

US EPA ARCHIVE DOCUMENT

PART I

**BACKGROUND AND DEFINITION
OF GROUND WATER CLASSES**

PART I

1.0 INTRODUCTION

1.1 EPA's Ground-Water Responsibilities

EPA currently administers more than eight statutes which direct the Agency toward reducing or eliminating threats to ground water from a large number and variety of sources. This is a far from simple task and is one which commands a major part of the Agency's budget and personnel resources. Changes in statutes and resulting regulations have occurred in the past, and will continue to occur in the future, to further manage these pollution sources. Through EPA's long-range planning efforts and, more recently, an agency-wide direction toward overall risk management, ground-water protection on a cross-media basis, the second "problem" is receiving increased attention.

An important tool in this cross-program phase was made available in August 1984, when EPA released its Ground-Water Protection Strategy. This Strategy represents the official policy of EPA in this field, and followed extensive debate and analysis within EPA, among other Federal and State agencies, and with the public. The goal of the Strategy is to maximize and coordinate protection functions, both within Headquarters and the Regions. It was not meant to resolve all of today's ground-water protection issues, but rather to set up a framework for better overall protection.

Ground-water classification was introduced in the Strategy as a key element in setting priorities for regulatory action prioritizing attention and resource management. As will be discussed more fully in Chapter 2.0, classification was deemed essential, given the potentially enormous numbers of pollution sources matched by the expense of clean-up programs, should contamination occur.

1.2 The Purpose of this Document

This document provides the technical guidelines for implementing the classification system, originally established in the Ground-Water Protection Strategy. By following the procedures and methods outlined, ground water, which may be affected by a facility or activity under EPA review, can be placed within a relevant class or classes, representing an implied hierarchy of protection. While the use of the system by EPA programs is discussed briefly in Section 2.3, this document should be viewed essentially as a set of technical guidelines for ground-water evaluation via classification.

Specific management strategies, "standards", and other program related policies, are outside the subject of this document.

It is also critical to note that EPA will not, as a result of these guidelines, the Strategy, or its current statutory authorities, be classifying large segments of land, aquifers, etc., in-advance of any specific decision. The Agency, or the delegated/authorized States, will only classify the ground water around specific sites or areas where a decision related to a permit, degree of clean-up or regulation, etc., is to be made. These differences are highlighted further in Chapter 2.0.

1.3 Organization of this Document

Chapter 2.0 provides additional background information on the Ground-Water Protection Strategy, including the rationale and use of classification. EPA's site-by-site approach is also contrasted with broader areawide mapping and classification efforts. The remainder of the guidelines document is organized into three major parts. Chapter 3.0 contains an overview of the classification system, and definitions and explanations of key terms and concepts. The procedures for classification are documented in Part II, Chapter 4.0. This chapter is designed for potential users of the system; whereas, the previous chapters provide less detailed information suited for general interest. Chapter 4.0 provides a step-by-step user's manual, covering the recommended sequence of decisions, corresponding data needs, and technical methods for each. A series of Appendices follows in Part III and includes a glossary (Appendix A) and a discussion of the alternative options considered for defining classification key terms and concepts (Appendix B). Appendix C is particularly relevant since it illustrates the classification procedures through a series of sample case studies. The remaining appendices provide background information and important references for performing the classification procedures.

2.0 BACKGROUND

2.1 Need for Ground-Water Classification

The EPA Ground-Water Protection Strategy (August, 1984) consists of four major elements:

- . Strengthen State Institutions -- through technical assistance and State grants
- . Cope with Unaddressed Sources -- through source-specific protection programs in cooperation with other EPA programs
- . Establish EPA Policy for Ground-Water Protection-- through the establishment and implementation of protection policies
- . Strengthen EPA Institutions -- through the establishment of Offices of Ground-Water Protection at Headquarters and in the Regions.

These guidelines stem from the third element, and the need to achieve greater consistency in the various programs at EPA with ground-water protection responsibilities. The Agency was concerned that the focus solely on individual polluting activities, rather than on the resource which might be affected, was leading to problems with consistency. Some EPA programs tended to factor-in ground-water considerations to a greater extent than other programs. Some EPA programs implemented specific statutes which themselves held a bias toward one medium, such as surface water, in a way that impacts on ground water were not fully assessed. Complicating the situation was the fact that many of these programs had become well established in their methods of operation.

In light of these factors, EPA adopted a policy for the Ground-Water Protection Strategy that "protection should consider the highest beneficial use to which ground water having significant water resources value can presently or potentially be put." This "differential protection" policy acknowledges that some ground water deserves unusually high protection due to their current use, relative value to society, and vulnerability to contamination. For these ground waters (Class I), management will include extraordinary protective measures. For most ground waters (Class II), the very high "baseline" of protection inherent in EPA's programs will be applied. Ground waters which have lower value to society for water supply or other disposal purposes (Class III), would logically, under this policy, require a

different management approach. Furthermore, the policy asserts that the extremes of the system (i.e., Class I and III) should be restricted to rather infrequent situations, reflecting the importance of effectively managing ground water for its best use.

The Agency recognized that in-advance aquifer classification offers a community or State certain advantages from an overall management perspective. EPA believes, however, that such decisions should be made at the state or local levels of government. The major purpose of these guidelines is, however, to support the site-by-site assessments typically employed in EPA permits, impact statements, and other decisions. Differences among such systems are reviewed in Chapter 2.3.

The Ground-Water Protection Strategy established a more protective category (Class I) than had been in existence prior to 1984. This more protective category will be recognized in a consistent way from program to program. Class III provides for the formalization of where EPA programs can recognize lower resource values -- i.e., not sources of drinking water -- either now or in the foreseeable future.

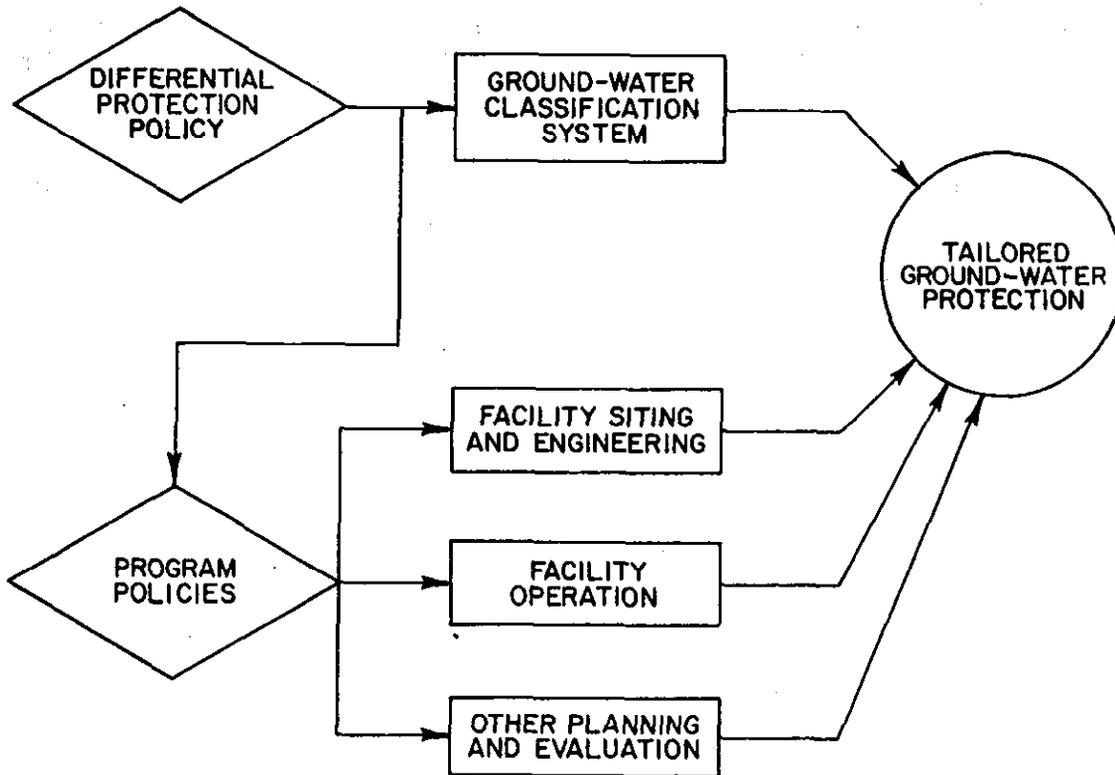
2.2 Guidelines Development

The development of these guidelines began in August, 1984, and consisted of three phases -- definition, testing, and review. Throughout the process, the Office of Ground-Water Protection (OGWP) worked closely with a guidelines work group, consisting of representatives from several states, EPA regions, other EPA programs, and the U.S. Geological Survey.

In the definition phase, key terms and concepts related to the classification scheme described in the Strategy were analyzed in detail. These included key terms and concepts such as "irreplaceable source of drinking water," "ecologically vital," "highly vulnerable," and "current source of drinking water." Several alternative options for defining each term were drawn up, along with data requirements and methodologies for employing each. Many of the alternative options were derived from approaches used by other EPA, state, and local programs to address similar or related concepts. Each approach was examined with respect to its:

- . Consistency with statutes, other programs, and with the overall intent of the Strategy;
- . Flexibility for accommodating State and region-specific characteristics or concerns;

FIGURE 2-1
CONCEPTUAL FRAMEWORK BETWEEN GROUND-WATER CLASSIFICATION AND
PROGRAM POLICIES FOR FACILITY SITING, ENGINEERING, AND OPERATION



- . Arbitrariness; and
- . Potential difficulties or complexities in implementation.

The next phase involved the preparation of detailed case studies with which to test the initial classification framework. Candidate case studies were canvassed from a variety of sources and a small workshop held to determine the workability of the classification definitions and to select the most relevant and representative samples for the guidance document. The feedback from this phase led to a refinement of the classification system and procedures.

Finally, the project focused on review and revision of several drafts. The public will review and comment on this draft in late 1986. Comments from the public review will be factored into the development of final guidelines in 1987.

2.3 Implementation in EPA Programs

The Ground-Water Protection Strategy provides two key insights on implementation. First, the Strategy establishes the differential protection approach as an official Agency policy. Classification is set as the primary means to implement that policy. Next, the Strategy provides examples of how classification may be used by specific EPA programs to assist in framing various program policies. A conceptual schematic of this approach is shown in Figure 2-1.

In order to implement these classification guidelines (which are not themselves enforceable requirements), EPA programs will need to modify their specific guidance documents and regulations. Decisions as to how they are to be implemented can only be made through EPA program office actions, taking into consideration each program's statutory requirements. Actual implementation may be different than the examples portrayed in the Ground-Water Protection Strategy due to changes in statutes and the need to be consistent with more recent program policies. The approach cited for the Resource Conservation and Recovery Act (RCRA) program in the Strategy, for example, was presented in the framework that existed before the sweeping Hazardous and Solid Waste Act Amendments of 1984 (HSWA). As it responds to HSWA, EPA will develop a coherent approach to ground-water protection that incorporates such Congressionally-mandated requirements under HSWA as the waste-specific "waste bans," location guidance/standards, liner/technology standards, and corrective action requirements. Differential protection and

classification will also be incorporated into this broader context.

Two specific rule-making actions have been completed--one for Superfund, and one under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, or "Superfund"), and one for radioactive wastes. The CERCLA National Contingency Plan (NCP) revised on November 20, 1985 (50 FR 47974) establishes the process for removal and/or remedial actions at Superfund sites (40 CFR Part 300). Revised Section 300.68(e)(2) addressing scoping of response actions during remedial investigations includes an assessment of "(v) Current and potential ground-water use (e.g., the appropriate ground-water classes under the system established in the EPA Ground-Water Protection Strategy" to assist in the determination of what type of action should be taken.

EPA also cites the Strategy in its list of other Federal criteria, advisories, guidance, and State standards to be considered. The list is found in the October 2, 1985, policy on CERCLA compliance with other Environmental Statutes (published as an appendix to the preamble of the NCP). The policy provides that (among other things) the classification factors must be considered in remedial action if it is pertinent. If the Agency finds that they are pertinent in response actions, but does not use them, or uses and alters them, the decision documents must state the rationale. Guidance manuals for implementing the new NCP are under development by the Agency.

The second completed implementation action is the release of the "Environmental Standards for the Management of Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes." EPA's role under the overriding Atomic Energy Act is very limited and is primarily standard-setting. The final rule (40 CFR Part 191; released in the Federal Register on September 19, 1985) includes two standards relative to differential protection:

- . A drinking-water-related standard is to be applied to all locations if a "special source" of ground-water is present. "Special sources" are further defined as a major subset within the Class I definition included in these guidelines.
- . A "total dose"-related standard is to be applied at the boundary of a "controlled area" for "significant sources of ground water." "Significant" sources are essentially a major subset within the Class II definition included in these guidelines.

At this time, conceptual approaches to implementation are in different stages of development and consideration by programs administering all major ground-water related statutes in EPA. In permit-based, "point-source"-type actions, it is expected that classification will be essentially an additional step in site-specific analysis. Broader-based, non permit/non-point sources are more problematic. In farm-by-farm application of pesticides, for example, there is no regulatory mechanism to evaluate each site-by-site action. EPA is beginning to consider the approaches to implementing differential protection and other Strategy-related policies for these broader sources. Again, the classification guidelines will be implemented as appropriate, given the overall authorities of the Agency under specific statutes.

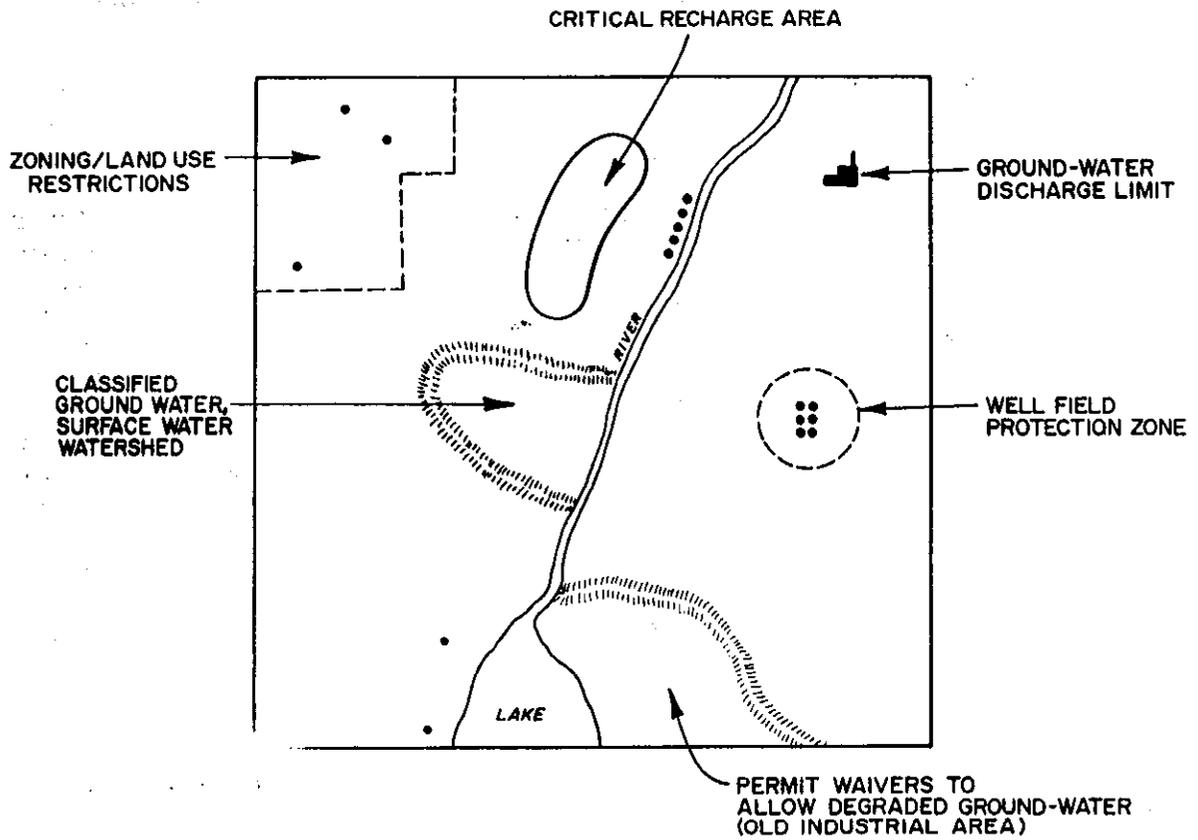
Since neither the guidelines definitions nor the program implementation options have been finalized, it is impossible to predict the numbers of EPA classification decisions which will result or be included in each particular class. Some initial analyses have been performed utilizing aggregated (i.e., not site specific) data on gross hydrogeological and socioeconomic characteristics around a subset of over 1400 RCRA, CERCLA, and UIC facilities. Assuming that the "quantitative" options (all denoted as Option A in Section 3.0 and 4.0) are selected, the range in classification outcomes covers:

Class I	5 to 11 percent
Class II	83 to 94 percent
Class III	1 to 6 percent

Given the different interpretation of the "qualitative options" for Class I terms (each denoted as Option B), no such analysis could be performed. It is important to note, however, these estimates reflect the percentage of classification decisions and not percentage of all United States ground water or aquifers. Additionally, these estimates were made on the basis of several assumptions regarding individual site characteristics. Sensitivity analyses show that the above ranges in percentage values account for most of the uncertainties associated with these assumptions.

It is appropriate to note, however, that well-field protection is typically the "high end" of any classification system as it is most often oriented to current, important public water supplies. Potential drinking water sources, ecologically vital ground waters, and low-quality, non-drinking water sources are not identified or managed in such systems.

FIGURE 2-2
 EXAMPLE OF STATE PROTECTION SYSTEMS



EXPLANATION

- ADMINISTRATIVE BOUNDARY
- WELL
- ▨ MOUNTAIN RIDGE

A final note: these guidelines may not be used as a defense or guide to future settlements of Federal enforcement or other administrative or judicial cases unless, or until, specific programs issue implementing directives, regulations, or policies on how these concepts are to be applied to specific programs in a consistent manner with their statutory authorities and mandates.

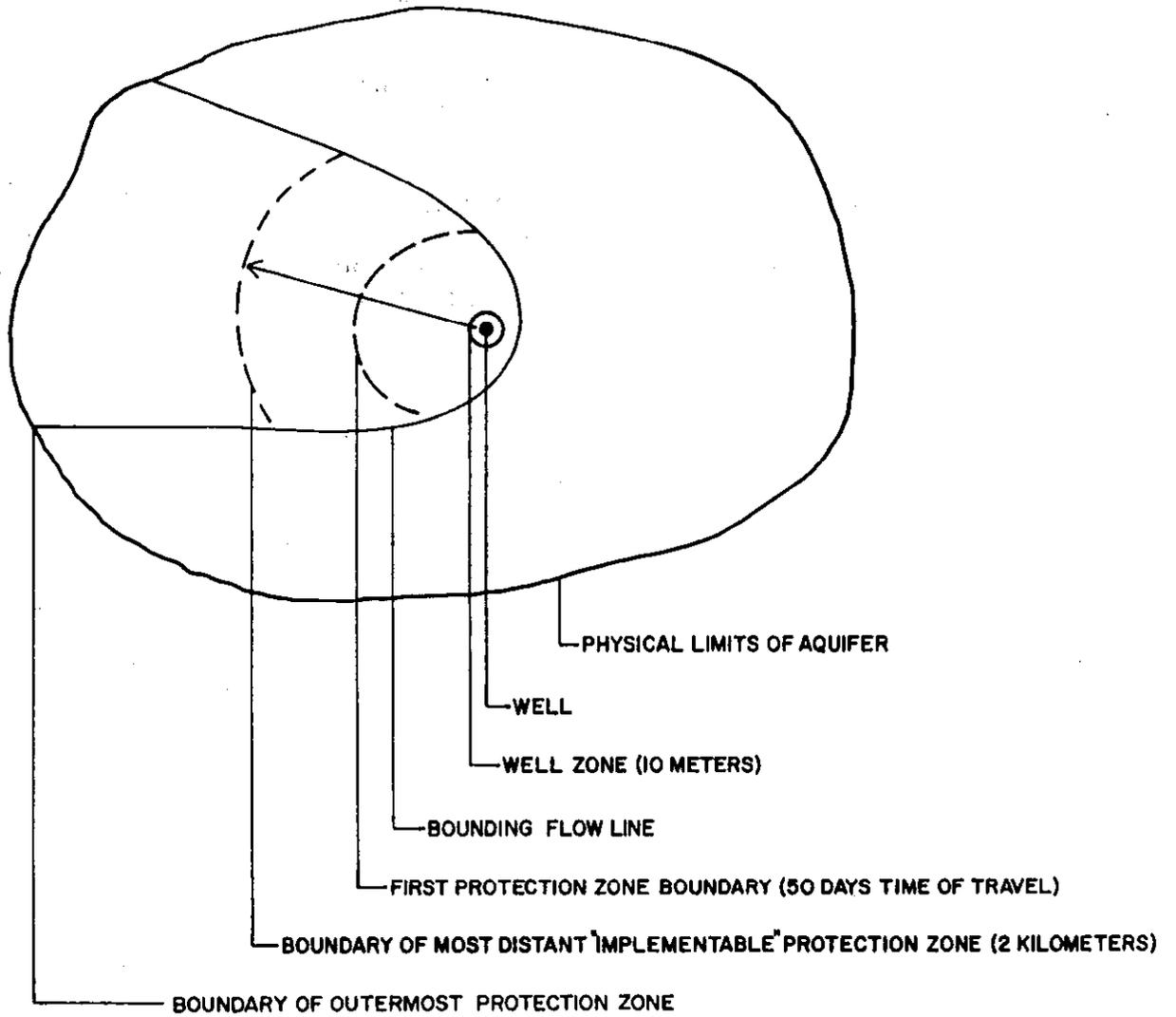
2.4 Interaction with State Ground-Water Protection Efforts

The EPA Ground-Water Classification system will be used as an important tool for decision-making in EPA programs, including those programs delegated to the states. State agencies responsible for ground-water management will not be required to adopt the EPA classification system or another system for general state program use. State agencies implementing delegated or authorized EPA programs will, however, need to use these classification guidelines as appropriate to those programs. Many states have, however, developed ground-water protection approaches that are tailored to their particular land use and hydrogeologic conditions (e.g. generic examples in Figure 2-2). At this time, at least half of the States have in operation, or under serious consideration, some form of site-by-site or in-advance classification system.

It is important to distinguish between these two generic types of classification systems. An in-advance or anticipatory approach to hydrogeologic mapping or aquifer classification is believed by many to be essential for effective local ground-water management (e.g., Conservation Foundation 1985). Through this process, geologic and hydrologic characteristics of currently used or potentially available ground-water sources are assessed through mapping, computer simulation, etc. Plans for water use are drawn-up, and land-use controls either suggested and/or actually put into place. These controls may be fairly sweeping in nature and cover industrial siting, housing development, road construction, etc.

Several Western European countries implement the concept of well-field protection zones (Figure 2-3), often thought of as the most pragmatic approach to anticipatory classification of public water-supply settings (e.g., Milde, et al, 1983). In West Germany, for example, nearly 80 percent of the 14,000 well fields in that country have protection areas in-place or in the process of being established. The key protection area is located within 2 kilometers (about 1.2 miles) from the well. As in most such systems, only a portion of the entire

FIGURE 2-3
IDEALIZED WELL FIELD PROTECTION ZONES IN WEST GERMANY
(AFTER MILDE ET. AL., 1983)



aquifer is given the "special" designation. In Switzerland the distances are shorter (minimum of 200 meters or about 650 feet); those in the Netherlands are time-of-travel based (typically 10 and 25 years travel time). Well-field protection zones are incorporated in some state and local protection systems; most notably, in Florida and the New England states.

There has been considerable activity at the Federal level in the area of enhancing State protection efforts. On June 19, 1986, the President signed into law the Safe Drinking Water Act Amendments of 1986. This law includes two new ground-water provisions, the first of which, (Section 1427), is a demonstration program establishing critical aquifer protection areas (CAPA) within Sole Source Aquifers. This is considered a program which is limited in extent, and geared to demonstrating techniques for protection of certain important ground waters.

The second element of the Amendments requires the States to develop programs to protect the wellhead areas of all public water systems within their jurisdiction "from contaminants that may have any adverse effects on the health of persons." These wellhead protection areas are defined as "any surface or subsurface areas surrounding wellfields through which contaminants are reasonably likely to move and reach a well or wellfield." EPA is required to issue technical guidance within a year after enactment which the States may use (i.e., may not choose to use) for determining the extent of the wellhead protection areas.

The Act specifies that the following elements be incorporated into State programs:

- . Duties of State and local agencies and public water supply systems in implementing the program
- . Determination of wellhead protection areas for each public well
- . Inventory of all potential anthropogenic sources within the protection area
- . A program that contains as appropriate, technical assistance, financial assistance, implementation of control measures, education training and demonstration projects to protect the wellhead areas from contaminants

- . Contingency plans for alternative water supplies in case of contamination
- . Siting considerations for all new wells
- . Procedures for public participation.

This program must be submitted to the Administrator of EPA within the three years after enactment and the States are expected to implement this program within two years after it has been approved by the Administrator. The only effect on a State of failing to submit a Wellhead Protection Program, however, is the loss of related funds.

The provision is structured to give all States maximum flexibility in formulating their programs and the Administrator will disapprove a program only if it is not adequate to protect public water wells from contamination. Any disapproval must be made within nine months of submittal; and, should a program be disapproved, a State must modify the program and resubmit their plans within six months.

Once a program is approved, the Administrator shall make 50 to 90 percent match grants to the State for costs for the development and implementation of the State program. The Congress has authorized \$20 million for each of FY 1987 and 1988 and \$35 million for each FY 1989 through 1991. As of this date, however, no funds for FY 1987 have been appropriated.

It is appropriate to note, however, that wellfield protection is typically the "high end" of any classification system, as it is most often oriented to current, important public water supplies. Potential drinking water sources, ecologically vital ground waters, and low-quality, non-drinking water sources are not identified or managed in such systems.

The important point is that anticipatory classification is best performed and implemented by State and local governments that hold land-use authority. Under its program, existing statutes and budget resources, EPA can only perform site-by-site classification as part of its routine program-by-program effort. The classification system outlined in this guidelines document attempts to be generally consistent with broader anticipatory classification systems. Unlike anticipatory classification, which takes many years (and considerable technical and financial resources) to implement, site-by-site classification can be rapidly factored into EPA

procedures in a way that is legally consistent with Agency authorities. By taking this approach, however, EPA does not wish to discourage anticipatory classification -- an approach which the Agency feels is a very useful one for effective resource management at the State and local levels.

Since a cornerstone of the Ground-Water Protection Strategy is fostering State-specific efforts, EPA is considering the substitution of State ground-water classification systems for the EPA system wherever possible. Given past program precedents, the State system will most likely need to be "equivalent to" or "at least as stringent" as EPA's. Since the implementation of the EPA ground-water classification system is still in the early stages, specific criteria or factors for such evaluations have not been determined. Options for Agency consideration, even though preliminary in nature, will be examined over the course of the next year. Institutional mechanisms at the Headquarters and Regional levels for reviewing such systems will also be considered.

In addition, EPA will be evaluating the legal basis for incorporating State Wellhead Protection areas approved by the Agency under the SDWA Amendments into its operating programs, as well as into this ground-water classification framework.