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GUIDELINES FOR GROUND-WATER CLASSIFICATION UNDER THE EPA GROUND-WATER PROTECTION STRATEGY

FINAL DRAFT

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OFFICE OF WATER

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EXECUTIVE SUMMARY

PART I

Introduction

The Environmental Protection Agency (EPA) issued its Ground-Water Protection Strategy in August, 1984. This guidance document for ground-water classification is a follow-up to the Strategy, and is a major step in EPA's efforts to provide policy direction for EPA programs with ground water responsibility. The purpose of this document is two-fold: (1) to further define the classes, concepts, and key terms related to the classification system outlined in the Ground-Water Protection Strategy, and (2) to describe the procedures and information needs for classifying ground water. Through the release of the Draft Guidelines, public comment is being solicited on the appropriate direction to meeting these purposes.

Through the process of classification, ground-water resources are separated into hierarchical categories on the basis of their value to society, use, and vulnerability to contamination. Ground-water classes will be a factor in deciding the level of protection or remediation the resource will be provided.

Background

The core of the Ground-Water Protection Strategy is a differential protection policy that recognizes that different ground waters require different levels of protection. A three-tiered classification system was established as the vehicle for implementing this policy.

The classification system will, as appropriate, be implemented by EPA program offices and state agencies responsible for EPA delegated programs as changes in program guidance and regulation are made. The differential protection policy, as expressed through the classification system, will assist the programs in tailoring protection policies for ground water. In permit-based actions concerning point sources of pollution, classification will most likely become an additional step in site-specific analysis. Similarly, EPA is considering various approaches for using differential protection and other strategy-related policies for broader-based, nonpoint sources. Two recent EPA rule-making actions-

- one for Superfund and one for radioactive waste disposal--incorporated aspects of the classification system. Other EPA program offices are in different stages of developing approaches to implementing the system. It is important to note that the Guidelines are not enforceable in particular EPA programs until legally incorporated by program guidance regulations, or other appropriate means.

State agencies responsible for managing ground water will not be required by EPA to adopt the classification system for general program use. In fact, many states have already developed ground-water protection approaches tailored to their particular land use and hydrogeologic conditions. However, state agencies carrying out delegated or authorized EPA programs may need to use these guidelines as they are implemented by those programs.

It should be noted that a site located in a designated Safe Drinking Water Act Sole Source Aquifer (SSA) is not automatically placed in Class I. The criteria for SSAs are less rigorous than those of Class I. Greater rigor is needed for classification since, unlike SSAs, Class I will be a decision-making factor in program regulations. SSAs are only considered at the Federal level under financially assisted projects such as farm loans and rural water districts.

At least half of the states are using, or are seriously considering using, some form of a site-by-site or anticipatory classification system. Under its existing programs, EPA will perform site-by-site rather than aquifer or well field classification. However, the classification system presented in this guidelines document attempts to be generally consistent with broader classification systems that may be used by the states. EPA is considering the substitution of state ground-water classification systems for the EPA system wherever possible. In the implementation of its ground-water protection programs, EPA will consider and incorporate, to the extent possible, State Wellhead Protection Areas approved under the Safe Drinking Water Act Amendments of 1986.

The EPA Ground-Water Classification System

The EPA Ground-Water Classification System consists of three general classes of ground water representing a hierarchy of ground-water resource values to society. These classes are:

- Class I - Special ground water

- Class II - Ground water currently and potentially a source for drinking water
- Class III - Ground water not a source of drinking water.

The classification system is, in general, based on drinking water as the highest beneficial use of the resource. The system is designed to be used in conjunction with the site-by-site assessments typically conducted by the EPA program offices in issuing permits and deciding on appropriate remedial action.

Classification Review Area:

A site-by-site approach to classifying ground water necessitates delineating a segment of ground water to which the classification criteria apply. Since EPA is not classifying ground water on a regional or aquifer-specific basis, a Classification Review Area concept is incorporated as a key element in the classification decision. This is, however, strictly an area for review of ground-water characteristics and <u>not</u> an area where regulation will be imposed beyond that of the specific activity under consideration.

The Classification Review Area is delineated based initially on a two-mile radius from the boundaries of the "facility" or the "activity." An expanded Classification Review Area is allowed under certain hydrogeolgoic conditions. Within the Classification Review Area, a preliminary inventory of public water-supply wells, populated areas not served by public supply, wetlands, and surface waters, is performed. The classification criteria are then applied to the Classification Review Area and a classification determination made.

Subdivision of Classification Review Area and Interconnection Concepts:

Where hydrogeologic data are available, the Classification Review Area can be subdivided to reflect the presence of naturally occuring ground-water bodies that may have significantly different use and value. These ground-water bodies, referred to as "ground-water units", must be characterized by a degree of interconnection (between adjacent ground-water units) such that an adverse change in water quality to one ground-water unit will have little likelihood of causing an adverse change in water quality in the adjacent ground-water unit. Each ground-water unit can

be treated as a separate subdivision of the Classification Review Area. A classification decision is made only for the ground-water unit or units potentially impacted by the activity.

The identification of ground-water units and assessment of interconnection between ground-water units may, in critical cases, require a rigorous hydrogeologic analysis. The acceptance of subdivisions will be on a case-by-case basis after review of the supporting analysis.

The recognition of ground-water unit subdivisions to the Classification Review Area establishes a spatial limit for classification and the application of protective management practices. The degree of interconnection to adjacent ground-water units and surface waters is also a criterion for differentiating between subclasses of Class III ground waters.

Ground-water units are mappable, three-dimensional ground-water bodies delineated on the basis of the three types boundaries described below:

Type 1: Permanent ground-water flow divides

Type 2: Extensive, low-permeability (non-aquifer) geologic units (e.g., thick, laterally extensive confining beds) especially where characterized by favorable hydraulic head relationships across them (i.e., the direction and magnitude of flow through the low-permeability unit)

Type 3: Permanent fresh-water/saline-water contacts. (Saline waters being defined as those waters with greater than 10,000 mg/l of Total Dissolved Solids).

The type of boundary separating ground-water units reflects the degree of interconnection between those units. Type 2 boundaries constitute a low degree of interconnection. A low degree is expected to be permanent unless improper management causes the low-permeability flow boundary to be breached. Type 1 and Type 3 boundaries imply an intermediate degree of interconnection. They are prone to alteration/modification due to changes in ground-water withdrawals and recharge.

A high degree of interconnection is inferred when the conditions for a lower degree of interconnection are not demonstrated. High interconnection of waters is assumed to occur within a given ground-water unit and where ground water discharges into adjacent surface waters. A high degree of interconnection implies a significant potential for cross-contamination of waters if a component part of these settings becomes polluted.

Class I - Special Ground Waters:

Class I ground waters are resources of unusually high value. They are highly vulnerable to contamination and are (1) irreplaceable sources of drinking water and/or (2) ecologically vital. Ground water, which is highly vulnerable to contamination, is characterized by a relatively high potential for contaminants to enter and/or to be transported within the ground-water flow system.

In these Draft Guidelines, the Agency is seeking comment on the appropriate approach to defining "highly vulnerable." Public comment will influence the Agency's choice of an approach for the Guidelines when they are issued in final form. To assist in framing the discussion, these Draft Guidelines focus on two options for determining vulnerability. Both of these require consideration of a number of hydrogeologic parameters. Option A would require use of the DRASTIC system (Aller et al, 1985), a numerical ranking system developed by the National Water Well Association under contract to EPA. The DRASTIC system provides a method of scoring an area's "vulnerability" based upon consideration of various parameters such as depth to water, recharge, aquifer media, etc. Using this approach, an area would be considered "highly vulnerable" if its DRASTIC score exceeds levels specified in these Guidelines. Option B does not rely on a set methodology with numerical criteria. Instead, vulnerability would be assessed in a more qualitative manner, relying on best professional judgement. The user might consider specific technical parameters within the DRASTIC system (i.e., depth to water, net recharge, aquifer media, etc.), but would not attribute scores to these parameters or provide numerical cutoffs for defining "highly vulnerable" areas. Other techniques would also be allowable under Option B. Thus, this alternative is considered qualitative in nature since specifics as to methods or criteria are not provided in these Classification Guidelines. Instead, the overall advantages and disadvantages of the general categories of techniques is provided. Comments on these two

options, as well as other options for assessing vulnerability, will be considered by the Agency in determining how best to incorporate this factor in classification decisions.

Ground water may be considered "irreplaceable" if it serves a substantial population and if delivery of comparable quality and quantity of water from alternative sources in the area would be economically infeasible or precluded by institutional constraints.

In these Draft Guidelines, the Agency is also soliciting comment on approaches to judging two aspects of the "irreplaceable" criterion. Option A incorporates a quantitative determination of the population served by the source and the economic feasibility of replacing the source. Under this approach, a drinking water source would be considered "irreplaceable" if it serves at least 2500 people and the annual cost to a typical user of replacing the source exceeds 0.7 to 1.0 percent of the mean household income in the area. Option B focuses on a qualitative assessment of the replaceability of the ground water. Under this approach, the relative size of the population served by the source and the cost of replacing the source would be factors to consider in assessing the source's "replaceability." The Guidelines would not, under Option B, provide a set methodology, nor one or more numerical cutoffs. Again, the determination would focus on best professional judgement. A user following Option B may choose, however, to consider some of the quantitative methods or approaches in Option A, if deemed relevant in a particular classification decision. Comments on these two options, as well as other options for assessing "substantial population" and "irreplaceable" (from an economic standpoint), will be considered by the Agency in determining how best to incorporate these factors in classification decisions.

Ground water may be considered ecologically vital if it supplies a sensitive ecological system located in a groundwater discharge area that supports a unique habitat. A unique habitat is defined to include habitats for endangered or threatened species listed or proposed for listing pursuant to the Endangered Species Act (as amended in 1982), as well as certain types of Federally managed and protected lands.

Class II - Current and Potential Sources of Drinking Water and Water Having Other Beneficial Uses:

All non-Class I ground water currently used, or potentially available, for drinking water and other beneficial use is included in this category, whether or not it is particularly vulnerable to contamination. This class is divided into two subclasses; current sources of drinking water (Subclass IIA), and potential sources of drinking water (Subclass IIB).

Ground water is considered a current source of drinking water under two conditions. The first condition is the presence of one or more operating drinking-water wells (or springs) within the Classification Review Area. The second condition requires the presence within the Classification Review Area of a water-supply reservoir watershed (or portion of a water-supply reservoir watershed) designated for water-quality protection, by either state or local government.

The concept of a current source of drinking water is rather broad by intent. Only a portion of the ground water in the Classification Review Area needs to be supplying water to drinking-water wells.

A potential source of drinking water is one which is capable of yielding a quantity of drinking water to a well or spring sufficient for the needs of an average family. Drinking water is taken specifically as water with a total-dissolved-solids (TDS) concentration of less than 10,000 mg/l, which can be used without treatment, or which can be treated using methods reasonably employed in a public water-supply system. The sufficient yield criterion has been established at 150 gallons/day.

Class III - Ground Water Not a Potential Source of Drinking Water and of Limited Beneficial Use:

Ground waters that are saline, or otherwise contaminated beyond levels which would allow use for drinking or other beneficial purposes, are in this class. They include ground waters (1) with a total-dissolved-solids (TDS) concentration over 10,000 mg/l, or (2) that are so contaminated by naturally occurring conditions, or by the effects of broad-scale human activity (i.e., unrelated to a specific activity), that they cannot be cleaned up using treatment methods reasonably employed in public water-supply systems. Two alternative tests are proposed for making this determination. A refer-

ence-technology test is proposed in the draft and an optional economically-based test is included in Appendix G.

Class III is subcategorized primarily on the basis of the degree of interconnection with surface waters or adjacent ground-water units containing ground water of a higher class. Subclass IIIA ground waters have a high-to-intermediate degree of interconnection to adjacent ground-water units of a higher class or surface waters. In addition, Subclass IIIA encompasses ground waters in those settings where yields are insufficient from any depth within the Classification Review Area to meet the needs of an average size family. Such ground waters, therefore, are not potential sources of drinking water.

Subclass IIIB is restricted to ground waters characterized by a low degree of interconnection to adjacent surface waters or ground waters of a higher class within the Classification Review Area. These ground waters are naturally isolated from sources of drinking water in such a way that there is little potential for producing additional adverse effects on human health and the environment. They have low resource values outside of mining, oil and gas recovery, or waste disposal.

PART II

Classification Procedures

These Guidelines provide a more in-depth discussion of the actual process of site-by-site classification. The process is facilitated through a classification decision chart and associated worksheet. These were developed to provide a systematic approach to classifying ground water based on certain criteria, e.g., presence of wells, ecologically vital areas, water quality, irreplaceability, etc. They are provided as suggested approaches only, since a given setting may be more effectively handled through another sequence of steps.

Classification requires certain information on the character of the Classification Review Area. The emphasis of data collection is on readily available sources. More in-depth analyses are not expected routinely, but, may become necessary for Class I or, especially, Class III areas and for subdivision of the Classification Review Area.

Preliminary data needs include:

- Base map of the Classification Review Area,
- Inventory of public water-supply systems in the review area,
- Delineation of areas served by private wells,
- Demographic information for the public water-supply systems and areas of private wells,
- Survey of ecologically vital areas, and
- Hydrogeologic data sufficient to judge vulnerability of or support interconnection analysis.

The remaining sections of this chapter contain technical guidance for the following:

- Expansion of the Classification Review Area,
- Subdivision of the Classification Review Area and Determination of Interconnection,
- Determining Irreplaceability,
- Determining Ground-Water Vulnerability,
- Determination of Reasonable Treatment, and
- Ground-Water and Surface-Water Interactions.

PART III

The final chapters of this document are appendices which contain the following information:

Appendix A - Glossary

Appendix B - Alternative Options Considered

Appendix C - Sample Applications of Ground-Water Classification

Appendix D - DRASTIC Factors and Ratings

Appendix E - Background Data Regarding Class I and III
Appendix F - Census Bureau Information

Appendix G - Economic Tests for Determining Class I Irreplaceable Waters and Class III-Untreated Ground Waters