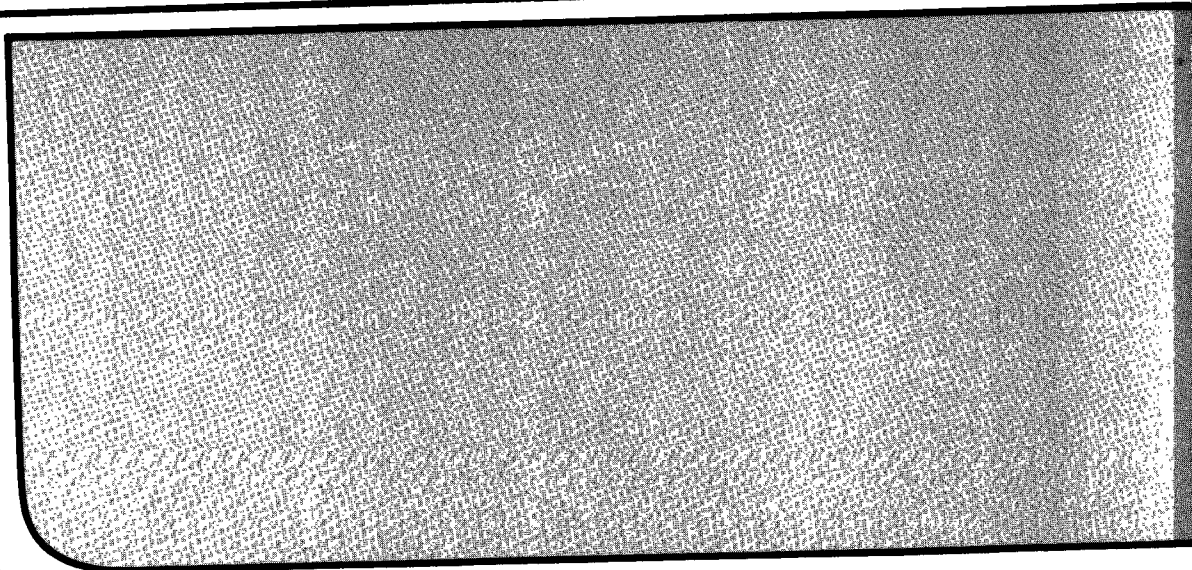


EPA

Developing A State Wellhead Protection Program

**A User's Guide
to Assist State Agencies
Under the Safe Drinking Water Act**



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Acknowledgements

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Marian Mlay
Director

*Office of Ground-
Water Protection*

Table of Contents

I. Introduction

Purpose of this Technical Assistance Document	1
How this Document is Organized	1
Overview of the Wellhead Protection Program	1

II. Roles and Duties of State and Local Agencies

WHP Program Submission Elements	3
Identify Roles	4
Assign Duties	6
Coordinate Activities	8

III. Delineation of Wellhead Protection Areas

WHP Program Submission Elements	11
Choose Institutional Processes	12
Choose Delineation Criteria	14
Identify Phasing Schedule	16

IV. Source Identification

WHP Program Submission Elements	19
List Source Categories	20
Develop Source Inventory	22
Modify Inventory	24

V. Management Approaches

WHP Program Submission Elements	27
Identify Management Programs	28
Identify Uncontrolled Sources	30
Specify Phasing Criteria	32

VI. Contingency Plan

WHP Program Submission Elements	35
Contingency Planning Process	36

VII. New Wells

WHP Program Submission Elements	39
Siting New Wells	40

VIII. Putting It All Together

Concluding Thoughts	42
Road Map to a WHP Program Submittal	43

Appendix: EPA Regional Ground-Water Representatives

I. INTRODUCTION

The 1986 Amendments to the Safe Drinking Water Act (SDWA) established a new Wellhead Protection (WHP) Program to protect ground waters that supply wells and wellfields that contribute drinking water to public water supply systems. Under SDWA Section 1428 each State must prepare a WHP Program and submit it to EPA by June 19, 1989. Although the law requires that every State WHP Program must contain specific elements, EPA recognizes that States should be allowed flexibility to tailor Program details to best suit their individual needs and circumstances.

Purpose of this Technical Assistance Document

This Technical Assistance Document (TAD) is one of several publications prepared by EPA to assist States in developing their WHP Programs. This TAD does not specify approaches that must be adopted or precise language that must be incorporated into the Program document submitted to EPA. Rather, it illustrates ranges of options that States can choose from as well as examples of the different approaches that can be taken in developing each element of their WHP Programs. In no way does the use of this TAD obviate a State's obligation to meet the requirements cited in the Guidance for Applicants for State Wellhead Protection Program Assistance Funds under the Safe Drinking Water Act, dated June 1987. The Guidance describes all the statutory requirements that a State's WHP Program must meet and discusses, in detail, the elements that must be included. This TAD is intended as a complement to the Guidance.

Other Technical Assistance Documents, which will be made available by EPA on request, address the technical details of approaches for preparing individual WHP Program elements. See Appendix A for a list of EPA contacts to obtain information about those other support documents.

How this Document is Organized

Each individual chapter addresses a major WHP Program element, and provides:

- A list of the major submittal requirements associated with the elements that chapter addresses, drawn directly from the June, 1987 EPA Guidance;
- Major messages that a State should consider while developing that particular point of their WHP Program;
- Graphic Illustrations that show a range of optional approaches a State might consider in developing the program element; and
- Case study examples that illustrate how a State might address the element in its WHP Program.

The "road map" figure at the end of this document guides the reader through the logical steps of using the TAD to support the WHP planning process.

Overview of the Wellhead Protection Program

Program Elements

A comprehensive Wellhead Protection Program comprises several distinct and essential elements. At a minimum, each State's WHP Program must:

- Specify roles and duties of State agencies, local government entities, and public water suppliers, with respect to the development and implementation of WHP Programs;
- Delineate the wellhead protection area (WHPA) for each wellhead, as defined in subsection 1428(e), based on reasonably available hydrogeologic information on ground-water flow, recharge and discharge, and other information the State deems necessary to adequately determine the WHPA;
- Identify sources of contaminants within each WHPA including all potential anthropogenic sources that may have any adverse effect on health;

Program Elements (cont'd)

- Develop management approaches which include, as appropriate, technical assistance, financial assistance, implementation of control measures, education, training, and demonstration projects that are used to protect the water supply within WHPAs from such contaminants;
- Develop contingency plans for each public water supply system indicating the location and provision of alternate drinking water supplies in the event of well or wellfield contamination;
- Site new wells properly to maximize yield and minimize potential contamination; and
- Ensure public participation by incorporating processes for appropriate involvement in WHP Program elements.

Program Philosophy

The design of the WHP Program is based on EPA's recognition of the need to:

- Meet the goals stated in the Safe Drinking Water Act;
- Take into account the diversity of hydrogeologic settings and sources of contamination;
- Maximize State creativity and flexibility in WHP Program design and implementation;
- Recognize State and local primacy in matters of land use and water allocation; and
- Assist States in achieving comprehensive ground-water protection.

In order to meet the intent of the WHP Program, States should design their individual WHP Programs to:

Meet the State's goals, fit within its institutional constraints, and address the State's unique problems;

Take advantage of existing institutional structures, organizations, authorities, etc.;

Formalize working arrangements and identify the mechanisms that will be used to coordinate the activities of all participating agencies;

Integrate new activities and policies with those already in place; and

Take advantage of the opportunity presented by the WHP Program to integrate related programs and use new approaches for ground-water protection.

Phasing

The WHP Program has three separate and distinct phases: First, development of the State's Program (authorized for FYs 1988 and 1989); Secondly, submittal of the State's Program (by June 19, 1989) and approval/disapproval by EPA (within nine months); and third, Implementation of the State WHP Programs that have been approved (authorized through FY 1991). During the development phase, each participating State is expected to prepare a State WHP Program specifically addressing each component required for WHP Program approval. All participating States must submit their WHP Programs to the appropriate EPA Region for EPA review no later than June 19, 1989. States whose WHP Programs are approved would then be eligible to apply for Federal funds to assist them in their implementation of the WHP Program. To date, no Federal funds have been appropriated in support of this program.

Chapter II: Roles and Duties of State and Local Agencies

As specified in Section 1428 of the SDWA and the EPA Guidance for Applicants, a State WHP Program submittal includes:

Identification of all State or local entities or public water suppliers that have a role in carrying out the WHP Program, and designation of a lead management agency

Duties of each participating agency, including those of the lead agency responsible for overall development and implementation of the program

Mechanisms that have been and will be used to coordinate and integrate participating State agencies, other State and local entities and appropriate Federal agencies

MAJOR MESSAGES

- Use the State's existing ground-water protection strategy, existing legal authority, and organizational structures where possible as a basis for assigning duties and roles
- Integrate functions of the WHP Program and related State programs (e.g., State planning or solid waste management)
- Create new authority and organizational capacity only if necessary to fill gaps (e.g., to handle cross media issues)
- Establish formal mechanisms to coordinate activities of various jurisdictions (e.g., Intra-State, State/Federal, Interstate) in achieving ground-water protection goals
- Be aware of potential conflicts in the goals of various interests (e.g., between government entities and public and private water suppliers)

The remainder of this Chapter illustrates the range of available options for identifying roles, assigning duties, and creating coordination mechanisms, along with case study examples of a State's experience in preparing these WHP Program elements.

Possible Participants

Range of Options

- State-Level Agencies:**
 - State EPA
 - Dept. of Public Health
 - Dept. of Natural Resources
 - State Geological Survey
 - State Water Board
 - State Planning Office
 - Other State Support Agencies
- Intergovernmental Agencies:**
 - Regional Planning Agencies
 - Interstate Compacts
- Local-Level Agencies:**
 - Municipal Public Works Departments
 - Zoning Boards
- Water Suppliers:**
 - Local Public Water Entities
 - Private Utilities
- Other Public Entities:**
 - Agriculture Extension Service
 - Special Districts
 - Soil & Water Conservation Districts
 - Groundwater Districts
 - Health Districts
 - Universities
- Private Sector Entities:**
 - Professional Associations
 - Technical Advisory Groups
 - Citizen Advisory Groups
 - User Groups

Functional Categories

Range of Options

- Administration:**
 - Budgeting
 - Funding
 - Data Collection
 - Data Management
 - Oversight
- Technical Support:**
 - QA/Testing
 - Research/Evaluation
 - Hydrogeology/Delineation
- Regulation:**
 - Permitting
 - Enforcement
 - Monitoring
- Planning:**
 - Infrastructure Development
 - Establishing Priorities
 - Water Use/Demand
- Service:**
 - Supply
 - Treatment/Purification

Role Designation Criteria

Range of Options

- Lead Agency Roles Based on:**
 - Policy Responsibility
 - Program management experience
 - Coordination experience
 - Budgetary Support
- Support Roles Based on:**
 - Technical specialization
 - Available staff
 - Regional/local presence

Sorting Out Overlapping Roles and Responsibilities

The State's environmental and natural resource programs are carried out primarily by two State agencies: the Department of Environmental Protection (DEP) and the Department of Water Resources (DWR). While the DEP had most of the responsibility for enforcing environmental protection regulations, the DWR was the primary planning agency for statewide natural resource matters.

A study by the State's Budget Office found that between the two agencies there were resources to fill nearly all the functional roles needed for a State WHP Program. However, they lacked expertise to provide technical support for testing water quality of aquifers, and for the development of fate and transport models in the WHP delineation process. The Budget Office recommended that the State's Geologic Survey serve this technical support role, due to its experience and available staff of qualified hydrogeologists.

The Budget Office also recommended that the DEP serve as the lead agency for the WHP Program, based on the strength of its experience and positive track record in managing Federally-delegated environmental programs. The DWR would continue to fulfill its planning role, and the State Geologic Survey would round out WHP functional roles by providing technical support.

The agency heads of DEP and DWR convened a working group of regional and local government officials to identify implementation and support roles at those levels. The Working Group reviewed past "track records" and potential roles, and solicited the advice of local Soil and Water Conservation Districts, local Agricultural Extension Agents, and regional Economic Development Councils. Additionally, the Working Group sponsored several public hearings to solicit important views on the experience and appropriateness of various local and regional organizations to play roles in the WHP Program. Based on this review and input from experienced observers of the local and regional ground-water scene, the Working Group presented specific recommendations for lead and support roles in the WHP Program.

Organizing Multiple State Roles

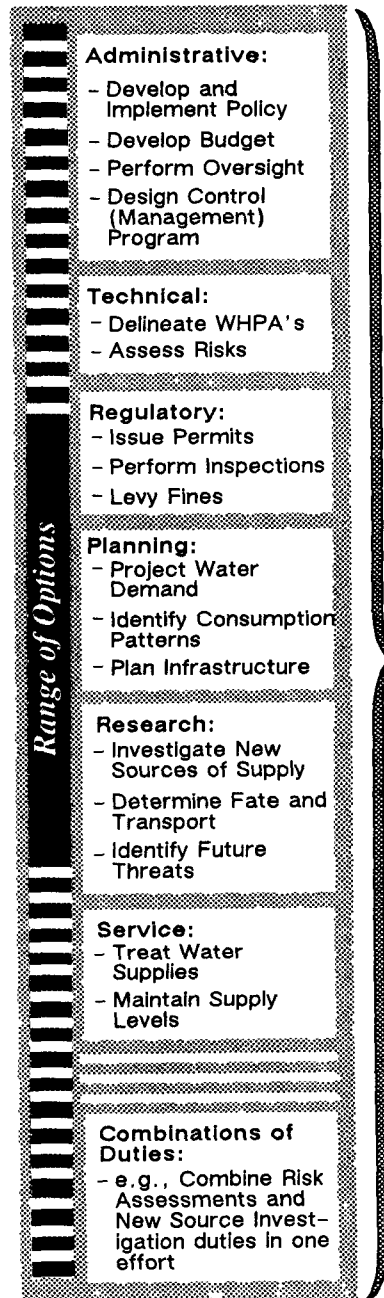
The State's programs which supported ground-water protection were limited, and responsibilities were scattered among several independent agencies. The Governor appointed a panel of experts to review the legislative mandates and institutional pattern of State ground-water protection activities, and recommend new arrangements for the State's WHP Program.

At that time, the Department of Public Health (DPH) was the agency primarily responsible for overall planning of ground-water protection activities and for assessing water needs and supply adequacy at the State level. Regional Planning Agencies had significant roles as well. Since many were recipients of federal planning assistance over the past 10 years, they had developed data bases and data management capabilities, along with an extensive knowledge of the infrastructure of the water supply systems in the region. Local water agencies had access to management tools for ground-water protection such as: zoning, erosion control ordinances, site plan reviews, and contaminant and source identification.

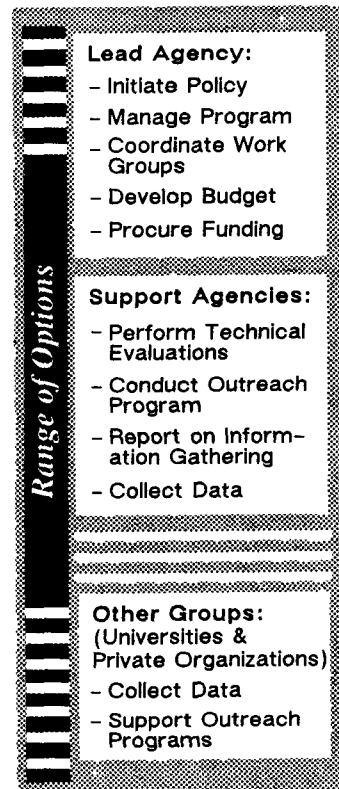
After determining the functional roles that each of the agencies played in support of ground-water protection, the panel observed that some functions, such as program administration and technical support, were not being adequately fulfilled. As a remedy, the panel recommended the creation of a Division of Ground-Water Protection (DGWP) within the DPH. Acting on the panel's recommendations, the Secretary of DPH created this new organizational unit.

DPH was designated the lead agency for the WHP Program, with responsibility for developing policy and overall strategy for ground-water protection. The DPH was supported by the State Office of Budget and Administration, which assumed responsibility for budget development and program management. The Governor's Intergovernmental Affairs Coordinator served as a broker between State and local government interests, and focused attention on the statewide significance of ground-water protection efforts. Because of their access to extensive planning data, the data management divisions of each Regional Planning Agency were designated to play support roles.

Duties



Assignments



Examples - for assigning duties to each participating agency**Consolidating Assignments by Areas of Technical Expertise**

Most of the State's current ground-water protection activities are focused in a single agency, the Department of Natural Resources (DNR). While the DNR was designated as lead agency for the WHP Program, many of the other important functions were assumed by other State organizations. For instance, the Office of State Planning was responsible for water supply infrastructure planning, the Industrial Site Review Board was responsible for issuing permits to potentially contaminating sources, and the Environmental Management Agency (EMA) was responsible for technical evaluations of water quality data. To better manage the WHP Program, the DNR consolidated assignments of support agencies according to their particular areas of expertise, thus reducing the number of organizations directly accountable to DNR.

The lead agency assigned WHPA delineation to the Division of Public Water Supply in the EMA, which coordinated hydrogeological investigations with the State University and the development of delineation criteria and methodology with the State's Geologic Survey. Preliminary source identification assignments were carried out by staff from the Industrial Site Review Board and coordinated by the EMA. Source category development was done by DNR in-house and list development and refinement were carried out by a technical working group made up of other State agency staff and local government staff under EMA's direction. The development of management approaches was handled by the DNR with assistance from an advisory team of local government officials, water suppliers, and community groups. Contingency planning was delegated directly to local private/public water utilities, but the process was managed under the supervision of the DNR. New well siting was handled by the State Planning Office, which drew support from the State Geologic Survey for technical expertise.

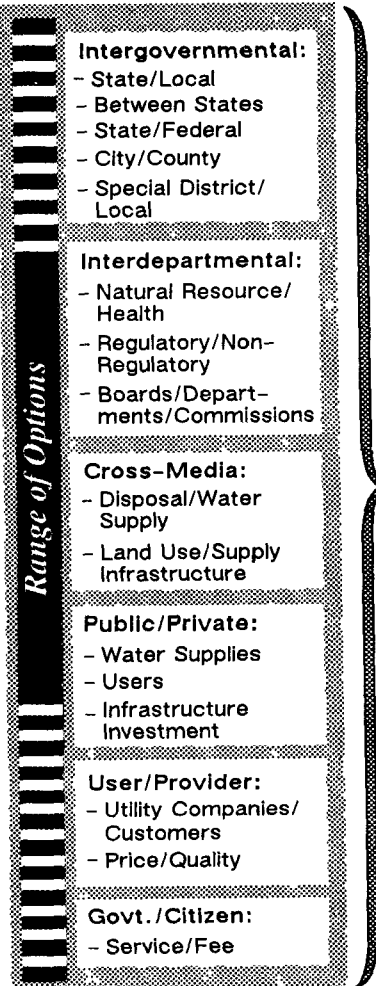
Assigning Duties by Delegating to Other Agencies

The State's environmental protection programs are highly developed. Nearly every form of Federal assistance and regulatory program available has been taken on and implemented by the State. The State's ground-water strategy is the responsibility of the Water Resources Board (WRB), an umbrella agency with limited staff resources responsible for developing environmental and water resource policy. In designating the WRB as lead agency for the WHP Program, the State anticipated that a significant number of duties would be delegated to other agencies that had sufficient staff resources to carry out assignments.

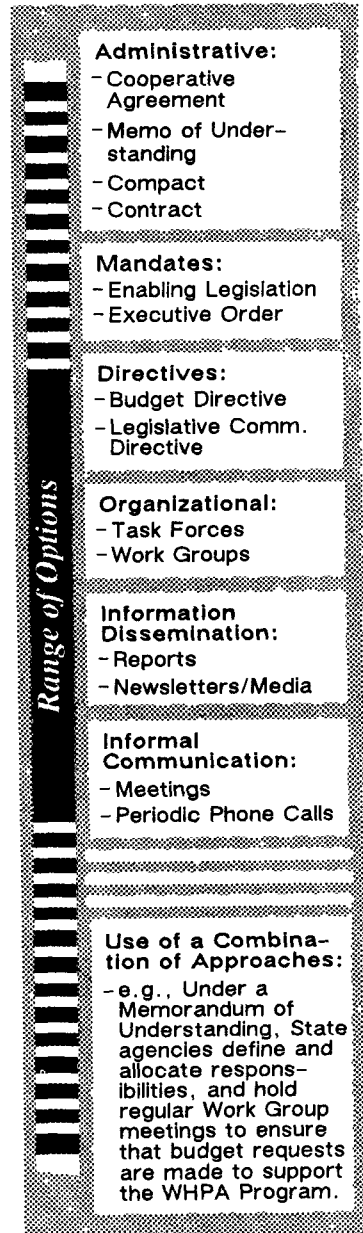
As a first step in assigning program responsibilities, the WRB, assisted by an independent advisory group of management and organization specialists from the State University, developed a strategic management plan. This plan outlined each WHP program element, the management process, and the probable tasks required, and then matched agency staff capabilities with each task. Next, Memoranda of Agreement were drawn up to specify duties assigned to each participating agency in the WHP Program.

A Memorandum of Agreement between the WRB and the State Geological Survey (SGS) specified that a technical workgroup would be responsible for reviewing the delineation criteria and methodology. The workgroup consisted of representatives from WRB and SGS, a hydrogeologist from the State University's Water Resource Center, an industry representative, and an environmental interest group representative. Source management plans were assigned to the WRB in conjunction with the local Soil and Water Conservation Districts (SWCD). Specific duties in this joint effort were defined in a cooperative agreement providing for financial support from the State Budget Office to support the WRB, the technical workgroup, and the local SWCDs.

**Identify
Interrelationships**



**Develop Mechanisms
to Coordinate Activities**



Examples - for coordinating activities of participating agencies**Coordinating Management of Existing Agencies**

The State had a wide variety of control measures in place to manage sources already identified. Many control measures were under the direction of separate organizational units, however, and regulatory programs were uncoordinated and ineffective. The lead State agency, the Department of Natural Resources (DNR), was charged with developing mechanisms to coordinate the activities of agencies participating in source management strategies for currently regulated sources.

The Office of Ground-Water Quality within the DNR formed a policy committee composed of the directors of the Water Pollution Division and Solid and Hazardous Waste Control Division and representatives from other agencies participating in WHP Program activities. As its first activity, this committee identified key interrelationships among agencies responsible for inspection, enforcement, and performance standards regulating sources within WHPAs. The committee was supported by technical staff from the relevant divisions within DNR by virtue of a budget directive from the Governor. In a Memorandum of Agreement, agency heads agreed to allocate staff time for developing WHP policies and procedures and organizing required public hearings.

To evaluate progress toward developing more effective inspection and enforcement operations within the WHPAs, the Director of the Office of Ground-Water Quality solicited periodic progress reports from divisions within the DNR, the Department of Health, the State EPA, and local government organizations that were responsible for inspection and enforcement duties.

The DNR policy committee also sponsored a review of all agencies' legal and administrative authority for ground-water protection. The review, performed by a task force from the State University's law faculty, analyzed opportunities for consolidation of authority to create a stronger basis for coordination and a more effective WHP Program.

Coordinating Intergovernmental Management of Unregulated Sources

As lead State agency, the Department of Health (DOH) was responsible for developing mechanisms to coordinate the efforts of all agencies concerned with currently unregulated sources. DOH realized the need for additional coordination of management efforts for these sources and sought advice on ways to strengthen it across all levels of government.

Interrelationships among those agencies concerned with non-regulated sources were studied by a work group consisting of representatives from the DOH, the State University's Public Administration and Law school faculties, the Governor's Office, and the State EPA. The work group identified a series of management interdependencies between levels of government which required coordination and cooperation to effectively control unregulated sources. For instance, local Soil and Water Conservation Districts had access to fertilizer and pesticide application data which was not collected by State agencies. In addition, Federal Agencies that may be subject to State WHP Program requirements were identified.

Strong local involvement in water supply matters is a tradition in the State, so the DOH decided that local governments would take primary management responsibility for identifying sources not currently regulated. To support this effort, the DOH hired a planning consultant "circuit rider," who travelled throughout the State provided technical assistance and advice to local agencies on zoning and development decisions affecting non-regulated sources. Through the State Public Affairs Office, which served to inform and coordinate the efforts of community-based groups, DOH also sponsored a public information campaign which included dissemination of fact sheets and slide presentations on non-regulated sources at public hearings.

DOH and the local agencies agreed to cooperate through an interagency agreement whereby WHP management strategies would be incorporated into local comprehensive plans, which would be amended to reflect this agreement within three years. As an incentive to local governments, small grants were provided to support the preparation of each WHP plan element.

As specified in Section 1428 of the SDWA and the EPA Guidance for Applicants, a State WHP Program submittal includes:

The institutional processes used to (a) develop the technical aspects of WHPA delineation, and (b) implement, monitor, and refine such elements

The choices and rationale for WHPA delineation criteria and criteria thresholds, including the overall goals that drive the State's selection

The choices and rationale for WHPA delineation methods

The phasing of delineation by major well types, hydrogeologic settings, or other factors, along with the rationale for such phasing

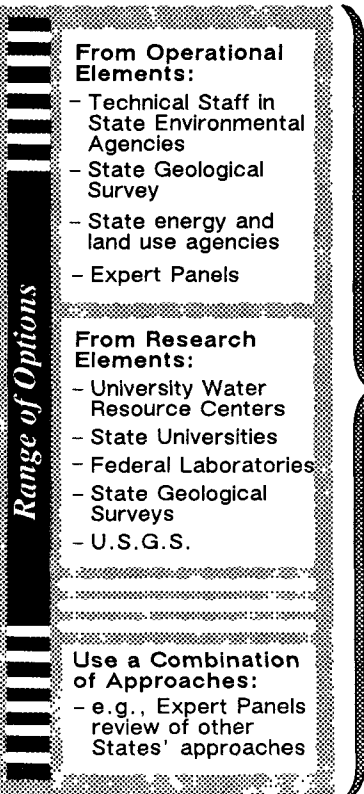
MAJOR MESSAGES

- Delineate WHPAs to protect wells from three general categories of threats:
 - 1) direct introduction of contaminants in areas immediately contiguous to wells
 - 2) microbial contaminants
 - 3) chemical contaminants
- Adopt overall delineation goals consistent with source management plans
- Use multiple zones where appropriate to match management controls with risk to well-water quality
- Ensure that delineation criteria and criteria thresholds are given primary importance, then focus on delineation methodologies
- Ensure qualified technical staff are made available; utilize peer review and technical workgroups
- Ensure that the delineation goals and methodology are compatible with the WHPA criteria and thresholds
- Compare alternative delineation criteria, thresholds, and methodologies through case study analysis to ensure cost-effectiveness
- Phase delineation of WHPAs according to such factors as well yield, hydrogeologic setting, vulnerability, or contaminant risk
- Streamline delineation by initially using simplified procedures to ensure early implementation, then subsequently delineate WHPA boundaries more precisely as soon as possible to increase protection
- Delineate larger WHPAs initially, especially if simpler methods are used; later, more sophisticated methods can be used to refine boundaries to ensure better protection
- Include a schedule for phasing delineation to use technical and financial resources most efficiently

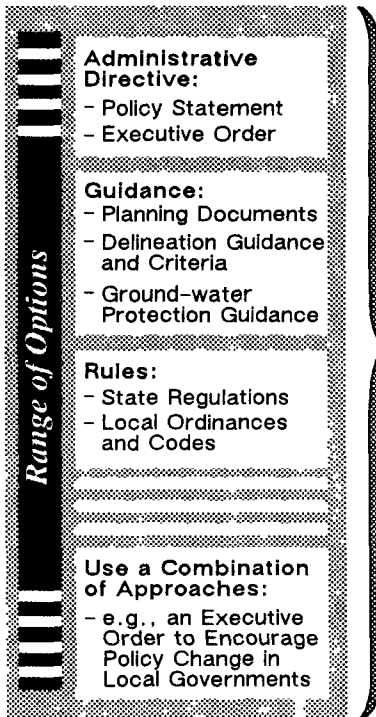
The remainder of this chapter illustrates the range of available options for institutional processes, delineation criteria, and phasing, along with case study examples of a State's experience in preparing these WHP Program elements.

Range of Options - for choosing institutional processes in delineation

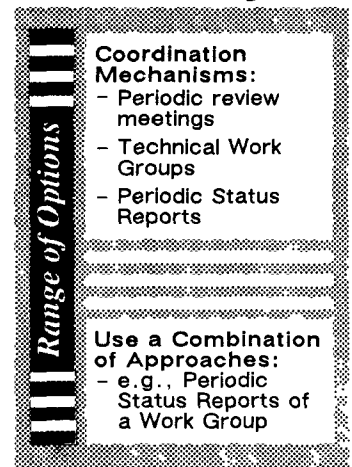
Technical Input



Implementation Tools



Methods of Monitoring & Refining



Involving the State University and the U. S. Geological Survey

When the State began planning its WHP Program, the only hydrogeological data available to the lead agency, the Department of Natural Resources (DNR), consisted of information on the locations of the State's public water wells. In contrast, the State University's Department of Geology had a significant amount of technical information on the State's hydrogeologic conditions which was continuously revised and updated. Similarly, the State Planning Office had a wealth of water quality data from previous section 208 studies. The DNR initially involved several research-oriented institutions in the delineation process. For example, the Department of Geology assisted in developing delineation criteria, thresholds, and methodology. Then, using data from University-sponsored hydrogeological studies, the DNR tested the criteria and thresholds in a variety of hydrogeological area case studies.

Early in the process the DNR also sought help from the Water Resource Board, the Waste Treatment Research Council, the Division of Environmental Regulation, and local Soil and Water Conservation Districts. For example, the staff of the State's Water Resource Board reviewed the methodology proposed by the Geology Department, and the District Office of the USGS provided technical assistance and peer review. To refine the methodology and resulting WHPA boundaries, the lead agency asked the State Planning Office and representatives of local governments to participate in the review process. This enhanced the local communities' receptiveness toward the boundaries delineated for the WHPAs and provided a basis for local cooperation for the Program's implementation.

The State subsequently entered into a cooperative agreement with the USGS to perform the actual delineation of WHPAs over a three-year period. The lead agency and the USGS agreed to meet quarterly to monitor and refine the delineation process.

Involving a Technical Advisory Committee, Local Governments, and the Public

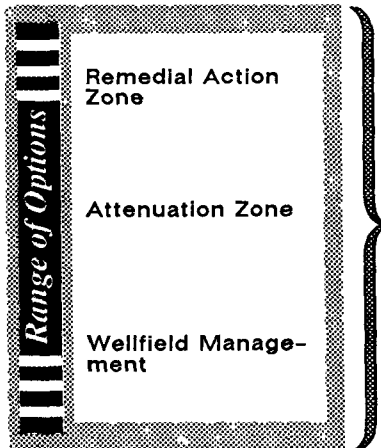
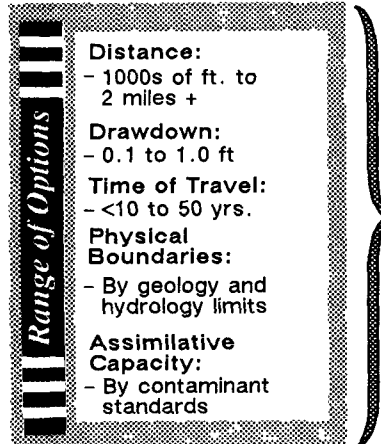
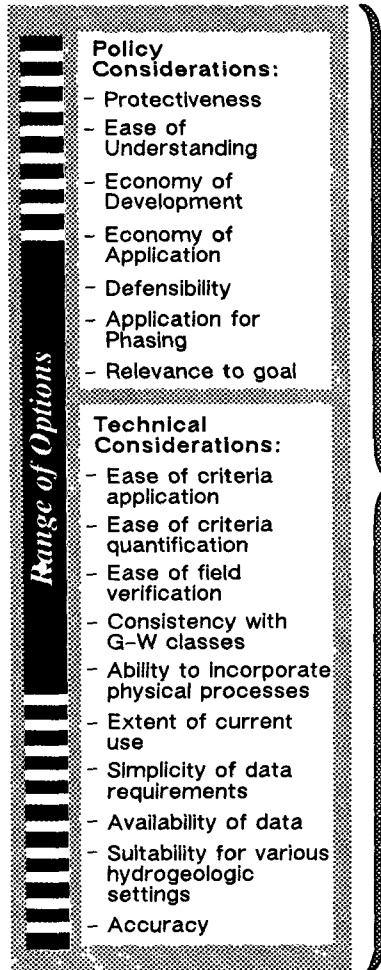
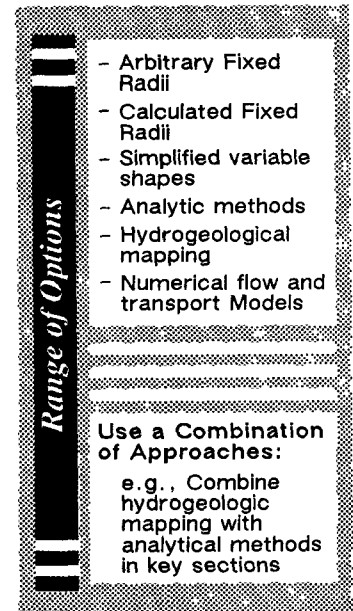
Prior to this State's participation in the WHP Program, the State's lead agency, the Department of Environmental Protection (DEP), successfully developed and implemented a ground-water classification scheme and mapped the State's major aquifers. The scheme was so well received that many local governments began to apply it to develop aquifer protection zones.

The DEP attributed much of the success of its ground-water classification scheme to the institutional processes used. Consequently, in developing delineation procedures for the WHP Program, the DEP chose to replicate, to the extent possible, the institutional processes that were successful in developing its ground-water classification scheme.

First, the lead agency reconvened the same Technical Advisory Committee (TAC) that had assisted in developing the ground-water classification scheme. The TAC included hydrogeologic and water use experts from Federal, State, and regional government agencies, and from the private sector. The TAC first established goals for the delineation process, then selected the State's WHPA delineation criteria and thresholds, and, finally, developed the methodology used to translate the criteria into on-the-map WHPA delineation boundaries.

The DEP adopted regulations that gave local/regional water authorities responsibility for protecting public drinking water wells and delineating WHPAs. The State Public Water Authority (PWA) was assigned the responsibility for reviewing and approving all WHPA delineations.

To assist the local Water Authorities, the lead agency developed and incorporated into a State guidance manual a systematic approach for delineating WHPAs. In addition, the lead agency met with the Water Authorities at regular intervals to monitor the delineation process being conducted by each Authority and provided hands-on technical assistance supplementing that provided by community groups, counties, and municipalities within the Authority's jurisdiction.

Range of Options - for choosing delineation criteria and thresholds**Delineation Goals****Criteria Thresholds****Criteria Considerations****Methods**

Establishing Wellfield Management for Entire Recharge Areas

As the lead agency, the Department of Environmental Protection (DEP) chose as its overall goal to establish wellfield management areas in major portions of the current or future recharge/contribution areas for wells throughout the State.

Since the State's wellfields draw mostly upon ground-water obtained from small, valley-fill aquifers with distinct boundaries, establishing wellfield management areas resulted in strong, effective measures to protect these aquifers from chemical contaminants. Also, given the small size of the State's aquifers and the State's limited financial and managerial resources, a wellfield management approach was relatively economical to implement.

Because of the small size of the State's aquifers and the large variation in hydrogeologic settings, the DEP selected physical boundaries as the primary criterion for delineating WHPAs. This approach was inexpensive and easy to apply and verify in the field, easy for the general public to understand, easy to defend if challenged, yet sufficiently sophisticated to avoid extensive revisions resulting from phased delineation. Since the shallow ground-water flow system replicated the topography throughout the State, topographical boundaries were used as the initial criteria threshold to delineate WHPAs.

Having chosen wellfield management as a criteria and flow boundary as a threshold, the lead agency chose topographical mapping as the technical method to "map" the State's WHPAs. Because this method could be implemented quickly, it enabled the State to delineate the majority of its WHPAs during the development phase of the WHP Program. Likewise, quick implementation of this method for areas immediately contiguous to wellheads allowed them to be readily incorporated early in delineation.

Finally, as delineation of the State's WHPAs progressed, the DEP also made use of analytical flow models to improve and refine the delineation procedures for its most sensitive wellhead areas. Through the application of an analytical flow equation, the degree of contribution of selected wellfield areas was identified.

Establishing a Remedial Action Zone Around Wellheads

As the lead agency for developing and implementing this State's WHP Program, the Department of Public Health (DPH) determined that remedial action zones around each well would be a primary delineation goal. This would minimize the likelihood that drinking water supplied by wells would be exposed to unexpected contaminant releases.

To meet this goal, DPH chose to enlarge the buffer zone immediately contiguous to each wellhead to protect against microbial and direct contamination. By banning new "high-risk" source activities in the buffer zone, corrective action measures could be completed before the contamination reached wells.

The DPH staff chose time of travel (TOT) as the criterion to delineate the WHPA boundaries. Because TOT was easily quantified and more easily understood, it was well suited to meet delineation goals. Their rationale indicated that TOT was especially appropriate since the State already had enough data on TOT to delineate the WHPAs easily and economically. The DPH also reasoned that different degrees of wellhead protection could be provided by applying different TOT threshold limits to meet unique regional conditions.

As the state-wide criteria threshold, the DPH chose to apply a 10-year TOT to delineate WHPAs for the majority of the State's wells. However, the DPH adopted other TOT thresholds appropriate for specific local conditions. For example, the DPH concluded that using a less protective threshold was justifiable in selected counties with aggressive inspection programs that included careful monitoring of "high risk" activities. On these grounds, certain counties were able to justify using a 5-year TOT rather than the more stringent 10-year TOT. Nevertheless, those counties were required by rule to apply for exemptions from the standard state-wide 10-year minimum TOT threshold.

In contrast, certain areas of the State required more stringent measures to meet WHP goals. As a result of hydrogeologic conditions in some counties, a longer time was needed to ensure effective remediation of releases. In those counties, a 15 to 25-year minimum TOT criterion threshold was required and certain activities were banned.

Delineation Timing

Range of Options

One-Step:

- Formally establish criteria, thresholds and methods

By Phase:

- Identify WHPAs generically
- Demonstrate test case applications
- Apply risk assessment to establish priorities
- Determine nature of phasing needed
- Establish criteria for each major or minor phase

Phasing Considerations

Range of Options

Communal Use Risk:

- Population served
- Pumping rates

Replaceability:

- Importance of particular wells
- Number of consumers served

Extent of Contamination of Ground Water**Presence and Extent of Contamination Threats:**

- Within WHPAs
- In Surrounding Areas

Degree of Aquifer Confinement**Assurance of Aquifer Confinement****Stringency of Management Programs****Stringency of Regulations****Availability of Staff and Resources**

Refinement

Range of Options

Reappraise or Improve Boundaries of Specific WHPAs as Needed:

- Apply more sophisticated methods
- Reinterpret existing methods
- Reinterpret existing data
- Collect new data

Adjust Hydrogeologically Determined Boundaries to Match Other Features:

- Governmental boundaries
- Area zoning boundaries
- Roads
- Major topographic features

Phasing Delineation Primarily by Vulnerability

The State selected its Department of Environmental Conservation (DEC) as the lead agency to develop and manage its WHP Program. Given the large number of public wells and large land area in the state, the DEC believed it was practical to schedule the delineation of the State's WHPAs in several phases, based primarily on the vulnerability of aquifers supplying the wells. The schedule would enable all of the State's WHPAs to be completely delineated within 10 years.

To facilitate the delineation of WHPAs, the lead agency initially used large criteria thresholds and simplified methods. Once all of the State's WHPAs were delineated generically, individual boundaries could be delineated more precisely. WHPAs could then be reduced in size during the process of refinement. This approach was based on the assumption that expanding the boundaries of WHPAs because they are under-protective would be more disruptive in the long run than reducing WHPA size appropriately for the level of protection needed.

The phasing philosophy of the lead agency made identification of wells located in shallow aquifers the first priority. Although wells drawing from shallow aquifers account for only 20 percent of the State's wells and tend to serve smaller populations, they comprise the State's most vulnerable underground drinking water sources. In addition, they are typically used by smaller rural communities, which generally lack land use controls for ground-water protection. The schedule allotted 24 months to complete this first phase of delineation.

The lead agency then targeted wells drawing upon semi-confined aquifers less than 100 feet deep for the second phase of delineation. These are the predominant type of aquifers found in oil producing areas of the State. Evidence from State records indicated that there were numerous improperly plugged exploration wells in these aquifers that could serve as conduits for the introduction of contaminants into well waters. A maximum of 48 months was scheduled to complete the second phase of wellhead delineation.

The last phase required delineating WHPAs for wells drawing upon confined aquifers deeper than

100 feet. The lead agency's rationale for allowing this delineation phase to proceed more slowly stemmed largely from the absence of information indicating that these wells were exposed to any immediate threat of contamination. As a contingency, the lead agency initiated several special studies to confirm this, and assured that delineation of WHPAs for these wells be completed within several years pending new findings from the study.

Phasing Delineation by Relative Risk to Population

The State has two basic regions: an upland region, inward from its coast, and a coastal plain which extends to its shoreline. The upland region is sparsely populated, relies on one or more confined aquifers, and is experiencing development pressure from leisure homes and recreational communities. The coastal plain is heavily populated and industrialized, with numerous aquifers and porous soils.

Based on factors of communal risk, the lead agency, the Department of Water Resources (DWR) decided to delineate WHPAs in the State's coastal plain first. These wells were highly susceptible to contamination and served most of the State's population.

DWR had extensive hydrogeologic information available on aquifer settings, pumping rates, and data accumulated during the planning, installation, and development of the wells serving the large urban areas on the coastal plain. In addition, regional characterization of the aquifers serving wells in the upland area was less thorough than in the coastal plain. Also, the State's limited technical and financial resources dictated that delineating WHPAs in the coastal plain would enable the State to address the most contaminant-prone WHPAs first.

Following this first round of delineations, wellfields in the upland area of the State were delineated. As delineation of the upland region was taking place, the lead agency initiated a data collection process in cooperation with a coalition of rural counties. This data would provide periodic reports of water needs for the growing demands of recreation communities in the region.

As specified in Section 1428 of the SDWA and the EPA Guidance for Applicants, a State WHP Program submittal includes:

List of categories of sources potentially contaminating WHPAs

Procedure for inventorying sources in each WHPA, and a schedule for completing the inventory process

Procedure for refining, expanding, updating, and verifying inventory of specific sources of contamination in each WHPA

MAJOR MESSAGES

- Use either an existing list or develop a new list:
 - first define the source categories
 - then assess whether they belong on the list
 - finally, prepare the list of relevant source categories
- Group source categories (e.g., by location or degree of risk) to facilitate and prioritize inventory efforts
- Involve knowledgeable State and local technical staffs in assessing source categories for inclusion on the list and developing inventory procedures
- Inventory the most important source categories and/or WHPAs first
- The initial inventory can follow or precede WHPA delineation
- Use existing permit and license information to conduct inventories
- Update source category lists and source inventories as better data or more resources become available
- Utilize local agencies and service group support whenever appropriate for inventorying and updating
- Inventory information can assist source management decisions

The remainder of this chapter illustrates the range of available options for listing source categories, inventorying sources of contamination, and adjusting the inventory, along with case study examples of a State's experience in preparing these WHP Program elements.

Defining Categories

Range of Options

Use Existing Lists:

- State list(s)
- Other States' lists
- OTA list of sources
- Federal regulatory categories (e.g., Superfund, CWA, RCRA)
- Local ordinances, codes

Derive a Source Category List:

- from existing contaminant surveys
- from monitoring information
- from review of manufacturers by SIC category
- from permitting files
- from advice received from State technical experts
- from a Delphi process with technical experts

Use a Combination of Approaches:

- e.g., combine several lists, or use a list supplemented with an existing survey

Assessing Categories

Range of Options

Screening:

- by chemicals stored or discharged
- by documented contamination incidents
- by major vs. minor source categories
- by distance to the wellhead
- by SIC code
- by regulatory status
- by risk assessment

Modeling:

- of fate and transport by generic hydro-geologic setting
- of risk by vulnerability

Use a Combination of Approaches:

- e.g., combine a simple screen with a risk model

Preparing a List

Range of Options

Without further source category grouping

Group Source Categories:

- by risk
- by regulatory status
- by well service area
- by hydrogeologic classifications
- by land use designations
- by political jurisdictions

Use a Combination of Approaches:

- e.g., combine risk category within a grouping by well service area

Working From an Existing Source List and Grouping Categories by Land Use

A State without its own comprehensive inventory of potential point and non-point sources of ground-water contamination decided to use an existing list of source categories as a starting point for developing its own list of source categories. Those available included one from a 1984 report by the Office of Technology Assessment (OTA), titled Protecting Our Nation's Ground Water from Contamination, category lists developed by other States, and lists of source categories already subject to State or Federal management (e. g., Resource Conservation and Recovery Act, Clean Water Act, and "Superfund"). Because it provided a well-developed framework that could be easily modified, the OTA list was chosen.

The lead agency, the Department of Natural Resources (DNR), reviewed the OTA list, decided which modifications would best reflect conditions within the State, and then circulated the modified OTA list among other State, regional, and local agencies to ensure that the list contained all appropriate categories. Source categories not found within the State, such as injection wells and underground mining, were deleted from the list, and other categories, such as grain storage and pesticide/herbicide distribution facilities, were added to reflect the major agricultural activities in the State.

The DNR then organized the list by county, which is the primary land use management authority in the State. County technical staffs subsequently reviewed the list and identified source categories (such as irrigation return flow, highway de-icing activities, and point sources such as landfills and fuel oil storage facilities) associated with various land uses in their counties. This approach to source categorization was compatible with standard land use designations used in county development planning, and provided a practical framework for relating wellhead protection to State or local land use management decisions.

Compiling a New List with State-Local Cooperation

The State had a well-developed ground-water management program before undertaking its WHP Program. Responsibility for ground-water management was widely distributed among county and municipal governments, the Regional Watershed Planning Board, and Special Water Districts in agricultural regions of the State.

As lead agency, the Office of State Planning (OSP) sought to develop as detailed a source category list as possible. OSP planned to use the list not only for WHP inventories, but also to develop source management strategies. OSP provided guidance on the types of sources to be included on the list, and its staff worked with the State Department of Health, the Department of Agriculture, and the Regional Watershed Planning Board to assemble a preliminary list of source categories. The list was based on data available from various State and local water management programs including aquifer management programs, discharge and waste permits, remedial action programs, and ground-water planning studies.

OSP then distributed its preliminary list to all county and municipal governments and water districts to allow them to recommend additions or deletions, as necessary. A technical committee coordinated by OSP and consisting of county and municipal staff and technical representatives from each State agency made sure that all known source categories that could pose significant contamination risks were included on the final state-wide list.

Source Identification	List Source Categories
	Develop Source Inventory
	Modify Inventory

Range of Options - for procedures to inventory contaminant sources

Inventory Procedures

Range of Options

Use Existing Public Records:

- existing surveys
- completed studies
- maps
- aerial photos
- permits
- licenses
- registrations
- notifications
- tax records
- directories
- regulatory compliance records

Conduct Surveys:

- mail
- telephone
- windshield
- door-to-door
- sanitary survey
- delegate survey responsibility to local governments or special districts

Enact Notification Requirements

Use a Combination of Approaches:

- e.g., combine use of existing records with windshield survey

Inventory Information

Range of Options

General Information:

- Source owner/ operator, name, address
- source type, I.D. No.
- potential contaminants
- location and size of source (latitude, longitude)
- distance to public water supply well

Additional Data:

- existing management controls
- known public health or environmental risks
- characteristics of saturated and unsaturated zones

Inventory Schedule

Range of Options

Timing:

- start independent of a WHPA delineation using estimate of WHPA criteria
- Conduct jointly with WHPA delineation, adjusting inventory as delineation boundaries are fixed
- start after WHPAs are delineated

Approach:

- perform initial screening prior to conducting detailed inventory
- Assign priorities based on potential contaminants, or populations served, or hydrogeologic settings

Use a Combination of Approaches:

- e.g., start with a simple screen, then add more detail after delineation is completed

Using Existing State Information

This State's lead agency for the WHP program, the Department of Environmental Protection (DEP), determined that extensive inventory information already existed within environmental programs for waste-water discharge, solid waste management, and well drilling. The information was distributed throughout several agencies, however, and the data stored in noncompatible formats. Because of existing commitments to complete WHPA delineation, the DEP could not assign its already over-worked staff to the Source Identification component of the WHP Program.

Instead, the DEP decided to contract with the State University to collect and organize the data available from State and local agencies and fill in gaps that existed for selected source categories not subject to regulation (e.g., bulk chemical storage). As part of this task, the University mailed questionnaires to various regional agencies and local governments to identify other sources on the State category list. In addition, State business directories and similar listings were computer-sorted by Standard Industrial Classification (SIC) code and zip code to locate other sources of concern. Finally, in order to provide an additional measure of coverage, the DEP coordinated a University-organized effort of several statewide volunteer groups, including the League of Women Voters and the American Association of Retired Persons, to conduct door-to-door surveys of WHPAs in rural areas to determine whether any sources may have been omitted.

As each WHPA was inventoried, information was organized into centralized files maintained by the DEP. This information was made readily available to local governments, Soil and Water Conservation Districts, and other State and local agencies through on-line computer access to the DEP's source inventory files.

Using Local Resources

In this State, most water management responsibilities traditionally were delegated to regional and local government units such as Regional Planning Agencies, Soil and Water Conservation Districts in rural areas, and to publicly-owned water suppliers, public health agencies, and municipalities in urban areas. Since these governmental units already knew a great deal about contaminant sources within their jurisdictions, the Department of Public Health (DPH), as lead State agency, assumed the role of coordinating source inventory efforts by these local agencies.

The DPH developed an inventory approach based on populations served by each wellhead and created a standard checklist of information needed. Each local and regional agency was provided with guidance from the DPH and given the responsibility of reviewing existing data sources (e.g., zoning maps, permits, and licenses). Staff conducted windshield surveys to gather the balance of the required data on all WHPAs. The DPH coordinated activities for any WHPA located in more than one jurisdiction, and worked directly with local and regional staffs to ensure that inventory procedures were conducted correctly and on schedule.

Since this State had not completed its delineation process, it asked the agencies to identify well locations and conduct inventories for listed source categories within a fixed radius around each wellhead, based on state-specified criteria. Once a WHPA was delineated, sources within it were re-inventoried as necessary.

Expanding Inventory

Range of Options

Additions to Data:

- Add new information on existing sources
- Add new sources in existing categories
- Add newly regulated source categories
- Include additional non-point sources

Use a Combination of Approaches:

- e.g., combine additional information on existing sources with inclusion of new sources

Refining Inventory Data

Range of Options

Convert Data to More Usable Forms:

- Standardize data collection methods
- Organize data by user priorities
- Identify specific contaminants of concern
- Convert distances to TOT measures

Use a Combination of Approaches:

- e.g., standardize data collection methods and better specify contaminants

Verifying Inventory

Range of Options

Data Quality Assurance:

- Office-based verification by cross-checking permit applications and renewals or mailing out questionnaires
- Field verification by performing on-site surveys

Use a Combination of Approaches:

- e.g., combine permit cross-checks with an on-site verification

Updating Inventory

Range of Options

Improving Existing Data:

- Review public records periodically
- Review environmental data bases for data updates
- Perform periodic surveys
- Review periodic surveys & completed studies
- Review permit modifications, renewals, and denials

Use a Combination of Approaches:

- e.g., combine periodic review of records with periodic surveys

Using State Permit Systems

This State has a rapidly expanding industrial base, which includes a wide variety of companies that make advanced industrial products. Industries whose activities have a potentially significant impact on well-water supplies are required to obtain state-administered permits (e.g., NPDES, RCRA, etc.) issued by the Department of Water Resources (DWR). Since the permitting system provides access to information on these sources, the DWR selected it as the vehicle for updating and verifying the inventory.

Existing permits were coded to indicate a source's location in a WHPA. As permits were reviewed for renewal, the State verified source status and characteristics as listed in the WHPA inventory. Where the State did not issue a new permit, or where permit conditions changed, the source's status on the inventory was altered accordingly.

Applicants for new source permits in WHPAs were required to provide detailed information on location, proximity to existing wells, and operating specifications. Permits for these new sources were flagged for entry into the WHPA inventory. The DWR staff periodically verified and updated the inventory by means of computerized access to the permit data files.

Using Service Group Support At the Municipal Level

Because local governments and special districts in developed areas have played important roles in primary water supply, WHPAs in this State reflected those jurisdictional boundaries. As lead agency, the State's Environmental Management Agency (EMA) relied on local governments for source data to update its inventory. However, in remote rural areas, the State had no effective local government support to update and verify its WHPA inventory data.

Responsibility for updating and verifying source inventories in urbanized areas was delegated to municipalities and special water supply districts. The EMA developed an approach and timetable for this procedure. Under this approach, local governments mailed surveys biennially to owners/operators of sources included in their WHPA inventories as part of the real estate tax assessment notification process. Whenever respondents reported sources as no longer in operation, they were dropped from the inventory after a windshield survey by local officials verified this fact. New sources were added to the inventory as local officials reviewed zoning changes, building permits, and other municipal licenses for potential sources of contamination.

In rural areas of the State, the State University Cooperative Extension Service coordinated efforts to update the inventory. Under EMA supervision, they recruited knowledgeable local citizens (e.g., volunteers from local conservation groups familiar with the area) and EMA student interns familiar with ground-water problems to serve as aides in verifying and updating the inventories. To assure quality control, Extension Service staff who had taught courses in ground-water and water quality management supervised and reviewed the verification effort.

As specified in Section 1428 of the SDWA and the EPA Guidance for Applicants, a State WHP Program submittal includes:

Identification and Evaluation of all existing Federal, State, or local source management programs

Identification of Uncontrolled Sources and the rationale for selecting management strategies for these sources

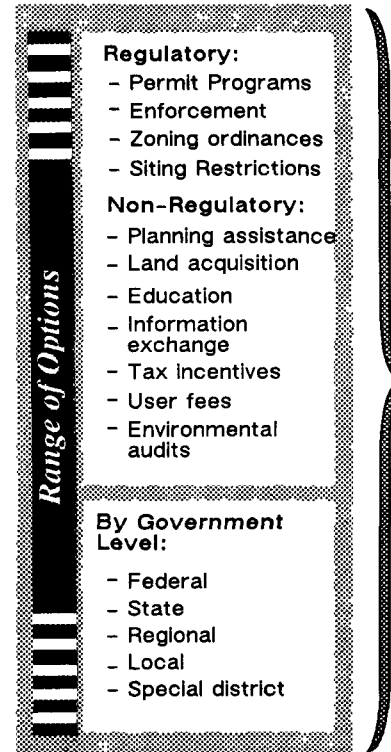
Criteria used by the State if it decides to phase management controls within WHPAs

MAJOR MESSAGES

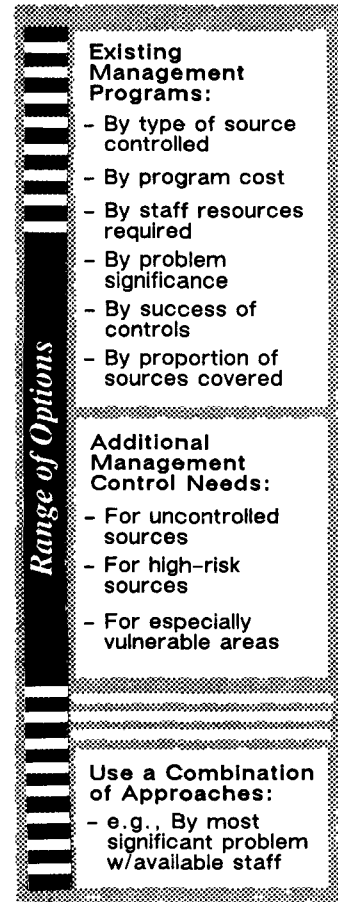
- Consider locations, institutional settings, and type of source in the selection of management approaches
- Use a combination of management methods for adequate source control
- Build upon existing management methods and programs at all levels of government
- Select management methods that provide protection to wellheads
- Make use of both prevention and clean-up approaches, and both point-of-withdrawal and point-of-use management approaches
- Consider both regulatory and nonregulatory mechanisms to achieve necessary protection
- Ensure that currently uncontrolled sources do not pose health threats within WHPAs
- Phase management controls based on factors such as: hydrogeology, source, type of wellhead, and population patterns
- Consider risk-based criteria in developing phased management approaches

The remainder of this Chapter illustrates the range of available options for identifying and evaluating management programs, for identifying uncontrolled sources, and phasing management controls, along with case study examples of a State's experience in preparing these WHP Program elements.

Identify Source Management Programs



Evaluation



Established Environmental Programs at the State Level

An industrialized State manages its own programs regulating municipal and industrial solid waste landfills and also has been delegated responsibility for the entire range of Federal environmental programs including Underground Injection Control. The State has a relatively strong permit and siting program for managing point-source pollution; nevertheless, some other program areas were evaluated by State legislative oversight committees as relatively deficient. For example, compliance oversight of sources after permit issuance was sporadic because of very limited staff resources.

The Governor appointed a special task force to review and evaluate the State's source management programs. The Department of Environmental Protection (DEP) was designated as lead agency and provided staff support. The task force review identified deficiencies and ranked them in priority order. These source management programs were compared with sources identified in the WHP inventory. Similarly, managed sources of high priority were compared with management approaches employed. The task force review identified a lack of early awareness of ground-water contamination as a high priority problem. The review also revealed that a range of management strategies was missing from existing State programs, and its findings created the basis for matching ground-water protection strategies with ambient monitoring and compliance monitoring programs.

The task force's evaluation also showed that several priority problems (e.g., of above ground storage of petroleum and bulk chemicals) were not being addressed with adequate staff resources, and as a result, recommended the creation of several new technical staff positions. This review, along with information on the roles and duties of organizations potentially responsible for wellhead protection, also helped to identify City and County Health Boards which could be delegated responsibility for inspection and compliance verification. By delegating these roles to local agencies, and enhancing the inspection process, the DEP was able to maintain the priorities of existing programs and devote attention to additional ground-water protection measures.

Supporting Source Control by Local Government

The State is predominantly rural, with an agricultural and mining-based economy; ground-water provides more than half the public water supply. While State environmental programs include ground-water discharge permits and aquifer classification, they do not address mining-related ground-water contamination and are not comprehensive for other source categories. The most critical source problems are municipal landfills and agricultural chemical storage and use. Many of these problems occur within WHPAs.

The Department of Water Resources (DWR) was given lead responsibility for reviewing and evaluating the State's source management programs. The DWR assigned a team of staff analysts to review source management programs at the State level. Because many source control programs operate at local levels, the lead agency provided a small grant to the State Municipal League for additional staff support to undertake a parallel review of local level source management throughout the State. The review revealed an opportunity to improve source management through state assistance to monitor agricultural chemical storage within WHPAs.

The State's Department of Agriculture, in conjunction with the local USDA extension agents, provided technical assistance to county governments to register and monitor large quantities of agricultural chemicals stored in WHPAs.

To supplement local approaches, the lead agency contracted with the State Chamber of Commerce to develop and operate a waste exchange hotline, and proposed loan guarantee provisions as incentives to industries within WHPAs that install new waste minimization technologies. Additionally, the lead agency sponsored a series of demonstration projects in selected counties to show the feasibility of waste reduction and its impact on ground-water quality. Together, these two approaches gained support from both the business community and the citizenry.

Identification of Uncontrolled Sources

Range of Options

Agriculture:

- Fertilizer application and storage
- Pesticide application and storage

Urban - NPS:

- Used oil
- Household wastes
- Urban Run-off

Small Business:

- Storage of sources
- Process by-products and residuals
- Waste streams

Available Strategies

Range of Options

Technical Assistance:

- Use of lab facilities
- Provision of trained personnel

Financial Assistance:

- Grants
- Reimbursements
- Loan seed money
- Leveraged funding from Federal programs

Control Measures:

- Permit requirements
- Inspections
- Performance standards

Education:

- Public Hearings
- Outreach Pamphlets

Training:

- Workshops
- Courses
- Certification programs

Demonstration Projects:

- Pilot programs
- Selected demonstration sites

Use a Combination of Approaches:

- e.g., Trade organization workshops to inform industry reps on cost-effective control measures

Selection Concerns

Range of Options

Cost:

- Availability of funds
- Level of extra cost to existing program

Expertise Available:

- Number of technical staff
- Types of skills

Compatibility with Existing Approaches:

- Presence of applicable ordinances and regulations
- Existence of organizational mandates

Risk:

- Degree of risk reduction
- Type of risk elimination

Addressing Pesticide and Nitrate Contamination

Both nitrates and pesticides have been detected in wells throughout the State. Current local zoning ordinances do not incorporate controls on land use based on proximity to public water supply wells, and agricultural management practices are unregulated at the local level.

Given that the State's economy has a very important grain-producing sector and that most uncontrolled sources are agricultural, the State recognized the importance of involving its Department of Agriculture (DOA) in discussions of the problem. However, it also recognized that another State agency might be better able to identify specific sources and develop source management strategies to protect ground-water. A dual lead agency arrangement was created between the DOA and the Division of Environmental Management (DEM) in the Department of Natural Resources to investigate suspected sources of agricultural contamination of ground-water. A review of the contaminants, their distribution, and associated activities confirmed that unregulated pesticides and nitrates were a significant threat to the State's ground-water. The lead agency team recommended that legislation be introduced to require pesticide use by prescription for specific pesticides that are known to leach into ground-water. Because of its established management advisory role on best management practices (BMPs), the DOA also agreed to develop guidelines on site-specific fertilizer application BMPs in WHPAs.

It is expected that several legislative sessions will be necessary to move this idea of more effective pesticide and fertilizer management from proposal to enactment. During that time, the DOA will contract with the State Association of Soil and Water Conservation Districts to develop a program for demonstrating innovative agricultural BMPs and the use of Integrated Pest Management (IPM) in several WHPAs. Responsible pesticide management will emphasize practices that change timing and application procedures to reduce leaching, selection of safer pesticides, and alternate crop production patterns, which require less pesticide.

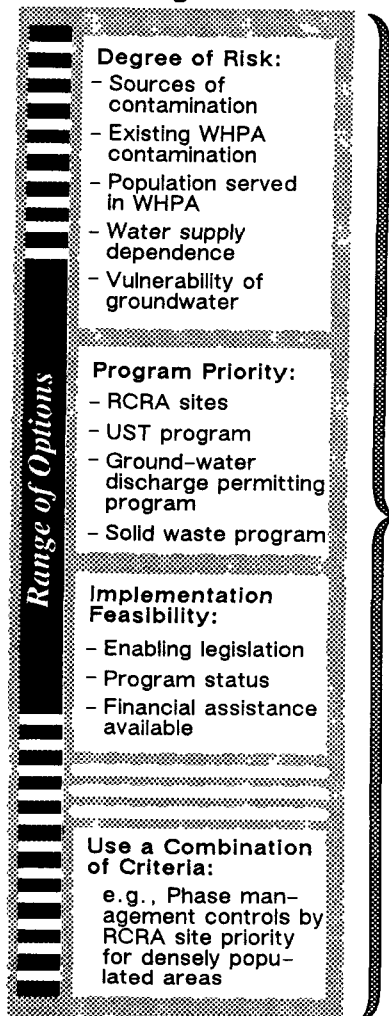
Addressing Unregulated Small Business Sources

The State has both light and heavy industrialized development and urban centers over nearly three-quarters of its area, but the remaining portion is a productive agricultural region. Source control programs in the State are geared to industrial facilities and feature operating standards and discharge permits for these sources. Many small businesses, such as food processors, dry cleaners, or car washes, are not regulated under the current home rule authority of counties and municipalities. These small businesses are widely distributed in WHPAs throughout the State. The State's small business community is apprehensive about the prospect of regulation and not fully aware of the significant impact their activities have on ground water.

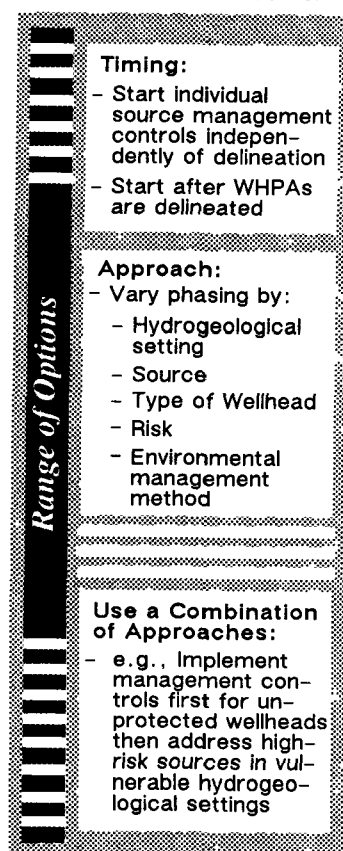
The State's planning agency, the Department of Community Development (DCD), has been designated as lead agency to identify and address uncontrolled sources and to evaluate potential management strategies. A small increase in the budget appropriation for wellhead protection enabled the lead agency to hire an environmental planner with ground-water experience and an urban planner with zoning and development control experience. Together they formed a team to provide technical assistance to counties and municipalities on environmental controls and land use approaches for small business resulting in improved source management. Additionally, a series of educational forums were planned for local business groups such as Chambers of Commerce and Kiwanis Clubs to communicate the significance of small business activity on ground-water quality.

The lead agency provided information in several ways: local "town meeting" programs via teleconference through public service television channels; articles in State business development publications; and public service advertisements on radio and television. The lead agency also provided pass-through financial assistance via water suppliers to small businesses that were willing to demonstrate the application of innovative, low-cost treatment technologies.

Phasing Criteria



Schedule Criteria



Setting Priorities by Vulnerability

The State had a variety of hydrogeological settings, but very little detailed information was available about the functional characteristics (e.g., degree of aquifer confinement) of each setting. With recently acquired staff resources to support source management through an appropriation from the State legislature (which mandated that staff be assigned to source management), a basis to perform risk assessments and set priorities to phase-in management controls was needed.

As lead agency, the Department of Public Health (DPH) worked with other State agencies seeking management control over these sources. Because of the nature of reliable and readily available ground-water data, the DPH used a numerical risk management system to rank-order the risk of ground water contamination in each of the State's hydrogeological settings using expected levels of source toxicity and volume of material discharged.

Rankings were determined for each source type, and risk management strategies developed accordingly. For instance, in light agriculture regions with few pesticide and fertilizer sources and a relatively thick unsaturated zone, the priority for risk management control was low. Where potential high threat source contaminants, such as underground storage tanks, were located in relatively high water tables and extremely porous geologic material, the priority for risk management was considered high.

In this phasing approach, individual source management controls were established in those areas where potential sources were deemed a threat, and were supported by recently acquired staff.

Setting Priorities by Source Threat

The State has a predominance of small community and non-community wells which are distributed in areas with mixed land uses and a variety of potentially contaminating sources. The State has a permit system for most of these sources but needs a basis to manage risks to ground-water and set priorities for inspections and new permit issuance.

The State Department of Environmental Protection (DEP) has the lead role for issuing permits. In order to determine where permitted sources coincided with drinking water supplies threatened by potentially contaminating sources, the geographic distribution pattern of permit holders was overlaid with the pattern of WHPAs. Readily-available data from these areas included user populations, well discharge volumes, and the type of permitted sources. The DEP translated these factors into a formula expressing the degree of risk posed by potentially contaminating sources as they would affect vulnerable water supplies. This formula became the basis for setting priorities and phasing management controls.

The risk priorities were used in preparing permit conditions, increased monitoring, inspections of compliance, and enforcement actions to ensure consistent management of sources in areas where underground drinking water supplies were vulnerable.

As specified in Section 1428 of the SDWA and the EPA Guidance for Applicants, a State WHP Program submittal includes:

Definition of "major" public water supplies in the State

Contingency plan for each major public water system in the State including: short and long-term alternate water supplies, coordination mechanisms, and financial considerations

MAJOR MESSAGES

- Define "major" public water supplies according to criteria specifically applicable to the State--e.g., number of registered wells, population density, patterns of water-use, responsibility for provision of water supply, or other factors
- Develop both temporary emergency response and long-term (i.e., permanent) water supply alternatives
- Use existing emergency response frameworks and State contingency plans wherever possible, and build upon and enhance these existing plans as necessary
- Identify parties responsible for implementing plans and mechanisms for coordinating action
- Evaluate the financial responsibilities and roles implied by the provision of both short-term and long-term water supplies
- Set priorities for developing contingency plans (e.g., emphasize plan development for major public suppliers)

The remainder of this chapter illustrates the range of available options for defining "major" public water supplies and preparing contingency plans along with case study examples of a state's experience in preparing these WHP Program elements.

Define "Major" Water Supply

Use Criteria Based On:

- Well Registration
- Population Served
- Size & staffing of public water supply
- Water use patterns
- Availability of alternative sources of water

Use a Combination of Criteria:

e.g., Define "major" according to number of well registrations serving the State's major urban areas

Contingency Plan

Develop Plan Elements:

- Short-term supplies
 - new or adjacent
- Long-term supplies
 - new, adjacent, or distant
- Coordination mechanisms:
 - Local specialized agency
 - County water offices
 - Emergency response teams

Financial Plan:

- State matching funds
- Development bonds
- Special accounts
- User fees

Add to Existing Plan Elements:

- Local public water supplies provide info. for generic plan
- Individual plans modified at local levels

Responsibility & Schedule

Plans Completed by:

- State agencies
- Local water districts
- Water suppliers
- Local governments

Timing:

- By date of State WHP program approval
- For licensing renewal of public water supplies
- As part of approval process for local development plans

Interim Emergency Response

- Use current state-wide plan
- Adapt other plans to fit emergency water contingencies
- Require local gov'ts. to develop short-term emergency response plans
- Evaluate potential emergency response plans

Generic Plan with Appropriate Local Modifications

The population in this State resides primarily in communities of less than 50,000, and is served by local public water suppliers. The two large urban centers of 500,000 have long-term and short-term contingency plans for their public water supplies. Provision of public water supplies, including the enforcement of drinking water quality standards and well registration, is managed at the county level. Although this State had delineated numerous WHPAs, only the large urban water supply systems had their own contingency plans.

As lead agency, the State Emergency Response Agency (ERA) chose as the criterion for a "major" water supply the smallest community population for which contingency plans were already in place. Accordingly, the State defined "major" water supplies as those serving at least 500,000 people. All WHPAs not covered by the plans for "major" suppliers were covered by a generic statewide water supply emergency response plan which was developed following a water supply emergency several years ago.

The planned distribution mechanism for emergency supplies of water consisted of a renewable contract with a major bottling company. The company operated throughout the State and could supply bottled water to communities whose water supplies were contaminated. A stockpile of equipment available to localities in the event of an emergency was also maintained by the ERA. Distribution of this equipment from ERA Regional Offices was ensured through a Memorandum of Agreement with the State's Department of Transportation which would use its truck fleet to deliver the equipment in an emergency.

This generic contingency plan served all non-major water suppliers in the State during the first three years of the WHP Program until they completed individual contingency plans. To encourage prompt completion of the plans, the State amended its Public Water Supply Act to require all public water suppliers to develop short-term contingency plans within two years after EPA approval of the State WHP Program. These short-term plans require that sources of temporary water supplies be identified and formal procedures for coordination during emergencies be established.

Each Public Water Supply Establishes its own Plan

This State had several large WHPAs serving predominantly urban communities, and many suppliers had contingency plans already in place. A majority of the water supplies serving over 75,000 people and/or pumping 2.5 mg/day had emergency response plans, and the State used these criteria to define "major." However, virtually all of the smaller water systems lacked contingency plans, especially those in unincorporated areas. In the past several years two of these communities had experienced emergencies and were caught without adequate temporary water supplies.

The Department of Environmental Quality (DEQ) amended the State regulations applicable to public water supplies to require all community water supplies to develop an emergency response plan by the time of submittal of the State WHP Program. Each plan had to address temporary water sources, coordination mechanisms for implementing the plan, long-term water supply alternatives, and financing mechanisms. The State also imposed a schedule for completing contingency plans for all non-community wells based upon the vulnerability to contaminant sources of the aquifers in which these supplies were located. Operating permits for new community or non-community systems were not issued by the State unless a contingency plan was submitted with the permit application to the State. Additionally, public water supplies were required to update their contingency plans every five years.

As lead agency, the DEQ hired a technical advisor as a liaison with local communities to ensure that contingency plans were developed in accordance with State regulations. Additionally, the technical advisor coordinated this effort with the community emergency planning activities required under SARA (Title III).

Non-community water supplies were covered by a generic State plan ensuring the provision of temporary water supplies from the closest available source. This plan was funded by a clause in the State Unincorporated Land Development Act providing for emergency support to victims of natural disasters.

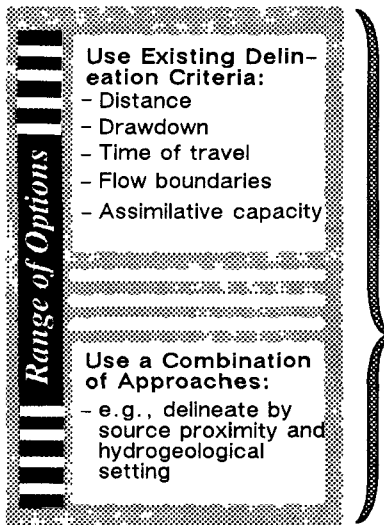
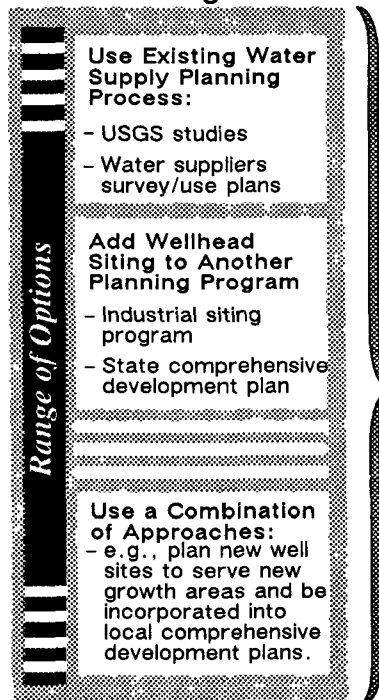
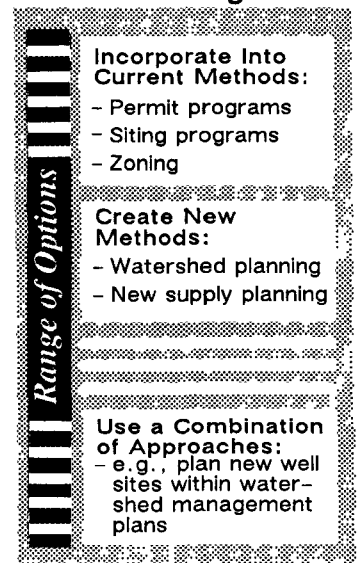
As specified in Section 1428 of the SDWA and the EPA Guidance for Applicants, a State WHP Program submittal includes:

Description of the process for managing sources of contamination within WHPAs for new public water supply wells

MAJOR MESSAGES

- Anticipate future supply needs and contamination threats by delineating and managing potential water supplies and potential WHPAs as part of the water supply planning process
- Site new wells properly to maximize well yield and minimize potential contamination from sources in the future
- Coordinate planning for new wells with other planning and development activities
- Explore the opportunities presented by planning for new wells to implement alternative approaches to wellhead protection, even though infeasible for established WHPAs, wells, and the communities they serve
- Undertake all steps necessary in the progression from proposal of new wells to formal WHPA designation and management
- Incorporate public participation in the new well siting process

The remainder of this chapter illustrates the range of available options for siting new wells and describes examples of a state's experience in preparing this WHP Program element.

Delineation**Siting****Source Management**

Extending An Existing WHPA To Cope With Increasing Demands

Public water suppliers and Public Works Departments of local governments in this State have primary responsibility for ensuring the availability of water supplies. Most of the new water in this State is supplied from either increased pumping of existing wells or the addition of a new well into an existing wellfield. Both of these circumstances caused changes in the formal boundaries of WHPAs and increased the potential for future contamination.

As the lead agency, the Office of Water Resources (OWR), with assistance from the State Department of Health, had responsibility for managing the steps required for a new WHPA designation. The OWR directed local water authorities to project future water needs and potential sources of new supply. Local water authorities must also report any modification to a well that would result in a change to the boundary of a WHPA. To aid local water suppliers and ensure that new wells are sited properly to maximize yield and minimize source contamination, the OWR developed a handbook describing the criteria for development of supplies from new wells and adjustments in WHPA boundaries.

Public hearings on water development plans and source management approaches for enlarged WHPAs were also required by the State. The extension of source management requirements to areas not previously designated as WHPAs was of great concern to businesses in those areas. The State was able to foster responsible water supply practices at the local level through a provision for public participation in the planning process. Representatives from several local citizens' groups were nominated by the local water commissioner to serve on technical and citizens' advisory committees during the planning and delineation phases of the WHPA extension process. These committees provided a channel for public concerns about the new supply development criteria, source management standards within WHPAs, future water supply needs, and the quantity and quality of future water supplies.

Delineating New WHPAs To Meet Future Drinking Water Needs

This State experienced rapid growth in both residential and business development, and it became clear that not enough attention was being given to future water supply needs. New businesses took options on building sites only to discover that public water supplies were not adequate. A State legislative committee held hearings and called for the development of state-wide and regional water supply strategies by the State Department Environmental Protection (DEP) in consultation with the State Department of Health. These strategies served as a catalyst for the development of long-term plans to meet projected water demand.

As lead agency, the DEP managed the delineation process of a new WHPA. The DEP started by obtaining an assessment of water use and available water yields across the State. The 1985 National Water Use Inventory compiled by the United States Geological Survey provided a basis for the State to extrapolate water use patterns for specific localities where projected water demands would pose significant shortages. These assessments were provided to municipalities and counties as a basis to develop or modify their water supply plans. State regulations for municipal and county planning required that local comprehensive plans incorporate elements on water supply planning.

Major undeveloped aquifer areas were designated as potential WHPAs by the DEP because they were logical sites for future drinking water supplies. Local planning authorities and zoning boards identified potential WHPAs. Sources in these potential WHPAs were identified, inventoried, and made subject to the same restrictions and permit conditions as sources within existing WHPAs.

The DEP provided water supply strategies and detailed water use information to local governments and required that comprehensive plans identify projected water supply needs. This approach allowed local governments to protect future water supplies from contamination before wells were actually sited.

Concluding Thoughts

This Technical Assistance Document (TAD) provides a range of suggestions for States to develop their Wellhead Protection (WHP) Program and offers States an opportunity to apply innovative approaches by focusing on the entire ground-water resource, rather than on a limited set of sources or contaminants.

The intention of this document is to identify what a complete program includes, raise program planning issues and concerns, provide concrete alternatives, and show that no single approach is necessarily best. Using this TAD as a guide throughout the planning process, States can assess their existing abilities to protect wellhead areas while evaluating ground-water quality. By examining the Case Study Examples provided here, lead agencies can interpret the organizational and environmental circumstances in their State, and consider how the examples provide analogies for building their WHP Program. Reviewing the graphic Range of Options for developing WHP Program elements provides another important opportunity for States to consider innovative approaches, and combine them in ways that meet unique State circumstances.

This TAD is provided with the hope that its simple and straightforward style will make the task of WHP Program development easier and more creative. For an overview of the path a State would follow in preparing its WHP Program, see the "Road Map" on the facing page.

Road Map to a WHP Program Submittal

- **Begin by:**
- ☐ Reviewing EPA Guidance for Wellhead Protection
 - ☐ Reviewing each WHP Program Submission Element
 - ☐ Considering "Major Messages" for each WHP Program Element
 - ☐ Reviewing existing Ground-water Conditions in the State
 - ☐ Reviewing the applicability of the Range of Options for each WHP Element
 - ☐ Interpreting the applicability of the Case Study Examples

■ **Assemble your WHP Program with the aid of this TAD by:**

■ **Incorporating Program Submission Elements and combining appropriate Options to meet unique State conditions for each WHP Program Element**

**State and Local
Agency Duties**
Chapter II

Delineation of WHPAs
Chapter III

Source Identification
Chapter IV

Management Approaches
Chapter V

Contingency Plan
Chapter VI

New Wells
Chapter VII

■ **Complete your
WHP Program:**

**State WHP Program
Submission**

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