assessment reports will become final. The department will then notify the appropriate PWS and ALUs of the final assessment reports and then disseminate the assessment reports to the public. If the requestor still disagrees with the department's final decision, the requestor may appeal the department's decision under Arizona's Administrative Procedures Act.

5.1.1 Sensitivity Determination Review Process

5.1.1.1 Surface Water

Surface water sources are normally open to the atmosphere and are not protected hydrogeologically against any spill. Therefore, all surface water sources are deemed hydrologically sensitive and their sensitivity determination cannot be appealed.

5.1.1.2 Groundwater

For sensitive groundwater sources, a PWS or an associated ALU may show, through a hydrogeological study or report prepared by a qualified licensed professional, that the source water is located in an area that has an adequate hydrogeological barrier. An adequate hydrogeological barrier must include at least:

1. A significant presence of suitable geologic media between the ground surface and the portion of the well casing that is (or can be) in hydraulic communication with the aquifer which will protect the aquifer from any chemical spill or release at the ground surface for five years, and

2. The above geologic media also must extend beyond the SWAA and/or be of sufficient lateral extent to protect the well.

5.1.2 Adjacent Land Use Evaluation Review Process

The ALU can either be removed from the assessment reports or its evaluation modified based on the information provided to the department. The review process may result in the following modifications:

1. Changing the ALU ranking from higher susceptibility to lower susceptibility if the ALU meets the conditions of lower susceptibility as described in Chapter 4,

2. Removing an ALU from the map if the ALU does not exist in the SWAA, and/or

3. Removing an ALU from the map if a site-specific hydrogeological study, prepared by a qualified licensed professional, reveals that the five year time of travel zone of contribution excludes the ALU.

5.2 FINAL ASSESSMENT REPORTS

When the department reviews the documentation submitted by the requestor and makes changes, as appropriate, to the draft preliminary assessment reports, the assessment reports will then become final. The department will then notify the appropriate PWS and ALUs of the final assessment reports and then disseminate the assessment reports to the public as described in Sections 4.3 and 6.2. This advance notice will allow the PWS and associated ALUs to prepare for inquiries from the public. If the requestor still disagrees with the department's final decision, the requestor may be able to appeal the department's decision under Arizona's Administrative Procedures Act.

CHAPTER 6 -- PUBLIC PARTICIPATION

6.1 PUBLIC PARTICIPATION, ASSESSMENT RESULTS DISSEMINATION, AND IMPLEMENTATION SCHEDULE

ADEQ conducted an extensive public participation process for the Source Water Assessment Program. The goal of public participation is: 1) to solicit public input on Arizona's source water assessment program approach and 2) to make the citizens of Arizona aware of the value and the need for Source Water Assessment and Protection. Efforts toward the second goal above will be concentrated primarily during the time when the completed assessment reports are being distributed to the public.

6.2 PUBLIC PARTICIPATION

Arizona's public participation strategy included three major components: 1) convening separate technical and citizens' advisory committees; 2) conducting statewide public workshops in Tucson, Flagstaff, and Phoenix; and 3) conducting four public hearings at locations around the state. Presentations on SWAP were also conducted at professional organization meetings, the state councils of governments, Water Quality Management Working Group, and other forums in the course of ADEQ's ongoing outreach efforts.

6.2.1 ADVISORY COMMITTEES

Members to the Technical Advisory Committee (TAC) and Citizens Advisory Committee (CAC) were recruited from a broad range of individuals and organizations. These included members of the engineering community, major water suppliers (e.g. Salt River Project, the Central Arizona Water Conservation District (Central Arizona Project), municipal water utilities and public works departments, private water companies and utility associations, the United States and Arizona Geological Surveys, the Arizona Medical Association, the Natural Resource Conservation Service, county and city environmental services departments, the Arizona Department of Health Services, Tribal representatives, the Inter-Tribal Council of Arizona, Councils of Governments, the Bureau of Reclamation, the American Cancer Society, the Arizona Public Health Association, AIDS Project Arizona, the Arizona Association of Community Health Centers, the American Heart Association, American Rivers, Motorola, and private citizens. ADEQ initially called potential participants to confirm participation. Numerous groups were invited to participate in the SWAP development process and some chose not to participate.

There was some overlap in the backgrounds and/or interests of members in the TAC and CAC. The differences can be characterized as follows: the TAC membership emphasized water providers, engineers, and government representatives; CAC membership generally emphasized public health advocates and citizens. Committees were kept informed of the work progress of the other. In April 1998, both committees convened jointly to review the content and status of the latest draft SWAP. At that meeting both committees agreed that further meetings were not required for development of the SWAP. Some members did agree to assist, without formal meetings, in reviewing and commenting on some of the final details of the SWAP.

Although members of selected groups were asked to participate on the advisory committees, any person or group who expressed interest in participating in these advisory committees was encouraged to do so. Schedules for advisory committee meetings are provided in Appendix I. Key issues raised during advisory committee meetings are summarized in the responsiveness summary provided in Appendix L. The department convened both Committees, in January 1999, one more time before finalizing the plan and submitting it to EPA.

6.2.1.1 TECHNICAL ADVISORY COMMITTEE

ADEQ established the TAC to provide recommendations and advice concerning the technical aspects of the SWAP. The TAC is primarily composed of hydrologists, engineers, geologists and scientists. The final list of TAC members is provided in Appendix J. Although the TAC was originally scheduled to meet three times (October 15, November 12, and January 12), an additional meeting was conducted on December 16 at the request of the TAC. Each meeting lasted approximately three hours. Because of the extensive public comments received during the public hearing comment period, ADEQ convened a joint meeting with both committees to review the proposed changes.

During the initial meetings, ADEQ introduced members to SDWA and Source Water Assessment provisions of the SDWA and the proposed strategies for accomplishing the source water assessment. Prior to the later meetings, when draft versions of the SWAP were available, copies were sent to the members for review prior to the subsequent meetings. ADEQ also elicited committee members' advice regarding the technical feasibility and effectiveness of the state's approach. Members consulted with ADEQ as the plan was being developed and also when various drafts of the SWAP were completed. A sub-TAC was formed, mainly consisting of hydrologists and geologists, to address specific technical issues and details which were presented to both committees each they met.

6.2.1.2 CITIZENS ADVISORY COMMITTEE

ADEQ established the Citizens Advisory Committee (CAC) to provide recommendations and advice concerning the practicability, desirability and appropriateness aspects of the SWAP. This diverse committee was also to advise ADEQ regarding how SWAP could be used in the transition to the local SWPPs. In addition, this committee may assist in generating interest among citizens and trigger SWPP efforts at the local level.

The CAC is primarily composed of members from target groups representing public health, vulnerable populations, businesses, local governments and public interests. The final list of CAC members is provided in Appendix K. The CAC was originally scheduled to meet three times (September 18, November 17, and January 15). Each meeting lasted approximately three hours. Because of the extensive public comments received during the public hearing comment period, ADEQ convened both committees to review the proposed changes.

6.2.2 PUBLIC WORKSHOPS

ADEQ held three statewide public workshops to present the SWAP provisions of the SDWA, the draft strategy for accomplishing the source water assessment, and to solicit comments from the public on Arizona's approach. ADEQ invited approximately 2,000 persons statewide to the public workshops. This included EPA's original stakeholder list, all water systems owners/operators, town planners and mayors, all county officials, and others who have indicated interest in the process. In addition, ADEQ announced the workshops through a press release. Attendance at the public workshops varied widely between a dozen and four dozen people.

6.2.3 PUBLIC HEARING

After the statewide public workshops and the numerous advisory committees meetings, ADEQ completed the second draft SWAP, at which point ADEQ conducted a public hearing to obtain comments on Arizona's approach. Notice of the public hearing was mailed to the same groups who were invited to the public workshops. In addition, legal notices were published in statewide newspapers and other publications. Further, ADEQ announced the public hearing through a press release. The public hearing responsiveness summary appears before the meetings/workshops responsiveness summary in Appendix L.

6.2.4 OUTREACH EFFORTS

In addition to the advisory committees, ADEQ conducted a general public information campaign, including statewide meetings and other program outreach efforts. Meeting announcements were widely distributed, along with pertinent information which consisted of an executive summary and an explanation of the key elements of the SWAP provided in Appendix E. ADEQ participated in informal meetings and attended other statewide functions in an effort to provide information about the SWAP such as the Arizona Water Pollution Control Association annual conference. In addition, ADEQ published articles on the SWAP in ADEQ's newsletter, Splash. All the SWAP information (draft plan, executive summary, responsiveness summaries, schedule of meetings, etc...) was also made available to the public on ADEQ's website (www.adeq.state.az.us). The Internet information also includes contact persons' names, addresses and Internet addresses, so that interested parties may send or call in their comments directly to ADEQ.

6.2.5 PUBLIC AWARENESS CAMPAIGN

In addition, ADEQ has received a federal grant to increase public participation and awareness of the source water assessment results notification and distribution process. The project will serve to increase public participation through radio and television announcements. In addition, ADEQ will develop and distribute window posters announcing location and availability of the assessment results. This task force will also increase the availability of the final assessment results themselves by not only using public libraries but also utility offices, legislative offices, council of governments offices and other available and appropriate distribution channels.

6.2.6 RESPONSIVENESS

Public responses to key program issues were documented during all advisory committee meetings, public workshops, public hearing and other outreach events. These issues included:

1. Use of the half-mile fixed radius
2. Information from PWSs
3. Sensitivity determinations
6. ALU determinations
5. Ranking of ALUs
6. Dissemination of the assessment results
7. Assessment review process

8. Updating of assessment reports

The state provided direct responses, when possible, to questions raised during public meetings. These and other written comments are summarized and addressed in the responsiveness summary provided in Appendix L.

6.3 ASSESSMENT REPORTS DISSEMINATION

The assessment results for each PWS will be in a format easy to read and understand by the average citizen. The narrative will be designed with the assistance of public information experts to ensure that the public is alerted to the issues without being unnecessarily alarmed.

The package will include the purpose of the source water assessment, and one or more maps illustrating sources of water used by the PWS. For each source, it will describe the corresponding delineated area, the associated ALUs, and the assessment results indicating to which contaminants the source has been determined to be susceptible, and specific guidance on interpreting results.

Prior to making any assessment reports available to the public, ADEQ will send the preliminary assessment reports as a draft to all appropriate PWSs and ALUs. This notice will allow PWSs and associated ALUs to either agree with the department's decision and prepare for inquiries from the public or request for a review of the draft preliminary assessment reports in accordance with the review process set forth in Chapter 5 prior to public dissemination. PWSs mat choose to use the assessment reports finding in Consumer Confidence Reports.

The assessment results will be distributed to the public via two or more of the following ways:

1. Direct mail, upon request
2. From ADEQ's website in summary lists
3. From the water supplier
6. Regional ADEQ offices
5. Public libraries
6. County health departments or ADEQ offices

Notice of availability of the results will be provided by one or more of the following means:

1. News release
2. Announcement published on the ADEQ's website
3. Notification from the water supplier in conjunction with periodic billing.

6.4 Implementation Schedule

There are 1,721 regulated PWSs in Arizona, of which 1,679 serve populations less than 10,000 and 62 serve populations more than 10,000. Approximately 120 PWSs are classified as consecutive water systems because they purchase finished water from other providers. Consecutive water systems are not required to monitor. ADEQ is not required to perform a Source Water Assessment on these systems. Appendix F provides the number of these PWSs categorized by source (groundwater or surface water) and service type (community, transient, noncommunity, and nontransient, noncommunity) in each county of Arizona.

A brief, simplified description of the service type is as follows:

Community -- covers service to permanent residents in their homes (795 systems)

Transient, noncommunity -- covers service to travelers at their stops in transit (660 systems)

Nontransient, noncommunity -- covers service to permanent residents at other than their homes, such as schools or workplaces with their own water supplies (225 systems)

When the amount of water drunk at home is compared to the amount drunk at work or while traveling. The water drunk at home is more significant than the water drunk while traveling. This is also reflected in the chemicals testing performed each type of water under the regulations. The water drunk while traveling is not tested for as many chemicals as the water drunk at home. SWAP takes this into consideration. If the regulations do not require a test for a particular chemical, the ALUs where that particular chemicals is commonly used will not be identified.

6.5 Other Regulatory Concerns Impacting Source Water Assessment

Since Arizona's Interim Monitoring Relief will expire on August 6, 1999, ADEQ will attempt to complete the assessment for PWSs (community and nontransient, noncommunity) serving less than 10,000 people by the above date in order to qualify

them for the Alternative Monitoring program. Assessments for the remaining PWSs are scheduled to be completed within two years after the EPA's approval of the SWAP. More time will likely be needed to complete these assessments due to the number of water sources in Arizona and therefore, when ADEQ submits the plan to EPA, it will request an 18-month extension from USEPA Region IX.

CHAPTER 7 -- ADEQ'S SOURCE WATER PROTECTION

As mentioned in Chapter 4, ADEQ will make the assessment results available to the public. ADEQ's intent is to make local citizens and officials aware of the current status of their drinking water sources with regards to adjacent land use. Further, this information will assist them to adequately plan future land use and zoning and initiate source water protection through ADEQ's Wellhead Protection program (WHPP). WHP staff will conduct outreach activities throughout the state promoting WHPP in mayors, city/town planners, and city/town councils conferences.

In addition, Table 7.1 below lists ADEQ's various protection programs which will help the SWAP identify the ALUs and provide active source water protection through the source water protection mechanisms.

7.1 WELLHEAD PROTECTION PROGRAM

The WHPP is a voluntary program with many similarities to the SWAP. With two major exceptions, all elements of SWAP are included in WHPP. First, SWAP also covers surface water sources. Second, the SWAP is a mandatory program requiring state implementation whereas the WHPP program is entirely voluntary for any water system. The WHPP is an ongoing independent program which will be able to use the contaminant source inventory and susceptibility analysis generated within the Source Water Assessment Program to replace similar activities in the WHPP. The WHPP is initiated with local public participation and may culminate in local zoning and other control programs developed to control sources.

Because WHPP is not a mandatory program, local officials may develop any variation of the program without seeking ADEQ approval. The state stands ready to encourage local WHPP development, provide technical assistance, and provide approvals for local action.

The Arizona WHPP is an EPA approved program. Locally developed plans will be reviewed to determine if they meet the needs of the source water assessments. Where possible, these plans will be used in place of the source water assessments as the EPA SWAPP Final Guidance stipulates. ADEQ will continue providing assistance to new and ongoing local wellhead protection activity.

The WHPP will continue during and after the source water inventories are completed. The completed assessment reports will be used to encourage local communities to develop wellhead programs.

Table 7.1: Source Water Protection Programs and Related Activities

Program Name	Helps Identify ALUs	Provides Active Protection	Source Water Protection Mechanism
Wellhead Protection Program	X		Provides guidance and technical assistance on wellhead protection .
Aquifer Protection Program	X	X	Regulates amount of discharge by facilities.
Storm Water Dry Wells	X	X	Registers dry wells, can require Best Management Practices.
Waste Water Reuse	X	X	Permits regulate where reuse can occur.
Waste Water Construction and Subdivision Approvals		X	Construction approvals assure that source water is protected.
Recharge Permit Certification	X	X	Requires recharge to occur where source water cannot be contaminated.
National Pollution Discharge Elimination System (NPDES)	X	X	Requires permits for discharges to surface water. State program does preliminary review for EPA permit.
404 Permits		X Surface Water Sources Only	Requires certain activities to comply with surface water standards.
Underground Storage Tanks	X	X	Requires Best Management Practices.
Water Quality Assurance Revolving Fund	X	X	Actively promotes cleanups, assesses sites in health priority basis.
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)	X	X	Actively promotes cleanups based on EPA requirements. Requires structured approach to site evaluation, inspection, and remediation of chemical contaminations.
Resource Conservation and Recovery Act (RCRA)	X	X	Requires the proper handling and disposal of hazardous waste.
Watershed Framework	X	X	Addresses water quality issues on a geographical area. Encourages a prevention approach between communities and regions.
Pesticides Contamination Program	X	X	Develops the groundwater protection list which restricts the sale and use of pesticides that have the potential to impact groundwater.
Nonpoint Source (NPS)	X	X	Develops Best Management Practices for various nonpoint pollution sources, develop rules for nitrogen discharges.
Total Maximum Daily Loads (TMDLs)	X	X	Requires that the Total Maximum Daily Load be established that a water body can absorb and still meet designated uses.

7.2 WATER PERMITS PROGRAMS

A primary goal of the Federal Source Water Assessment Program is to lead states toward the development of Source Water Protection programs. Since 1984, Arizona has administered state programs for the protection of its groundwater (drinking water). The

Environmental Quality Act (EQA) of 1986 strengthened Arizona's commitment to source water protection in Arizona.

The SWAP and SWPP will help validate and strengthen Arizona's existing source water protection program. ADEQ issues permits to ensure that public health and the quality of groundwater and surface waters are protected. This involves a review of permit applications for technical appropriateness and consistency with statutes, rules, and guidance.

State permit programs include the following:

- Aquifer Protection Permits (APP)
- Clean closure approvals (part of APP program)
- Wastewater reuse
- Wastewater construction and subdivision approvals
- Stormwater dry well registration
- Recharge permit certifications (permits by Arizona Department of Water Resources)

ADEQ also provides support for the following federal programs where the state does not have primary authority:

- National Pollutant Discharge Elimination System (NPDES)
  - NPDES wastewater
  - NPDES stormwater

- 404 Permits
  - Individual permits
  - Nationwide permits (general permits)

7.2.1 Aquifer Protection Permits and Clean Closure Approvals

The Groundwater Quality Protection Permit program was replaced by a more comprehensive Aquifer Protection Permit program when new rules were developed in 1989. ADEQ is mandated to permit all existing discharging facilities by 2001.

Aquifer Protection Permits are issued when there is a discharge to the land surface, underlying soil, or groundwater and there is a reasonable probability that the pollutants discharged could impact groundwater. Among covered facilities are new and existing mines, industrial facilities and drywells, wastewater treatment plants, and surface

impoundments. All permits require an evaluation of the best available demonstrated control technology (BADCT) to ensure that aquifer water quality standards will not be violated or that the aquifer will not be further degraded.

A "clean closure approval" requires that groundwater will not be impacted, leaching of pollutants will not occur, and that there will be no violations of aquifer water quality standards. These approvals are based on an evaluation of hydrogeologic site characteristics, facility design and operation, treatment methods, and evaluation of analytical data that supports a clean closure. Concentrations of pollutants that may remain in place must be below all applicable regulatory levels.

7.2.2 Storm Water Dry Well Registration

To date, since the EQA established the program in 1986, over 14,000 storm water dry wells have been registered in Arizona. ADEQ receives requests for registration for an average of 150 to 200 dry wells each month. Registration information is reviewed and additional information is often requested to determine if an APP is required when dry wells are in industrial areas where hazardous substances are used, stored, loaded, or treated. Best management practices are used to ensure that no hazardous substances enter the dry wells. The program also oversees dry well investigations and closures.

7.2.3 Wastewater Reuse

Permits are written to regulate the reuse of reclaimed domestic wastewater for irrigation of landscaping, crops, etc., and encourage consumptive reuse of wastewater as a resource while ensuring the protection of Arizona's source waters and the public health. This program has been in effect since the Environmental Quality Act of 1986. ADEQ receives approximately 40 applications for reuse permits or renewals each year.

7.2.4 Wastewater Construction and Subdivision Approvals

Approvals to construct wastewater facilities and subdivisions are issued by ADEQ to ensure the protection of public health, safety, and the environment, including source water protection. The proposed plans and specifications must comply with ADEQ sanitation rules, engineering guidelines and policies. In addition, approvals to operate are issued following construction to ensure that the facilities are constructed in accordance with the approval to construct. An average of 350 Approvals to Construct are issued each year. In addition 60 to 80 subdivision approvals are issued each year.

7.2.5 Recharge Permit Certifications

APPs are written to allow for the recharge of treated wastewater. Approval is based on a finding that the project will not cause contaminants to be leached from the vadose zone, or cause a plume to migrate. ADEQ also requires a monitoring plan for this type of operation.

Most of the water that serves to recharge groundwater resources is not wastewater. This water is surface water from reservoirs and water transported from the Colorado River by the Central Arizona Project canal. While this type of recharge is exempt from APP requirements, the ADWR permits this type of recharge, and ADEQ certifies the permits. Certification is based on a finding that the project will not cause contaminants to be leached from the vadose zone, or cause a plume to migrate. ADEQ also reviews and approves the monitoring plan. The two agencies work together to provide source water protection in this area to ensure that water quality is protected while adequate water supplies are protected for future generations.

7.2.6 Wastewater NPDES

Because Arizona does not have primacy for the NPDES program, EPA issues all NPDES permits. However, ADEQ drafts the majority of permits and certifies all of them. NPDES permits are issued for five years. Approximately 35 permits are being renewed each year, while about seven permit applications are received for entirely new discharges. By controlling the quality of discharges to surface water, the program helps protect the waters for use with groundwater recharge or for use as drinking water.

7.2.7 Storm Water NPDES

More than 3,300 facilities are currently authorized to discharge storm water in Arizona. Although EPA issues the storm water permits to safeguard water quality standards ADEQ conducts a Clean Water Act certification on NPDES permits. A separate Clean Water Act certification process is required for individual permits and municipal permits for all cities with populations greater than 100,000.

The state cooperates with EPA on both the regional and national levels regarding compliance and programmatic issues. Outreach is provided across the state to industrial associations and governmental entities.

7.2.8 404 Permits

ADEQ approves Section 401 Certificates to assist the U.S. Army Corps of Engineers to accomplish either individual Section 404 permit or Section 404 nationwide permit issuance. The purpose of state certification is to ensure that activities requiring a 404 permit comply with surface water quality standards. An average of 174 applications for 401 Certificates are reviewed annually by ADEQ.

7.3 UNDERGROUND STORAGE TANKS

ADEQ is the lead agency for the implementation of both the underground storage tank (UST) and the leaking underground storage tank (LUST) programs statewide. ADEQ registers all USTs subject to Subtitle I jurisdiction; collects UST fees and excise tax; develops state regulations, policies and guidance for both programs; conducts release detection and tank upgrades, installation, and closure inspections; conducts state-lead cleanups and oversees cleanups by responsible parties and volunteer parties; and enforces leak detection, financial responsibility, and LUST regulatory requirements. The UST section is tracking 8,000 registered underground storage tanks and 6,288 confirmed LUSTs. The LUST program is currently managing 1,060 groundwater impacted sites and 5,228 facilities with petroleum hydrocarbon contaminated soil.

The department adopted the groundwater protection list (GPL) for soil remediation levels. The vadose zone and saturated flow models were developed to be protective of groundwater. This direction is consistent with the source water protection goals.

7.4 WATER QUALITY ASSURANCE REVOLVING FUND

The mission of the Water Quality Assurance Revolving Fund (WQARF) Program is to safeguard public health, protect the environment, and restore natural resources through investigation, management, and remediation of soil and/or groundwater that is contaminated with hazardous substances.

Through the WQARF Program, ADEQ identifies, assesses, and cleans up soil and groundwater contaminated with hazardous substances. The program conducts these efforts statewide with support from state funds and oversees privately funded cleanup efforts.

Although WQARF is a remediation program rather than a protective program, some aspects of the program serve to protect source water supplies. Specific revisions to the program were intended to encourage cleanups. Remedial actions to control, contain, and

remove contaminants from groundwater, surface water, and soils can result in protection of identified susceptible water supplies. One provision of the statute allows water providers to request early action by ADEQ to address the loss or reduction of available water for a particular use that may include well replacement, water treatment, or providing an alternative water supply.

7.5 SUPERFUND (CERCLA)

ADEQ performs work on remedial projects governed and funded by the federal Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), commonly known as Superfund. Superfund sites posing the greatest threats to human health and the environment are placed on the National Priority List (NPL). There are twelve NPL sites in Arizona, including three military sites under U.S. Department of Defense jurisdiction.

The remediation programs maintain lists of sites that will assist in the identification of ALUs for the susceptibility and sensitivity assessment of SWAP. Facilities or sites with known or suspected releases of hazardous substances appear on CERCLA's NPL or the WQARF Priority List (to be replaced by a more comprehensive site registry per new statute). Facilities or sites shown on the ACIDS (Arizona CERCLA Information and Data System) list (a state-operated database) were evaluated under the "preliminary assessment" program. Sites suspected of contamination received site inspections to establish existence of contamination.

7.6 RESOURCE CONSERVATION AND RECOVERY ACT

ADEQ is authorized to administer its Hazardous Waste Program under the federal Resource Conservation and Recovery Act (RCRA) program in lieu of EPA. The Hazardous Waste Program: permits facilities that treat, store or dispose of hazardous waste; inspects generators, transporters and treatment, storage and disposal facilities to ensure the safe handling and proper recycling of hazardous wastes; performs compliance and enforcement actions to ensure hazardous waste management facilities comply with state rules and standards; and gathers and reports information needed to regulate the generation, transportation, storage, treatment and disposal of hazardous wastes.

7.7 WATERSHED

ADEQ has been pursuing a shift to watershed-based environmental management in recognition that water quality issues within a single watershed should be approached in a coordinated manner. The goal is to integrate ADEQ regulatory, monitoring, and planning

efforts with those of other government agencies and the needs of communities within the watershed.

Key elements of the watershed approach include partnerships among water suppliers, consumers, industries, government agencies, and local communities with a common geographic focus.

Although the time frames for implementation of SWAP and watershed are not compatible, data collected as part of the SWAP as well as the assessment results will be made available to ADEQ groundwater and surface water monitoring and assessment programs. The watershed boundaries defined by the Watershed Program will be helpful in the final surface water source delineations.

7.8 PESTICIDE CONTAMINATION PROGRAM

The Pesticide Contamination Prevention (PCP) Program was implemented as part of the Environmental Quality Act (EQA) on July 1, 1987. The goal of the Pesticide Contamination Prevention Program is to protect and prevent the state groundwater resources from contamination brought about by agricultural use of pesticides. The goal is achieved by the following components in the Arizona Revised Statutes (ARS):

1. Data call-in review and approval process- Agricultural pesticide registrants are required to submit information on product chemistry and environmental fate of pesticide active ingredients to ADEQ for review and approval prior to registering the pesticide products with the Arizona Department of Agriculture.

2. Specific Numeric Values (SNVs)- The establishment of the SNVs for the mobility and persistence parameters for the purpose of generating the Groundwater Protection List (GWPL).

3. Groundwater Protection List (GWPL)- GWPL is a list of agricultural pesticide active ingredients which may have the potential to pollute the state groundwater resources. GWPL is generated by comparing the mobility and persistence characteristics of pesticide active ingredients with the SNVs establishedpreviously. These pesticides are subject to sale and use restrictions that are listed on the pesticides label.

4. Monitoring - Groundwater and soil in the state are routinely monitored for pesticide active ingredients on the GWPL. If the detection is confirmed and determined to be associated with agricultural activities, compliance/enforcement processes will be initiated.

The Pesticide Contamination Prevention program conducted several studies throughout the state and currently maintains a database of pesticides application (past and present) as well as water quality obtained through sampling conducted in various locations of the state. The information compiled in the PCP database will be processed through GIS to produce maps that show where pesticides, regulated under Arizona's Drinking Water rules, are or have been applied statewide. This will help determine susceptibility.

7.9 NONPOINT SOURCE

Over the past 25 years, Water Quality Program activities and resources have been primarily focused on point sources of pollution. While these efforts have resulted in significant improvements, Arizona's waters are still being impacted by nonpoint sources of pollution. Nonpoint sources are now considered the single largest cause of water pollution in the nation. The U.S. EPA recently indicated that approximately 75 percent of the nation's current water quality degradation is now attributable to nonpoint sources of pollution. Arizona's State Management Plan (SMP) II reflects the identified numbers of NPS activities/facilities which have reasonable probability to discharge NPS pollutants into Arizona's surface and groundwater resources. These activities/ facilities are increasing annually, but are summarized for the onset of SMP II in Table 7.2 below.

Arizona's water quality standards have been adopted by the state (A.A.C. R.18.11-101 et. seq.) and are reevaluated every three years. Arizona currently enforces water quality standards for NPS activities which cause exceedences. The NPS program will share its information with the SWAP to determine the ALUs.

Table 7.2: Non Point Activities in Arizona

Facility Type	Number of Facilities	%
Onsite wastewater treatment facilities	257,444	67.08%
Active/inactive mining	95,103	24.78%
Sand and gravel materials sources	8,400	2.19%
Irrigated agriculture	8,100	2.11%
Silviculture	6,276	1.64%
Other agriculture (aquaculture, grazing, CAFOs)	6,102	1.59%
Recreation	1,335	0.35%
Landfills	413	0.11%
Sand and gravel operations	300	0.08%
Nonpoint source urban runoff	300	0.08%
TOTAL	383,773.00	100.00%

7.10 Total Maximum Daily Loads

The Clean Water Act requires states to identify and list lakes, rivers, and streams that do not meet water surface quality standards. For each of those water bodies, a state is required to establish a total maximum daily load (TMDL) for each non-attainment pollutant at a level needed to ensure that water quality standards are met. A TMDL is the amount of pollution a water body can absorb and still support uses such as drinking water, aquatic life, and recreation. TMDL issues are critical to source water assessments and protection. The TMDL program will be sharing information about ALUs with SWAP.

7.11 Land Use Planning and Zoning

Land use planning and zoning is a county and local municipality function. The federal and state governments have no authority over land use planning and zoning in Arizona. However, ADEQ will make the assessment results available to the municipalities and counties with zoning authority as required by the 1996 SDWA amendments. The department is confident that the assessment results will encourage and result in source water protection at the local level critical to the protection of drinking water source, and it

will be important to integrate water quality issues and concerns into the land use planning processes. County and local governments will need to be involved in the challenging roles that lie ahead.

Examples of critical land use issues with potential water quality impacts include both point and nonpoint pollution sources. Landfills, for instance, may present a threat to groundwater quality. Underground storage tanks, industrial areas, wastewater treatment plants, and septic systems are also potential sources of pollution. Local governments and counties have the authority to protect water resources through comprehensive plans and ordinances. Land use planning can prevent pollution by incorporating safeguards into the zoning laws and development review processes. In addition, planning can be helpful in limiting the siting of potentially polluting land uses in high risk areas.

Zoning is used to control development within a jurisdiction. By dividing areas into districts, future land uses can be regulated. Water resources can be protected by providing proper zoning for land uses.

ADEQ is optimistic that SWAP will lead to a better understanding of the impacts of land use and development on water quality. With this valuable information agencies will be better able to define land use planning strategies that will help to prevent negative impacts and protect water quality.

CHAPTER 8 -- SOURCE WATER ASSESSMENT AND OTHER DRINKING WATER PROGRAMS

8.1 ROLE OF THE MONITORING ASSISTANCE PROGRAM

In its 1997 and 1998 regular sessions, the Arizona Legislature passed into law the Small Water Systems Bill which authorizes establishment of a monitoring assistance program. The program is currently under development, and will be known as MAP (Monitoring Assistance Program).

Under MAP, ADEQ contractors will monitor chemicals on behalf of small water systems. The program covers all synthetic organic chemicals, all volatile organic chemicals and all inorganic chemicals except asbestos, copper, lead, nitrates and nitrites. All other monitoring requirements remain the responsibility of the water supplier. The program will be supported by fees which will be assessed to water systems on the basis of meter or service connection size. Participation in the program is mandatory for water systems serving 10,000 or fewer persons and optional for larger systems. Implementation of the MAP is projected to begin in January 1999.

The scheduling of source water assessments for systems will be driven primarily by a combination of the MAP and the requirements of interim monitoring relief (IMR). In Arizona, water systems are assigned a specific monitoring year. Under MAP, ADEQ plans to sample each system during its monitoring year. The IMR program authorized small water systems, for a three-year period from August 6, 1996, to August 6, 1999, to replace the normal requirements of four sets of quarterly samples at each point of entry (POE) with a single set if that set results in no detects and is taken during the part of the year that represents the water system's highest susceptibility to contamination. ADEQ plans to make maximum possible use of this opportunity and will schedule sampling for systems with variable susceptibility in their season of highest risk.

8.2 ROLE OF COMPLIANCE ASSISTANCE

ADEQ's compliance assistance will include four components:

1. ADEQ inspectors conducting sanitary surveys, construction inspections or responding to complaints, will provide technical and compliance assistance upon request to the extent consistent with their mission.

2. The Program Development and Outreach Unit (PDOU) of the Drinking Water Section offers compliance assistance as one of its primary missions. Since 1991,

it has jointly sponsored 10-25 seminars and workshops each year geared toward owners and operators of small water systems. Sponsoring partners have included the Arizona Corporation Commission, which regulates investor-owned utilities, and the Arizona Small Utilities Association, a chapter of the National Rural Water Association. Seminar topics have included explanations of rule packages, monitoring requirements and upcoming new developments in the regulatory arena that will affect them.

3. In 1996, ADEQ inaugurated a small business compliance assistance program modeled after Illinois' successful program. Small businesses, those with 20 or fewer employees, can approach ADEQ staff assigned to this program and request an audit of its operation to identify any compliance problems. As long as the proprietor makes a good faith commitment to correct any problems identified in the audit, administrative enforcement action by ADEQ may be discretionary. Most small water systems qualify for this program.

4. In authorizing the state Revolving Loan Fund provision in the 1996 Safe Drinking Water Act Reauthorization, Congress also authorized a number of set-aside opportunities for states to tailor to fit their own needs in implementing the Act. One of those set-asides allows the use of up to two percent of the funds from the SRF grant for technical assistance. Arizona plans to take full advantage of this set-aside. Half of the set-aside from the FY 97 grant (one percent) and all of the set-aside from subsequent years (two percent) will be passed through to third-party providers of technical assistance. ADEQ anticipates that this assistance will consist of a mix of classroom instruction, remote assistance via telephone and on-site assistance, either on request or via a circuit-rider program. Implementation is scheduled for early 1998.

The Source Water Assessment and Wellhead Protection staff have participated during several of "On the Road Programs" and have made themselves available for presentations before various interested groups. The SWAP and WHPP staffs will continue to be available as technical resources for the above programs in addition to providing technical assistance as permitted under the Safe Drinking Water Act Reauthorization.

8.3 Role of Alternative Monitoring

Alternative monitoring, formerly referred to as permanent monitoring relief, is still under development at the ~~national~~ federal level. It will address options for providing reduced monitoring opportunities to qualifying water systems. EPA expects to issue final regulations in 1999. As proposed, alternative monitoring will take three forms:

1. Monitoring waivers
2. Surrogate sampling
3. Reduced nitrate sampling

It is anticipated that qualifying criteria in the final rule will include, at a minimum, a set of satisfactory initial monitoring results and completion of the source water assessment for the qualifying water system. ADEQ plans to qualify as many water systems as possible for alternative monitoring during the IMR period by completing source water assessments for these systems.

8.4 Role of Monitoring Waivers

Arizona currently has an approved waiver program under existing EPA waiver guidelines. Approximately 100 waivers have been issued to date. ADEQ is planning a major expansion and anticipates greatly increasing the number of waivers granted. Key provisions in the expansion include:

1. Granting waivers on ADEQ initiative rather than waiting for the PWSs to request them;

2. Issuing area wide waivers;

3. Issuing automatic inorganic waivers when three sets of analyses meet the Maximum Contaminant Level (MCL).

ADEQ plans to review available occurrence and use data with the goal of qualifying as many water systems for applicable area wide waivers prior to implementation of the Monitoring Assistance Program to minimize the collection of unnecessary samples and reduce the cost of the program. Data collected through the source water assessment effort will be used to identify additional water systems that can qualify for waivers in the ensuing round of sampling.

8.5 Role of the Groundwater Disinfection Rule

Arizona is a stakeholder in the national EPA Groundwater Disinfection Rules workgroup. The workgroup goal is to develop susceptibility criteria and guidance to be used by states to determine when a groundwater well serving drinking water is susceptible to microbial contamination and has to be disinfected. The workgroup has been studying the issue for over a year and has been waiting also for the Disinfections By-products Rules Workgroup to finish their studies.

GWDR workgroup members have been looking at susceptibility criteria not dependant on microbial results alone. A nationwide trial review process has just been completed where systems throughout the United States were chosen for the study. The participating states looked at several categories of susceptibility and ranked them as high, medium, or low risk, using the draft proposed criteria scoring system. Unfortunately, because Arizona does not meet the criteria for statewide implementation of wellhead protection areas, Arizona was eliminated from selection for the trial run. However, Arizona was chosen to help with the trial run of reviewing and ranking the systems using the draft proposed risk factors. The statistics from this trial run will be compiled to see if there is consistency in ranking between states' programs. If not, other criteria or a revision of the current process will occur. If all the states agree on the ranking of systems in this trial run, then the criteria will be refined and used to begin the development of guidance for the future development and promulgation of the GWDR.

There are several national workgroups for federal rules with related topics that need to be kept informed of the requirements being recommended by the other workgroups. The following workgroups or rules teams have been established to deal with issues related to source water and susceptibility criteria:

- Groundwater Disinfection Rule Workgroup
- Enhanced Surface Water Treatment Rule Workgroup
- Groundwater Under the Direct Influence of Surface Water
- Disinfection By-Products Workgroup
- Information Collection Rule
- Source Water Assessment Workgroups
- Wellhead Protection Programs

8.6 Role of Surface Water Treatment Rule

ADEQ implemented the surface water treatment rule in Arizona on June 23, 1993. All surface water systems in Arizona must filter and disinfect prior to distribution. No exceptions are allowed. Further, public water systems using wells whose source of water has been determined to be under the direct influence of surface water must also install filtration and disinfection treatment. Most of Arizona's PWSs have been evaluated and been found not to have groundwater under the direct influence of surface water based on general site characteristics. Regulations identifying technical criteria to evaluate those wells where there is a strong possibility of surface water influence are being developed. Arizona has actively solicited the participation of stakeholders in the process of developing this rules package.

ADEQ's Drinking Water Program, located at the agency's main facility, will remain responsible for insuring the compliance with primacy requirements contained in 40 CFR 142. The implementation of the Surface Water Treatment Rule, the Enhanced Surface Water Treatment Rule and the Groundwater Under the Direct Influence of Surface Water criteria are an ongoing process in Arizona. All surface water systems have been identified and have filtration and disinfection or are on a schedule to install filtration and disinfection, as approved by the department. Those systems not complying with the surface water treatment rule fall under the compliance and enforcement policy of the agency.

8.7 Role of Groundwater Under the Direct Influence of Surface Water Rule

After a number of attempts to administratively define a process for determining if a well is delivering groundwater under the direct influence of surface water, ADEQ is now defining the process by rule. As a result, Arizona did not meet the 1994 deadline for completing these determinations for community water systems. ADEQ has, however, identified those sources that are suspected of being GUDI. After passage of this rule, ADEQ intends to conduct the GUDI evaluation of the suspected sources in conjunction with the source water assessment and plans to complete the GUDI determinations for all community and nontransient, noncommunity water systems by the 1999 deadline for the non-transients. Once a source has been identified as GUDI, the source water assessment for that source will be conducted using the protocol for surface water sources.

8.8 Role of Sanitary Surveys

In the past, sanitary surveys have mainly concentrated on operational and maintenance condition of the water system's physical facilities and on compliance with certain preventative requirements contained in Arizona's drinking water rules. The sanitary survey model which has been embraced by EPA for a number of years also includes elements of source water assessment and susceptibility analysis. Arizona concurs with the EPA model and this initiative gives the department an opportunity to migrate toward it. ADEQ plans to involve the sanitary survey inspectors in the source water assessment process. Any additions to the normal procedures will be done routinely through the sanitary survey process.

CHAPTER 9 -- ASSESSMENT PROGRAM PLANNING AND FUNDING

9.1 SOURCE WATER ASSESSMENT PROGRAM STRATEGIC PLANNING

ADEQ developed its strategic plan to coordinate the Source Water Assessment Program with a wide range of existing and new program activities. The Monitoring Assistance Program (MAP) is an example of a new ADEQ initiative which will serve the broad goals of the Drinking Water Program and, at the same time, provide valuable information for source water protection efforts. The Source Water Assessment Program will continue to play an important role in the new federal options and requirements, such as alternative monitoring, the groundwater disinfection rule (GWDR), and the enhanced surface water treatment rule. This section describes ADEQ's plans to implement these varied activities by carefully designing our strategic plan and integrated workplans to take advantage of these new opportunities and to make the best use of our resources.

9.2 SOURCE WATER ASSESSMENT DELEGATION AGREEMENT

At this time, existing delegation agreements with Maricopa and Pima counties may be used where possible to facilitate the assessment of PWSs in their counties. In other counties with delegation agreements, technical staff are not tasked with comprehensive responsibilities for source water assessments but may be asked to assist within the limits of their authority.

9.3 COORDINATION WITH NEIGHBORING STATES AND TRIBES

ADEQ was awarded a $20,000 pilot project grant by EPA to coordinate common goals of SWAP as it relates to the Colorado River with our neighboring states of California, Nevada, Colorado, and Utah. Obtaining concurrence on the methodology and information sharing of the respective state SWAPs for this major surface water source will provide a common approach for all state source water assessments. EPA will continue to facilitate interstate teleconferences and meetings. Further, ADEQ will be attending regional meetings offered by EPA to address interstate issues and how these issues can be resolved.

Although Congress never allocated resources for Native American tribes to conduct source water assessment, Arizona recognized that SWAAs may extend into tribal lands and therefore has requested assistance from EPA Region IX to coordinate with all reservations in Arizona. In addition, several Native American tribal organizations have responded to ADEQ's invitation and have been participating as members of our TAC.

ADEQ will offer assistance to the tribes in completing their SWAs should they establish similar programs.

9.4 COORDINATION WITH OTHER FEDERAL PROGRAMS

Arizona has actively participated with the EPA and other states to coordinate with federal agencies in their role as sources of information for local and state wide studies. ADEQ has been working with the U.S.G.S. to provide assistance during implementation of the SWAP. Several federal programs have been participants on our advisory committees. Until further guidance is provided, ADEQ will rely on existing contacts within other federal programs to access assistance where possible. In addition, federal agencies own and operate approximately 135 PWSs in Arizona. The department will assess these PWSs will be assessed using the same standards as used for other private and government PWSs.

9.5 FINANCING SWAP WITH STATE DRINKING WATER REVOLVING FUND

The 1996 Amendments to the Safe Drinking Water Act include authorization for the drinking water state Revolving Fund (DWSRF). In Arizona, the SRF is administered through the Water Infrastructure Fund Authority (WIFA). According to the act and consistent with EPA's guidance, states may set aside up to 10 percent of their DWSRF allotments for assessments for public water systems. This set-aside for delineations and assessments is only available from the FY 97 capitalization grant. ADEQ plans to utilize the full 10 percent set aside ($1,690,000) for this purpose. These funds must be obligated within four fiscal years after receipt of the grant from EPA. The DWSRF federal funds enabled ADEQ to hire additional staff to immediately initiate technical work required under SWAP.

9.5.1. State/Federal Funding

State funds currently directed toward assessment, planning and drinking water programs will continue to be used to the extent possible, to support this new effort. Much of the up-front work in development of the SWAP and the public participation activities have been funded by existing state and federal funds. Appropriate portions of the state's performance partnership grant have also been directed toward this program. In addition to the pilot project for Colorado River States, ADEQ has been granted a $10,000 grant for public education. ADEQ is also pursuing other possible funding sources under the Clean Water Action Plan.

9.5.2 ADEQ SWAP Workplan

ADEQ has developed a draft three-year workplan for SWAP. The workplan in its current form includes the following main products: (1) public participation strategy (see Chapter 4), (2) SWAP plan submittal to EPA, and (3) the assessment priority list.

The department will first assess community and nontransient, noncommunity PWSs that serve less than 10,000 people; second, community and nontransient, noncommunity PWSs that serve more than 10,000 people, and; third, all transient PWSs. The order is based on a combination of public health risk and giving community and nontransient noncommunity PWSs that serve less than 10,000 people the opportunity to qualify for Alternative Monitoring Guidelines.

9.5.3 Intended-Use Plan

In September, 1997, a draft Intended Use Plan (IUP) was developed and distributed to a large audience statewide. The plan indicated the amount and purpose for each set aside under the DWSRF. Public hearings were conducted and comments received on the IUP. In October 1997, the Water Infrastructure Finance Authority (WIFA) approved the final IUP which was then submitted to the EPA, Region IX. The intended use plan is an annual activity.

9.6 Update Source Water Assessment Program

Congress did not intend SWAP to be an ongoing program. The primary goal of this federal program is to encourage local citizens to use available SWA information to establish local source water protection or wellhead protection programs. As a result, continuous funding for SWAP was not established. This plan does not anticipate the possibility of state or federal funding for updating source water assessment reports as new wells are added to the PWS or new sources of contamination are discovered. Reevaluation of delineated areas, contaminant inventories susceptibility analysis, and protection programs can be conducted with local resources based on locally accepted standards. The ADEQ Wellhead Protection Program continues to be funded, and will be available to provide technical assistance and encouragement when a local community or public water system expresses interest in establishing a source water protection program.

9.7 Reporting Progress to EPA

Upon approval of the Source Water Assessment Plan, ADEQ will prepare the first report to EPA containing information identified in the final guidance documents. This will

include the numbers of public water supplies identified as groundwater, surface water, or combined, including the population served. At the end of the first year, ADEQ will report, using the above three categories, the number of completed delineations, source inventories, and susceptibility determinations. In addition, ADEQ will provide information concerning how local assessment reports have been made available to the public. The second year report will duplicate the categorical content of the first year report. Subsequent reporting will depend on resource availability and level of ongoing activity.

CHAPTER 10 -- IMPLEMENTATION OF A VOLUNTARY SOURCE WATER PROTECTION PROGRAM

A voluntary Source Water Protection Program (SWPP) offers a public water system or community an opportunity to expand on the work done for the initial drinking water source assessments.

The goal of a local SWPP is to identify, develop and implement local measures that advance the protection of the drinking water supply. A local program should maximize the use of existing data and develop more detailed information, drawing on local knowledge.

The following steps are recommended for Public Water Systems or communities that choose to implement a voluntary Source Water Protection Program.

- Review the state's Wellhead Protection Program
- Establish a local advisory committee
- Review the Source Water Assessment prepared by ADEQ for the public water system and determine if and where to expand and improve it. Activities that may be appropriate include:
    - Gather additional site-specific hydrogeologic information and other relevant data
    - Revise delineations of the original assessment area and zones, if necessary
    - Refine and update contaminant activity inventory
    - Review vulnerability analysis, based on hydrogeologic conditions and nature of specific contaminants
    - Prioritize the contaminant activities that need to be studied more closely based on vulnerability
    - Prepare reports and maps
- Develop protection program based on original or revised assessment

- Submit protection program (and revised assessment, if appropriate) to ADEQ, other agencies, and the public
- Implement protection program
- Conduct contingency planning

The sharing of information is encouraged, especially among drinking water systems or communities with common delineated zones or protection areas, or those that share aquifers or watersheds. ADEQ recommends that communities and systems with common interests work together on protection programs. ADEQ can provide examples of groups of water systems that have joined together to work on similar projects (e.g., watershed surveys).

Smaller systems, whose zones and protection areas lie within the zones or protection areas of a larger system, may be able to make use of the information developed by the larger system, as well as provide information to the larger system.

10.1 PUBIC PARTICIPATION DURING DEVELOPMENT OF PROTECTION PROGRAM

A successful source water protection program requires that public water systems or communities involve the public. Such participation may be through the use of already established local public advisory groups, or through the use of volunteers for aspects of information collection, to name two examples. Representatives from the variety of stakeholder groups, such as those presented in Appendices J and K, may be appropriate to consider in forming local advisory groups.

10.2 REVIEW OF INITIAL SOURCE WATER ASSESSMENT

The source water assessment for the Public Water System should be reviewed to determine whether it should be updated or revised. Revisions of the assessment, if appropriate, could be made on the delineation, the activity inventory, ranking of activities, or the vulnerability analysis, or a combination of these elements.

10.2.1 Delineation

Local drinking water systems or communities may decide upon different protection areas or zones than were used in the initial assessment. Protection areas and zones should be delineated as described in Chapter 3.0.

10.2.2 Contaminant Assessment Inventory

As with the original assessment, gathering supplemental information should be coordinated with the work of various state, local and federal agencies. It should also consider permits issued and the enforcement actions taken. Some examples of these are presented in Chapter 5 of this plan. Some communities have inventoried potential sources of significant contamination on a parcel-by-parcel basis, using volunteers from the community.

As part of a local protection program, other potential contaminants associated with particular activities could be considered besides those subject to drinking water regulation. Those could include the following: US EPA's priority pollutants; chemicals that are subject to the Toxic Release Inventory; Arizona's list of hazardous substances; chemicals identified as causing cancer or birth defects or other reproductive harm.

Supplemental inventories could include research of written documents, review of land use data, conducting surveys, and field reconnaissance. Each of these sources is described in more detail below.

Written documents include those published by federal, state, and local agencies, such as lists, inventories, records and other items that would identify the following: underground or above ground storage tanks, federal Superfund sites, contamination sites, landfill locations, septic systems, and other locally regulated activities. Other documents include telephone directories, business records, property tax records, news articles, and historical or archival information.

Land-use data can help identify possible contaminant activities or sources of pollution. These can often be identified from information that may be available from the local planning or building departments. These may include aerial photographs, topographic maps, zoning maps, and building permits.

Surveys may also be done to confirm or supplement information collected by other means. The surveys can help prioritize the contaminant sources or properties that need a more detailed review. Types of surveys include mail questionnaires, telephone surveys, personal interviews, and automobile windshield surveys.

A field review may be done to identify land uses and to look for potential sources of contamination not clearly identified by the previous methods. Contamination sources to document could include: abandoned or improperly destroyed wells, closely spaced septic systems, point source and nonpoint source contaminants, and changes in business use.

10.2.3 Ranking of Contaminant Activities

The objective of the inventory process in a protection program is to determine which of the potential sources of contamination pose the greatest threat to the water supply. Section 3.5.4 provides information that may be helpful in developing a list of local potential sources of contamination. State and federal agencies, including those that perform health and environmental assessments, can provide assistance in developing risk determinations.

The quantity of potential contaminants and the amount of area that the source occupies in the protection area could be included in determining potential risk. Comments that explore the source and the determination of the potential risk could be included.

10.2.4 Susceptibility Analysis

Information collected can be used to revise the susceptibility analysis, if appropriate. Updated information on the hydrogeology of the protection area, or other site-specific data should also be included. The approach described in Chapter 3.0 should be followed in analyzing a water source's susceptibility.

10.2.5 Update of Assessment Maps

Results of the inventory could be illustrated on an updated map that identifies the drinking water source, zones and protection areas, and activities that are considered to be potential origins of significant contamination. Such a map is helpful in the development of a protection program and in describing the program to the public.

10.3 Updating Original Assessment Reports

Updating the original ADEQ assessment is important in this process, particularly since a fairly simple hydrogeological approach was used. In addition, the number and type of contaminant sources may change over time. In some cases, ADEQ's initial delineation and inventory will be conservative and err on the side of caution. A more detailed investigation under these circumstances may show that some of the contaminant sources may not put the drinking water source at risk or that hydrogeologic features exist that protect the drinking water source.

When an assessment shows a water supply to be susceptible to one or more contaminants, the following steps should be taken, as part of developing a protection program:

1. Reevaluate the zones and protection areas to determine if the they are accurate, and if necessary revise, using a more sophisticated method

2. Collect more hydrogeologic data

3. Collect more information on the Adjacent Land Use and the specific contaminants of concern.

10.4 PROTECTION MEASURES FOR SOURCE WATERS

If the drinking water source is susceptible to contamination, protection measures may be taken. These might include a building moratorium, a relocation of the contaminant source, development of an alternative water supply, or other source management activities.

10.5 PROVIDING INFORMATION TO THE PUBLIC

When the system or community decides to make the findings of its protection efforts available to the public, the following methods are examples of those that may be used to provide information.

- Provide documents for review in public libraries
- Provide documents for review at county health departments
- Distribute press releases that refer public to locations of documents for public review
- Mail notice to organizations identifying locations of documents for public review
- Mail notice to customers of locations of documents for public review
- Hold a public meeting that describes the findings of the protection program and refers to locations of documents for public review
- Mail assessment reports to customers/public
- Provide results in annual report to customers/public
- Make results available by electronic access (e.g., Internet)

- In all cases, copies of the updated source water assessment and protection reports should be provided to ADEQ as part of the public record.

10.6 Source Water Protection Information Updates

In order to have an effective and successful source water protection program, public water systems and/or communities should update their corresponding source water assessment reports periodically. This will ensure that any changes to the land use are appropriately addressed.

Appendices Table of Contents

APPENDIX A

ACRONYMS

List of Acronyms

ACIDS	Arizona CERCLA Information and Data System
ADEQ	Arizona Department of Environmental Quality
ALU	Adjacent Land Use
APP	Aquifer Protection Program
ASTM	American Society for Testing and Materials
AZURITE	Arizona Unified Repository for Informational Tracking of the Environment
CAC	Citizens Advisory Committee
CAFO	Concentrated Animal Feeding Operation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DWSRF	Drinking Water State Revolving Fund
EPA	Environmental Protection Agency
EQA	Environmental Quality Act
GIS	Geographic Information System
GPS	Global Positioning System
GWUDISW	Ground Water Under the Direct Influence of Surface Water
GUDI	Ground Water Under the Direct Influence of Surface Water
GWDR	Groundwater Disinfection Rule
HUC	Hydrologic Unit Code
IMR	Interim Monitoring Relief
IOC	Inorganic Chemical
IUP	Intended Use Plan
K	Hydraulic Conductivity
LUST	Leaking Underground Storage Tank
MAP	Monitoring Assistance Program
MCL	Maximum Contaminant Level
NPDES	National Pollutant Discharge Elimination System
NPS	Nonpoint Source
PWS	Public Water System
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RSVP	Retired and Senior Volunteer Program
SDWA	Safe Drinking Water Act
SMP	State Management Plan
SOC	Synthetic Organic Chemical
SWA	Source Water Assessment
SWAA	Source Water Assessment Area
SWAP	Source Water Assessment Program
SWPA	Source Water Protection Area
SWPP	Source Water Protection Program
TAC	Technical Advisory Committee
TMDL	Total Maximum Daily Load
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Chemical
WHPP	Wellhead Protection Program
WQARF	Water Quality Assurance Revolving Fund

APPENDIX B

GLOSSARY

GLOSSARY

Advection	The process by which solutes are transported by the bulk motion of the flowing groundwater.
Alluvium	A general term for clay, silt, sand, gravel, or similar unconsolidated material deposited during comparatively recent geologic time by a stream or other body of running water as a sediment in the bed of a stream or its floodplain or as a fan at the base of a mountain slope.
Aquifer	A water-bearing unit that will yield water in a usable quantity to a well or spring.
Basin	The major sediment-filled trough that lies between mountains.
Capillary fringe	The zone above the water table in which water is held by surface tension. Pore spaces within the capillary fringe are saturated but the water is under lower-than-atmospheric pressure.
Dispersion	The spreading and mixing of chemical constituents in groundwater caused by diffusion and mixing in microscopic variations in velocities within and between pores.
Hydraulic conductivity	The capacity of a rock to transmit water. Expressed as the volume of water that will move in unit time under a unit hydraulic gradient through a unit area measured at right angles to the direction of flow.
Hydraulic gradient	The slope of the water table or potentiometric surface; that is, the change in water level per unit of distance along the direction of maximum head decrease. Determined by measuring the water level in several wells.
Hydraulic head	In groundwater, the height above sea level of a column of water plus the energy contained in the mass of water in the column.
Percolate	The act of water seeping or filtering through the soil without a definite channel.
Permeable	Having a texture that permits water to move through a material under differences in head.
Porosity	The volume of openings in a rock, expressed as the ratio of openings to total volume of rock.
Potentiometric surface	An imaginary surface representing the level to which water will rise in a well.

Recharge	The addition of water to the zone of saturation; also, the amount of water added.
Regulated (chemicals)	Those chemicals for which the drinking water regulations require testing that have an established MCL.
Saturated zone	The zone (below the unsaturated zone) in which interconnected openings contain only water.
Transmissivity	The capacity of an aquifer to transmit water; equal to the hydraulic conductivity times the aquifer thickness.
Unregulated (chemicals)	Those chemicals for which the drinking water regulations require test that do not have an established MCL.
Unsaturated zone	The subsurface zone, usually starting at the land surface, that contains both water and air.
Vadose Zone	That area between the surface soil and the top of the groundwater table; the unsaturated zone.
Water table	The level in the saturated zone at which the water is under pressure equal to the atmospheric pressure.
Well screen	A filtering device used to keep sediment from entering a water well.
Wellhead protection area	"The surface and subsurface area surrounding a water well or well field, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or well field." (SDWA)

APPENDIX C

FORMS

SOURCE WATER ASSESSMENT
INFORMATION FORM

SANITARY SURVEY -- GROUNDWATER SYSTEM
CHECKLIST FORM

SOURCE WATER ASSESSMENT INFORMATION FORM (use 1 form per well)

Please verify the information below, fill in the blanks (one for per well) and provide information requested:

Water System ID Number:_____
Water System Name:_____
Water System Address:_____
Telephone:_____
Fax:_____
Well Number 55-_____Local Well Name:_____Well Number:_____
Related Points of Entry (POEs):_____
Contact Person:_____

WELL LOCATION

1.Street Address:_____
2.City:_____ Zip Code:_____
3.Township, Range, Section and 1/4, 1/4, 1/4:_____
4.Is Well GPS Located? No Yes. If yes, what is: Latitude:_____, Longitude:_____

WELL INFORMATION

1.Total Well Depth (borehole):_____ feet
2.Is the Well an Open Hole with No Casing: Yes___ No.___
ahead is Total Depth of Casing?_____ feet
b. What is Total Screen Interval or Perforated Casing Interval?_____ feet
c. What is Depth to Top of Screen or Perforated Casing Interval?_____ feet
d. What is Depth to Bottom of Screen or Perforated Casing Interval?_____ feet
3.What Is Pumping Capacity of the Pump:_____ gallons per minute
4.Average volume pumped per year for:
a.1995_____ acrefeet/gallons/cubic feet (circle one)
b.1996_____ acrefeet/gallons/cubic feet (circle one)
c.1997_____ acrefeet/gallons/cubic feet (circle one)
5.What is Depth to Groundwater When Well Is Pumping?_____ feet
6.What is Depth to Groundwater When Well Is Not Pumping?_____ feet

HYDROGEOLOGIC INFORMATION

1.Has a Pump Test (Aquifer Test) Been Done on the Well? Yes___No.___,If yes,
ahead Was Pump Yield?_____ gallons per minute
b. What Was Static Water Level?_____ feet
c. What Was Pumping Water Level?_____ feet
d. What is the Gradient?_____
c. What the Direction of Groundwater Flow? North___ South.___ East___ West___ Other___
2.Was a Driller's Report Done on this Well? Yes___ No.___
a. If yes, submit a copy of Driller's Report and /or Aquifer Test with this questionnaire

3. Are there any Professional reports available that would provide hydrogeologic information for the area in which this well is located? Yes____ No.____

. . . . . a. If yes, submit a copy of the **summary** of hydrogeologic/geologic study with this questionnaire

IF YOU HAVE ANY QUESTIONS, PLEASE CALL 1-800-234-5677 EXT 4644

I certify that the above information and all attached copies are true and accurate to the best of my knowledge.

_____	_____	_____
Signature	Name (Please Print)	Date

Title_____

GROUND WATER SYSTEM CHECKLIST ONLY

FIELD SERVICES NOTICE OF INSPECTION
AZ DEPT OF ENVIRONMENTAL QUALITY
WATER QUALITY DIVISION

FACILITY INFORMATION	INSPECTION INFORMATION
Facility ID # _____	County: _____ Date: ___/___/___
Facility Name _____	Inspection By: _____
_____	Accompanied By: _____
Address: _____	System Grade: _____ Cert. Op/Grade: _____
City: _____ Zip: _____	Follow-up Contact: _____
Population/Connections: _____/_____	Physical Facilities OK: _____
Number of Plants/Wells: _____/_____	☐ Community ☐ NCTran ☐ NCNTran ☐ Other
Operator's Name: _____	Well Number(s): _____

OPDW. CERTIFIED OPERATOR STATUS	DEFICIENCIES ☐ YES ☐ NO ☐ N/A
*1.( )No certified operator	*3.( )No distribution grade
*2.( )Certified operator not at appropriate grade	*4.( )No treatment grade

A. WELL	DEFICIENCIES ☐ YES ☐ NO ☐ N/A
#1 #2 #3	#1 #2 #3
*1.( )( )( )Water supply in flood zone	17.( )( )( )Well vent not properly installed
2.( )( )( )Site needs general clean-up	18.( )( )( )Well vent not properly screened
3.( )( )( )Site not properly fenced	19.( )( )( )Needed vacuum relief valve not installed
4.( )( )( )Well building damaged	20.( )( )( )Vacuum relief valve not screened
5.( )( )( )Security fence damaged	21.( )( )( )Vacuum relief valve leaking
6.( )( )( )Security fence not locked	22.( )( )( )Needed check valve on pipe from well not installed
7.( )( )( )Well building not secured	23.( )( )( )Check valve defective
8.( )( )( )State well number not posted	24.( )( )( )No/improperly installed sampling tap
9.( )( )( )Well site not properly graded	*25.( )( )( )Well less than 50 feet from sewer
10.( )( )( )No slab/slab inadequate	*26.( )( )( )Well less than 100 feet from septic tank
11.( )( )( )Well casing annulus not sealed	*27.( )( )( )Well less than 100 feet from APP discharge
12.( )( )( )Inadequate well seal/repair	*28.( )( )( )Well less than 100 feet from UST
13.( )( )( )Direct openings into well	*29.( )( )( )Well less than 100 feet from Haz. Waste Facility
14.( )( )( )Casing not 12"above slab	98.( )( )( )Other deficiencies - well
15.( )( )( )Improper lubricant	
16.( )( )( )Needed well vent not installed	

B. CHLORINATION FACILITIES	DEFICIENCIES ☐ YES ☐ NO ☐ N/A
Yes__No__/Gas__ Solution___	11.( )Room not properly vented
1.( )No chlorine injection nozzle	12.( )Chlorinator subject to freezing
2.( )No standby chlorinator	13.( )No inspection window
*3.( )Required chlorinator not installed	14.( )No ammonia for leak detection
*4.( )Inadequate chlorine residual	15.( )S.C.B.A not mounted outside Cl room
*5.( )Not chlorinating if required	16.( )Room fan switch not outside
6.( )Chlorine feed tank empty	17.( )No daily log of free chlorine residual
7.( )Equipment not properly installed	18.( )No chlorine test kit
8.( )Equipment not operating properly	19.( )Contact time less than 30 minutes
9.( )Dosing cylinder empty	*20.( )Unapproved chlorination compound
10.( )Line plugged	98.( )Other deficiencies - chlorination

* Bolded Statement will be used to evaluate the well integrity

C. STORAGE TANK	DEFICIENCIES ☐ YES ☐ NO ☐ N/A
*1.( )( )( )No storage tank	11.( )( )( )Hatch not secured
*2.( )( )( )Insufficient storage	12.( )( )( )Tank vent inadequately installed
3.( )( )( )Storage tank top needs repair	13.( )( )( )Vent not screened
4.( )( )( )Tank leaks - needs repair	14.( )( )( )No tank drain valve
5.( )( )( )Tank has deteriorated beyond repair	15.( )( )( )No visual water level indicator
6.( )( )( )Overflow pipe not properly screened	16.( )( )( )Water level target inoperative
7.( )( )( )No overflow pipe installed	17.( )( )( )Openings around target cable
8.( )( )( )No splash block below overflow	18.( )( )( )No tank bedding ring
9.( )( )( )Hatch not sealed	19.( )( )( )Tank bedding damaged
10.( )( )( )Inadequate or no hatch curb	98.( )( )( )Other deficiencies - storage tank

D. PRESSURE TANK	DEFICIENCIES ☐ YES ☐ NO ☐ N/A
Yes___No___	5.( )( )( )No blowoff for excess air
1.( )( )( )No pressure gauge	6.( )( )( )Appears to be excessive air
2.( )( )( )No bottom drain valve	7.( )( )( )No means for adding air
3.( )( )( )No water level sight glass	8.( )( )( )No safety relief valve
4.( )( )( )Booster glands leak	98.( )( )( )Other deficiencies - pressure tank

E. DISTRIBUTION SYSTEM	DEFICIENCIES ☐ YES ☐ NO ☐ N/A
1.( )Mains less than three feet deep	5.( )Facilities subject to freezing
*2.( )Cross-connections exist	6.( )Unapproved pipe material
3.( )Leaks in distribution system	*7.( )Water main too close to sewer main
*4.( )Inadequate system pressure	98.( )Other deficiencies - distribution system

F. GENERAL	DEFICIENCIES ☐ YES ☐ NO ☐ N/A
*1.( )Insufficient records kept	*12.( )No microbiological site sampling plan
2.( )Routine maintenance not performed	*13.( )Microbiological site sampling plan inadequate
3.( )System frequently out-of-operation (power, etc.)	*14.( )BPA program not implemented
4.( )Water supply frequently depleted	*15.( )BPA program is inadequate
5.( )User complaints being received	*16.( )Emergency plan due after 1/1/94
*6.( )Construction without an Approval To Construct	*17.( )Emergency plan is inadequate
*7.( )Operating without Approval of Construction	96.( )Industrial Commission inspection recommended
*8.( )No "As built" drawings submitted where required	97.( )Repeat deficiencies
*9.( )Construction does not conform to approved plans	98.( )Other deficiencies - general
*10.( )No O&M manual on hand (water treatment only)	
*11.( )Contaminants near water supply source	

* Bolded Statement will be used to evaluate the well integrity

APPENDIX D

ARIZONA'S REGULATED DRINKING WATER CHEMICALS

REGULATED IOCs

CONTAMINANT	TESTING METHOD	ORIGIN OF CONTAMINANT
Antimony	200.8, 200.9, SM 3113B, ASTM D-3697-92	Naturally occurs in soils
Arsenic	200.7, 200.8, 200.9, SM 3120B, SM 3113B, SM 3114B, ASTM D-2972-93C, ASTM D-2972-93B	Naturally occurs in soils
Asbestos	TEM	Naturally occurs in soils
Barium	200.7, 200.8, SM 3120B, SM 3113B, SM 3111D	Naturally occurs in soils, paints, bricks, tiles, and jet fuels
Beryllium	200.7, 200.8, 200.9, SM 3120B, SM 3113B, ASTM D-3645-93B	Naturally occurs in soils, electrical equipment and components, atomic reactors, aircraft, rockets, and missile fuels
Cadmium	200.7, 200.8, 200.9, SM 3113B	Corrosion of galvanized pipes or galvanized pipe operations
Chromium	200.7, 200.8, 200.9, SM 3120B, SM 3113B	Naturally occurs in soils, mining and plating operations
Cyanide	SM 4500-CN-C, SM 4500-CN-E, SM 4500-CN-F, SM 4500-CN-G, ASTM D2036-91A, ASTM D2036-91B, 335.4, USGS I-3300-85	Electroplating, steel processing, plastics, synthetic fabrics, and fertilizer products
Fluoride	300, SM 4110B, SM 4500F-B,D, SM 4500F-C, SM 4500F-E, ASTM D4327-91, ASTM D1179-93B, TIS 380-75WE, TIS 129-71W	Naturally occurs in soils
Mercury	245.1, 245.2, 200.8, ASTM D3223-91, SM 3112B	Electrical equipment and water pumps
Nickel	200.7, 200.8, 200.9, SM 3120B, SM 3113B, SM 3111B	Naturally occurs in soil, electroplating, stainless steel alloy mining operations, and refining operations
Nitrate as (N)	353.3	Septic systems and fertilizers
Nitrite as (N)	300	Septic systems and fertilizers
Total Nitrate/Nitrite	300	Septic systems and fertilizers
Selenium	200.8, 200.8, SM 3113B, SM 3114B, ASTM D-3859-93A, ASTM D-3859-93B,	Naturally occurs in soil, electronics and photocopying operations, glass manufacturing, and pharmaceuticals
Thallium	200.8, 200.9	Naturally occurs in soil, electronics and photocopying operations, glass manufacturing, and pharmaceuticals

REGULATED VOCs		
CONTAMINANT	**TESTING METHOD**	**ORIGIN OF CONTAMINANT**
Benzene	502.2, 524.2	Solvents, degreasers and gasoline
Carbon Tetrachloride	502.2, 524.2, 551	Household cleaning fluids
Chlorobenzene	502.2, 524.2	
o-Dichlorobenzene	502.2, 524.2	Pesticides and dye applications
p-Dichlorobenzene	502.2, 524.2	Pesticides and dye applications
1,2-Dichloroethane	502.2, 524.2	Solvents in chemical processing
1,1-Dichloroethylene	502.2, 524.2	Solvents in chemical processing
cis-1,2-Dichloroethylene	502.2, 524.2	Solvents in chemical processing
trans-1,2-Dichloroethylene	502.2, 524.2	Solvents in chemical processing
Dichloromethane	502.2, 524.2	
1,2-Dichloropropane	502.2, 524.2	Solvents in chemical processing and pesticides applications
Ethylbenzene	502.2, 524.2	Gasoline
Styrene	502.2, 524.2	Plastics manufacturing
Tetrachloroethylene (PCE)	502.2, 524.2, 551	Dry cleaning and solvents
Toluene	502.2, 524.2	Solvent and oil refineries
1,2,4-Trichlorobenzene	502.2, 524.2	Chemical processing, solvents, and electrical substations
1,1,1-Trichloroethane	502.2, 524.2, 551	Chemical processing
1,1,2-Trichloroethane	502.2, 524.2	Chemical processing
Trichloroethylene(TCE)	502.2, 524.2, 551	Metal cleaning and dry cleaning
Vinyl Chloride	502.2, 524.2	Solvents

REGULATED SOCs		
CONTAMINANT	**TESTING METHOD**	**ORIGIN OF CONTAMINANT**
2,4-D	515.1, 515.2, 555	Herbicides applications
2,4,5-TP (Silvex)	515.1, 555, 515.2	Herbicides applications
2,3,7,8-TCDD (dioxin)	1613	Herbicides manufacturing
Alachlor	505, 507, 525.2, 508.1	Herbicides applications
Aroclor 1221	505, 508	Substations
Aroclor 1260	505, 508	Substations
Aroclor 1016	505, 508	Substations
Aroclor 1254	505, 508	Substations
Aroclor 1242	505, 508	Substations
Aroclor 1248	505, 508	Substations
Aroclor 1232	505, 508	Substations
Atrazine	505, 507, 525.2, 508.1	Herbicides applications
Benzo(a)pyrene	525.1, 550, 550.1	Coal tar lining and sealants in water storage tanks
Carbofuran	531.1, SM 6610	Pesticides applications
Chlordane	505, 508, 525.2, 508.1	Historical use only of pesticides applications and termite control
Dalapon	515.1, 552.1	Herbicides applications
Di(2-ethylhexyl)adipate	506, 525.2	Plastic, rubber, and food packaging materials manufacturing
Di(2-ethylhexyl)phthalate	506, 525.2	
Dibromochloropropane (DBCP)	504.1, 5510	Historical use only of pesticides applications
Dinoseb	515.1, 555, 515.2	Historical use only of herbicides and pesticides applications
Diquat	549.1	Herbicides applications
Endothall	548.1, SM 6651	Herbicides applications
Endrin	505, 508, 525.2, 508.1	Historical use only of pesticides applications

REGULATED SOCs		
CONTAMINANT	**TESTING METHOD**	**ORIGIN OF CONTAMINANT**
Ethylenedibromide (EDB)	504.1, 551	Historical use only of pesticides applications.
Glyphosate	547	Herbicides applications.
Heptachlor	505, 508, 525.2, 508.1	Pesticides applications.
Heptachlor Epoxide	505, 508, 525.2, 508.1	Historical use only of pesticides applications.
Hexachlorobenzene	505, 508, 525.2, 508.1	Oil refineries and pesticides manufacturing and applications.
Hexachlorocyclopentadiene	505, 508, 525.2, 508.1	Pesticides manufacturing.
Lindane	505, 508, 525.2, 508.1	Pesticides applications.
Methoxychlor	505, 508, 525.2, 508.1	Pesticides applications.
Oxamyl	531.1, SM 6610	Insecticides applications.
Pentachlorophenol	515.1, 555, 515.1, 525.2	Herbicides-wood applications.
Picloram	515.1, 555, 515.2	Pesticides and herbicides applications.
Polychlorinated Biphenyls (PCB)	508A (run only if Aroclor screen is positive)	Electrical substations and transmission fluids applications.
Simazine	505, 507, 525.2, 508.1	Herbicides applications.
Toxaphene	505, 508, 525.2	Historical use only of pesticides applications.

APPENDIX E

ADEQ'S SOURCE WATER ASSESSMENT AND PROTECTION PUBLICATIONS

SOURCE WATER ASSESSMENT PROGRAM EXECUTIVE SUMMARY

Under the 1996 Safe Drinking Water Act (SDWA) amendments, the Arizona Department of Environmental Quality (ADEQ) is required to develop and implement a Source Water Assessment Program (SWAP). Three key steps associated with SWAP are: a) delineation of source water assessment areas, b) inventory of adjacent land uses (ALUs) where chemicals regulated under the SDWA, which have maximum contaminant level, are commonly used or present, and c) susceptibility analysis which will evaluate the risk ALUs might pose to the water source.

Several benefits are associated with SWAP. By knowing the source water quality statewide and making it available to the public, local officials will be able to initiate and focus source water protection efforts at the local level where needed. Also, by knowing the source water quality statewide, ADEQ will be able to use SWAP as a tool to tailor specific monitoring requirements for each public water system (PWS). This effort is partly in response to the high costs many small PWSs incur testing for chemicals with which they have never had any problems, especially for chemicals such as Synthetic Organic Chemicals (SOCs). SOCs testing is generally considered very costly and can become especially burdensome for small PWSs.

The SWAP will result in an evaluation of each source water that provides drinking water to each PWS in Arizona. This evaluation will determine the degree to which a PWS is protected, or at risk from contamination. Once completed, SWAP reports will be used to assist local communities in implementing protection measures such as Wellhead Protection. In addition, specific monitoring requirements can be tailored for each system. For example, if a PWS has no history of a particular chemical, as well as no potential for future contamination (based on land use practices and the risk they might pose to water sources), then monitoring relief or reduced monitoring for that chemicals(s), would be granted for that PWS. If a different PWS has a history of problems with that same chemical(s), then monitoring would still be required.

Adjacent land uses within the designated source water assessment areas will be evaluated. ADEQ has compliance information (occurrence data) on all PWSs in Arizona. Areas which have a history of contamination problems and are located within these source water assessment areas will be looked at very closely.

ADEQ is confident that the SWAP and the related source water protection activities will prove instrumental in preserving drinking water safety. By knowing ALUs around water sources and current contamination problems throughout the state, local solutions to local problems can be undertaken. Through the flexibility built into the 1996 SDWA amendments, Arizona can have state specific solutions and protection for our drinking water. For more information, please contact toll free 1-800-234-5677 extension 4644 or (602) 207-4644.

WHAT DOES DELINEATION OF SOURCE WATER ASSESSMENT AREAS MEAN?

Delineating source water assessment areas means identifying the surface water or groundwater areas that contribute to a well, well field or a surface water intake. Source water assessment areas are also referred to as wellhead protection areas or contribution zones for groundwater sources, and watersheds or drainage areas for surface waters. Every public water system (PWS) obtains its water from either groundwater sources (aquifers) or surface water sources (streams, canals, reservoirs or lakes).

How will Arizona delineate source water assessment areas for its groundwater systems?

For PWSs relying on groundwater, Arizona has chosen a site specific approach to determine the appropriate delineated area around PWS wells as the source water assessment area. This distance will be determined by various computer models using a five-year time-of-travel and hydrogeologic parameters that are unique to each drinking water source.

How will Arizona delineate source water assessment areas for its surface water systems?

For PWSs relying on surface waters, Arizona will include the entire drainage area upstream from the public water systems' intake structure up to the boundary of the state borders. Identifying the entir drainage area will help the public become aware of their drainage boundaries. However, due to the large area of the drainage areas in the state, Arizona will conduct the detailed assessment in the following sub-drainage areas:

1) a 500-foot buffer zone on each side of a stream or canal and ten miles upstream from the intake including major tributaries, and

2) a 500-foot buffer zone around a lake or reservoir including ten miles upstream from the intake including major tributaries, and including major tributaries.

For more information, please contact toll free 1-800-234-5677 extension 4644 or (602) 207-4644.

WHAT DOES ADJACENT LAND USE MEAN?

Adjacent land use (ALUs) is defined as any facility or activity where chemicals regulated under the Safe Drinking Water Act which have a maximum contaminant level (MCLs) are commonly used.

How will Arizona identify ALUs around its drinking water sources?

Many regulated activities, underground storage tanks, and solid waste disposal, have already been listed in databases used by ADEQ. Observations by field inspectors will be used to confirm the activities, as well as to identify new activities and activities not regulated by ADEQ.

Will all ALUs in Arizona be considered in the source water assessment?

Only those ALUs where chemicals regulated under the Safe Drinking Water Act, which have MCLs, are commonly used and are within the source water assessment areas.

For more information, please contact toll free 1-800-234-5677 extension 4644 or (602) 207-4644.

WHAT DOES SUSCEPTIBILITY ANALYSIS MEAN?

The goal of susceptibility analysis is to determine the risk which adjacent land uses (ALUs) might pose to a public water system (PWS). There are two steps associated with susceptibility analysis: a) sensitivity determination and b) adjacent land use evaluation.

What is sensitivity determination?

The sensitivity determination of an aquifer determines whether the natural hydrogeology of an aquifer provides an adequate barrier to the migration of chemicals, if released at the ground surface. This consists of looking at the hydrogeological characteristics of the aquifer, such as the existence of a clay layer with a minimum thickness of fifty feet, and the structural integrity of the well.

What is an ALU evaluation?

The ALU evaluation will consist of examining permitting compliance status, use of best management practices, and remediation status of any reportable releases or spills which occurred within the last three years.

Both, sensitivity determination and ALU evaluation will be used in the overall susceptibility analysis in order to determine what kind of risk, if any, an ALU might pose to a PWS.

For more information, please contact toll free 1-800-234-5677 extension 4644 or (602) 207-4644.

APPENDIX F

ARIZONA'S PUBLIC WATER SYSTEMS CLASSIFICATION

PWSs Classification (serving less than 10,000)

	Community					NTNC					TNC				
	GW	PGW	SW	PSW	Subtotal	GW	PGW	SW	PSW	Subtotal	GW	PGW	SW	PSW	Subtotal
Apache	23	0	0	0	23	5	0	0	0	5	34	0	1	0	35
Cochise	57	1	1	0	59	18	0	0	0	18	32	0	1	0	33
Coconino	23	3	5	1	32	4	1	1	2	8	63	18	6	14	101
Gila	45	3	5	1	54	13	0	0	0	13	38	0	3	0	41
Graham	6	1	1	0	8	1	0	0	0	1	5	0	6	0	11
Greenlee	6	0	1	0	7	1	0	1	0	2	6	0	0	0	6
Maricopa	108	3	3	0	114	41	0	0	0	41	68	3	2	0	73
Mohave	48	5	2	0	55	7	0	0	0	7	40	3	1	0	44
Navajo	44	1	0	0	45	6	1	0	0	7	15	1	0	1	17
Pima 10	88	1	0	0	89	8	0	0	0	8	15	0	1	0	16
Pima 20	55	2	1	0	58	38	2	0	0	40	35	0	1	0	36
Pinal	66	30	1	0	97	22	2	0	0	24	27	9	0	1	37
Santa Cruz	13	0	0	0	13	2	0	0	0	2	24	0	0	0	24
Yavapai	86	4	1	1	92	24	0	0	0	24	93	2	0	0	95
Yuma	25	0	8	0	33	13	0	2	0	15	12	0	2	0	14
LaPaz	7	0	9	0	16	9	0	0	0	9	76	0	1	0	77
Total	700	54	38	3	**795**	212	6	4	2	**224**	584	36	25	16	**660**

GW: ..... Groundwater
PGW: ..... Purchasers of Groundwater
SW: ..... Surface Water
PSW: ..... Purchasers of Surface Water
NTNC: ..... Non-Transient Non-Community
TNC: ..... Transient Non-Community

PWSs Classification (serving more than 10,000)

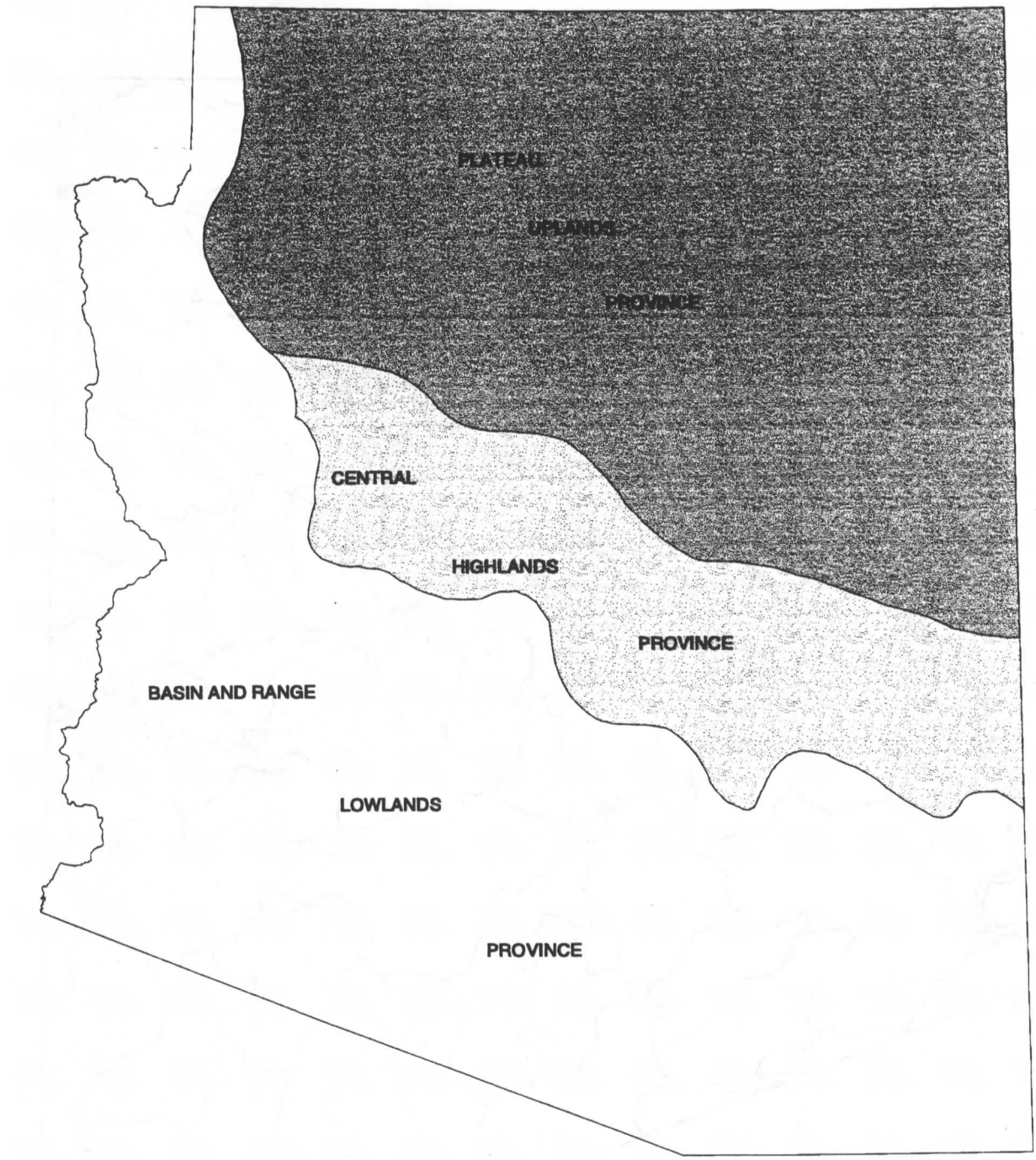
	Community					NTNC					TNC				
	GW	PGW	SW	PSW	Subtotal	GW	PGW	SW	PSW	Subtotal	GW	PGW	SW	PSW	Subtotal
Apache	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cochise	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Coconino	2	0	1	1	4	0	0	0	0	0	0	0	0	0	0
Gila	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Graham	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
Greenlee	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maricopa	8	0	6	0	14	1	0	0	0	1	0	0	0	0	0
Mohave	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Navajo	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Pima 10	4	0	1	0	5	0	0	0	0	0	0	0	0	0	0
Pima 20	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Pinal	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Santa Cruz	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Yavapai	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Yuma	1	0	1	0	2	0	0	0	0	0	0	0	0	0	0
LaPaz	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	30	0	10	1	41	1	0	0	0	1	0	0	0	0	0

GW: ..... Groundwater
PGW: ..... Purchasers of Groundwater (consecutive water systems)
SW: ..... Surface Water
PSW: ..... Purchasers of Surface Water
NTNC: ..... Non-Transient Non-Community
TNC: ..... Transient Non-Community

APPENDIX G

MAPS

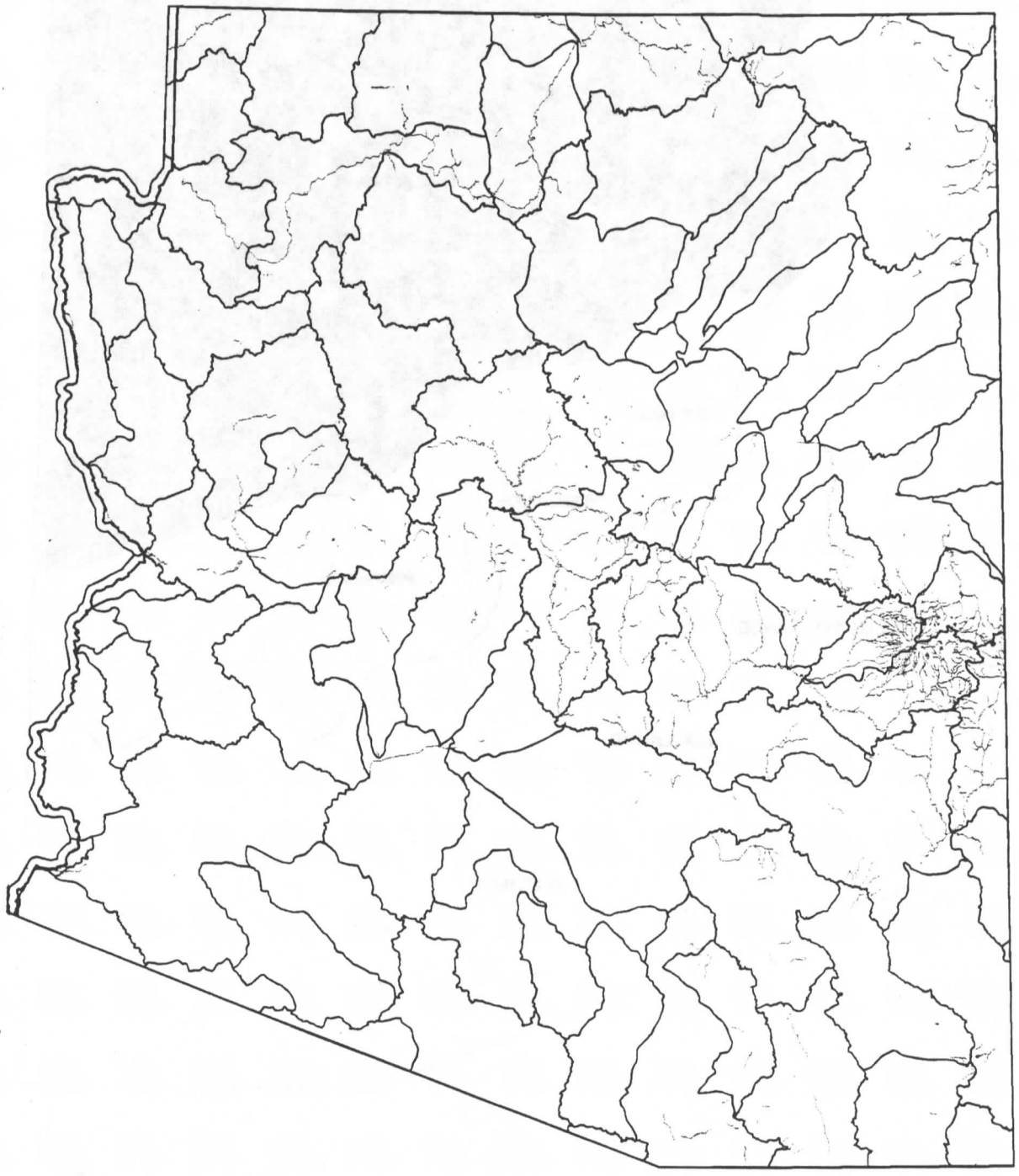
HYDROGEOLOGIC PROVINCES OF ARIZONA



60 0 60 120 Miles

N
W E
S

HYDROLOGIC UNIT CODE WATERSHEDS IN ARIZONA



APPENDIX H

ADJACENT LAND USE AND ASSOCIATED CHEMICALS COMMONLY USED AND REGULATED UNDER SAFE DRINKING WATER ACT

ALL PUBLIC WATER SYSTEMS

SURFACE WATER SOURCES

Adjacent Land Use	Associated Chemicals Regulated By SDWA
Manure spread/pits	Biological contaminants
Wells	Biological contaminants
Landfills	Biological contaminants, nitrate and Nitrite
WWTP, cesspools, and septics	Biological contaminants, nitrate and nitrite
Stormwater	Biological contaminants
Grazing/feed lots	Biological contaminants, nitrate and nitrite
Cemeteries	Biological contaminants
Reuse irrigation	Biological contaminants, nitrate and nitrite
Agriculture	Nitrate and nitrite

GROUNDWATER SOURCES

Adjacent Land Use	Associated Chemicals Regulated By SDWA
Manure spread/pits	Biological contaminants
Wells	Biological contaminants
Landfills	Biological contaminants, nitrate and nitrite
WWTP, cesspools, and septics	Biological contaminants, Nitrate and nitrite
Stormwater	Biological contaminants
Grazing/feed lots	Biological contaminants, Cryptosporidium, nitrate and nitrite
Cemeteries	Biological contaminants
Reuse irrigation	Biological contaminants, nitrate and nitrite
Agriculture	Nitrate and nitrite

ALL NONTRANSIENT NONCOMMUNITY

SURFACE WATER SOURCES

Adjacent Land Use	Associated Chemicals Regulated By SDWA
Gas stations	VOCs (via subsurface)
Petroleum products production, storage and distribution centers	VOCs (via subsurface)
Dry cleaners	VOCs (via subsurface)
Landfills	VOCs (via subsurface)
Hazardous waste storage/disposal facilities	VOCs (via subsurface)
Superfund sites	VOCs (via subsurface)
Underground and leaking underground storage tanks	VOCs (via subsurface)
Marinas	VOCs (via subsurface and watershed)
Crop dusting	SOCs (via subsurface and watershed)
Agriculture	SOCs (via subsurface and watershed)
Manufacture, and storage of pesticides and herbicides	SOCs (via subsurface)
Hazardous waste storage/disposal facilities	SOCs (via subsurface)
Mining activities	IOCs (via subsurface and watershed)
Metal plating	IOCs (via subsurface and watershed)
Foundries	IOCs (via subsurface and watershed)
Hazardous waste storage/disposal facilities	IOCs (via subsurface)
Landfills	IOCs (via subsurface)
Manure spread/pits, WWTP, septic tank systems, grazing/feed lots, reuse irrigation, golf courses, agriculture	Nitrate/nitrites (via subsurface)
Agriculture	Nitrate/nitrites (via watershed)

ALL NONTRANSIENT NONCOMMUNITY SYSTEMS

GROUNDWATER SOURCES

Petroleum products production, storage and distribution centers	VOCs
Superfund sites	VOCs
Gas stations	VOCs
Dry cleaners	VOCs
Landfills	VOCs
Hazardous waste storage/disposal facilities	VOCs
Underground and leaking underground storage tanks	VOCs
Manufacture and storage of pesticides and herbicides	SOCs
Hazardous waste storage and disposal facilities	SOCs
Golf course	SOCs
Agriculture	SOCs
Metal plating	IOCs
Mining activities	IOCs
Hazardous waste storage/disposal facilities	IOCs
Landfills	IOCs
Foundries	IOCs
Manure spread/pits, WWTPs, septic tank systems, grazing/feed lots, reuse irrigation, golf courses, agriculture	Nitrate and nitrites

ALL COMMUNITY SYSTEMS

SURFACE WATER SOURCES

Adjacent Land Use	Associated Chemicals Regulated By SDWA
Gas stations	VOCs (via subsurface)
Petroleum products production, storage and distribution centers	VOCs (via subsurface)
Dry cleaners	VOCs (via subsurface)
Landfills	VOCs (via subsurface)
Hazardous waste storage/disposal facilities	VOCs (via subsurface)
Superfund sites	VOCs (via subsurface)
Underground and leaking underground storage tanks	VOCs (via subsurface)
Marinas	VOCs (via watershed)
Crop dusting	SOCs (via subsurface and watershed)
Agriculture	SOCs (via subsurface and watershed)
Manufacture, and storage of pesticides and herbicides	SOCs (via subsurface)
Hazardous waste storage/disposal facilities	SOCs (via subsurface)
Mining activities	IOCs (via subsurface and watershed)
Metal plating	IOCs (via subsurface and watershed)
Foundries	IOCs (via subsurface and watershed)
Hazardous waste storage/disposal facilities	IOCs (via subsurface)
Landfills	IOCs (via subsurface)
Manure spread/pits, WWTP, septic tank systems, grazing/feed lots, reuse irrigation, golf courses, agriculture	Nitrate and nitrites (via subsurface)
Agriculture	Nitrate and nitrites (via watershed)
Naturally occurring	Radiochemicals

ALL COMMUNITY SYSTEMS

GROUNDWATER SOURCES

Petroleum products production, storage and distribution centers	VOCs
Superfund sites	VOCs
Gas stations	VOCs
Dry cleaners	VOCs
Landfills	VOCs
Hazardous waste storage/disposal facilities	VOCs
Underground and leaking underground storage tanks	VOCs
Manufacture and storage of pesticides and herbicides	SOCs
Hazardous waste storage and disposal facilities	SOCs
Golf course	SOCs
Agriculture	SOCs
Metal plating	IOCs
Mining activities	IOCs
Hazardous waste storage/disposal facilities	IOCs
Landfills	IOCs
Foundries	IOCs
Manure spread/pits, WWTPs, septic tank systems, grazing/feed lots, reuse irrigation, golf courses, agriculture	Nitrate and nitrites
Naturally Occurring	Radiochemicals