

Potomac River Basin
Source Water Assessment Program
Interstate Assistance

CP 993949-01-0

Under Clean Water Act, Section 104(b)(3)

Final Project Report

by
The Interstate Commission on the Potomac River Basin

April 1999

ICPRB Report 99 - 5

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Introduction

Under provisions of the Safe Drinking Water Act Amendments of 1996 (P.L. 104-182) each state is required to conduct a Source Water Assessment in accordance with *State Source Water Assessment and Protection Programs Guidance, Final Guidance* (EPA 1997-2). Under this interstate assistance project, the Interstate Commission on the Potomac River Basin (ICPRB), is assisting the Potomac River basin states (Maryland, Pennsylvania, Virginia, West Virginia, and District of Columbia; see attached map) to produce their source assessments. This effort will address special cases, including: rivers which cross state borders and boundary rivers, and involve work with each of the basin states as they develop their programs. The work focuses on providing interstate liaison to the basin states as they produce plans. The term of this project was from August 18, 1998 through April 30, 1999.

The major tasks being accomplished are facilitating the transfer of information across boundary rivers and state lines, and making data compatible with the receiving states' data handling systems. This assistance will increase consistency and lead to the future accomplishment of source delineation, pollutant inventory, and susceptibility analysis.

Tasks

The major tasks to be accomplished before February 1999 are to facilitate the transfer of information across boundary rivers and state lines, and to make data compatible with the receiving states' data handling systems. This assistance would increase consistency in the states developing their Plans and would lead to the future accomplishment of source delineation, potential contaminant inventory development, and susceptibility analysis.

Progress:-

Staff of the Interstate Commission on the Potomac River Basin (ICPRB) contacted the Source Water Assessment Program (SWAP) personnel by phone in each of the Potomac River basin states: Maryland, Pennsylvania, Virginia, West Virginia, and the District of Columbia, in order to confirm this project and to set up lines of communication. Staff visited the offices of several states (Maryland, Pennsylvania, West Virginia, and the District of Columbia) in order to discuss specific details of their respective SWAP Plan preparations. ICPRB staff also participated in an information exchange meeting of the Region III SWAP project personnel and US EPA representatives, which was held in Martinsburg, WV on November 10, 1998. As other general activities, ICPRB staff participated in several conference phone calls with the EPA Region III Project Officer Mr. Garrison D. Miller and other US EPA staff.

Task 1. Plan Source Delineation

ICPRB will identify relevant data and methods for source delineation among the Potomac basin states and facilitate their exchange among the states for their mutual benefit. In addition, ICPRB

will provide liaison with respect to source delineation data and information among the basin states in order to assist each in the production of its own SWAP.

Progress:- August 18 - December 31, 1998

ICPRB staff contacted the Potomac River basin states in order to obtain their draft SWAP Plan materials that were available as of late November, 1998. ICPRB obtained *State Methods for Delineating Source Water Protection Areas for Surface Water Supplied Sources of Drinking Water* (EPA 1997-1) as a base reference on the subject. The SWAP Source Delineation procedures, as described in each of the state Plan materials, were summarized and outlined by ICPRB and presented in consistent format for effective comparison. That comparison document was distributed to all the states and US EPA Region III on December 4, 1998, and is included in this report beginning on page 8.

Some of the preliminary comparisons indicate that Source Delineation will vary by state, with varying degrees of reference to interstate source watersheds. Maryland's Plan specifically anticipates obtaining information from source watershed areas in other states. Virginia, while adopting a five-mile upstream zone of influence, does not appear to explicitly address acquisition of information across boundary rivers with other states. West Virginia is developing two approaches: whole topographic watersheds up to state borders, and zones of critical concern based on travel time. With regard to state boundary waters, the Ohio River Valley Water Sanitation Commission (ORSANCO) is conducting delineations for West Virginia. The District of Columbia will delineate the entire interstate topographic source watershed up stream of its Potomac River intakes.

Progress:- January 1 - April 30, 1999

In order to provide up-to-date information on the subject of Source Delineation to be useful prior to the February due date for SWAP Plans of the Potomac River basin states, ICPRB conducted a second comparison of procedures proposed among the basin states and the District of Columbia. The most recent Source Delineation information from the available state SWAP Plans was incorporated into an updated comparison document and distributed to the states, the District of Columbia, and US EPA Region III on January 15, 1999, and is included in this report beginning on page 14.

ICPRB determined that it can feasibly perform surface source delineations across state boundaries in order to facilitate full topographic definition of contributing watersheds. Such interstate source delineations can be made available upon request to the Potomac River basin states. The method for a surface water source delineation would involve the following steps:

1. Locate the source water withdrawal point in geo-reference coordinates.
2. Using ArcView Spatial Analyst software and digital elevation map data, determine the boundary of the contributing watershed up stream of the referenced withdrawal point.
3. Manually examine the results by comparing them with USGS published contour maps.

4. Where source watershed boundaries coincide with major watershed boundaries, use the major watershed boundary digital data developed by the USGS. (Some general watershed boundaries have been determined by the USGS.)

Task 2. Plan Potential Contaminant Inventory

ICPRB will work with the Potomac River basin states to identify relevant potential contaminants which may affect interstate source waters. ICPRB will make this information available to the relevant states for their mutual benefit in the production of their own SWAPs.

Progress:- August 18 - December 31, 1998

ICPRB staff contacted the Potomac River basin states in order to obtain their draft SWAP Plan materials that were available as of late November, 1998. The SWAP Potential Contaminant Inventory procedures, as described in each of the state Plan materials, were summarized and outlined by ICPRB and presented in consistent format for effective comparison. That comparison document was distributed to all the states and US EPA Region III on December 4, 1998.

Since that time, ICPRB obtained more recent information from Virginia, and developed draft Potential Contaminant Inventory plans for the District of Columbia. These will be incorporated into an updated comparison document for distribution to the states, the District of Columbia, and US EPA Region III in the first half of January 1999.

Some of the preliminary comparisons indicate that the states are developing varying approaches to Potential Contaminant Inventory procedures.

Maryland appears to be planning to collect information across the entire state. It plans to seek information from NPDES, SARA Title III, Superfund, other land disposal sites, pipelines, sewers, transportation, and active mining site data bases.

Pennsylvania is considering three successive proximity zones to guide the collection of potential contaminant data. Sources of information will include NPDES, RCLA, other land disposal sites, pipelines, sewers, transportation, active and abandoned mining sites, and oil and gas well data bases.

Virginia, consistent with its other water regulation programs, is focusing attention on areas within five miles upstream of its intakes. As sources of information, Virginia is planning to use NPDES, Superfund, tire disposal, and other land disposal site information data bases.

West Virginia plans to adopt a zone of five hours travel time at the 90th percentile stream flow. Sources of information will include NPDES, SARA Title III, Superfund, RCLA, other land disposal sites, active and abandoned mining sites, and oil and gas well data bases.

The District of Columbia initially proposed to tailor its inventorying of potential contaminant information based on correlated time of travel and fate of broad classes of contaminants. However, during the revisions to the DC SWAP Plan, it was decided to adopt the more thorough approach of inventorying all potential sources of contamination in the watershed upstream of the intakes and use a single time of travel threshold of 10 hours to determine degree of susceptibility. Potential contaminant information will be derived from generally available federal data bases (e.g. NPDES, SARA Title III, Superfund, RCLA), and locally based information from the upstream states (e.g. other land disposal sites, pipelines, sewers, transportation, active and abandoned mining sites, and oil and gas well data bases).

Progress:- January 1 - April 30, 1999

In order to provide up-to-date information on the subject of Potential Contaminant Inventory development to be useful prior to the February due date for SWAP Plans of the Potomac River basin states, ICPRB conducted a second comparison of procedures proposed among the basin states and the District of Columbia. The most recent Potential Contaminant Inventory development information from the available state SWAP Plans was incorporated into an updated comparison document and distributed to the states, the District of Columbia, and US EPA Region III on January 15, 1999.

ICPRB confirmed that the databases of the U.S. EPA's BASINS system were available to the Potomac River basin states for use in conducting their Source Water Assessments. The databases relevant to Potential Contaminants include: land use, water quality, bacteria, Toxics Release Inventory (TRI) data, National Sediment Inventory (NSI) station data, and point source and loading data from the Permit Compliance System (PCS). ICPRB can facilitate the use of this data by the Potomac River basin states for interstate development of Potential Contaminant Inventories.

Task 3. Plan Susceptibility Analysis

ICPRB will work with the Potomac River basin states to identify relevant analytical methods in order to assess source water susceptibility to potential pollutants which may affect interstate source waters. ICPRB will make this information available to the relevant states for their mutual benefit in the production of their own SWAPs.

Progress:- August 18 - December 31, 1998

In an effort to encourage consistent conformity with US EPA guidelines, ICPRB staff provided the *Draft Susceptibility Analysis Document* (EPA 1998) to several of the Potomac River basin state SWAP project leaders.

ICPRB staff contacted the Potomac River basin states in order to obtain their draft SWAP Plan materials that were available as of late November, 1998. The SWAP Susceptibility Analysis

procedures, as described in each of the state Plan materials, were summarized and outlined by ICPRB and presented in consistent format for effective comparison. That comparison document was distributed to all the states and US EPA Region III on December 4, 1998.

Progress:- January 1 - April 30, 1999

In order to provide up-to-date information on the subject of Susceptibility Analysis to be useful prior to the February due date for SWAP Plans of the Potomac River basin states, ICPRB conducted a second comparison of procedures proposed among the basin states and the District of Columbia. The most recent Susceptibility Analysis information from the available state SWAP Plans was incorporated into an updated comparison document and distributed to the states, the District of Columbia, and US EPA Region III on January 15, 1999.

ICPRB confirmed that the U.S. EPA BASINS system would be a useful tool for assisting in conducting Susceptibility Analyses.

ICPRB identified and requested a copy of the latest information for the State of Maryland concerning many parameters pertinent to the location of new electrical power generating facilities. Importantly, this information is expected to include major linear features such as roads and rail lines.

Task 4. Information and Data Formatting and Exchange

Progress:- August 18, 1998 - April 30, 1999

ICPRB staff embarked on a program of reviewing and compiling pertinent SWAP Plan information from each of the Potomac River basin states. That information focused on source delineation, potential contaminant inventories, and susceptibility analysis techniques. The information was condensed and presented to all the basin states in a consistent format for ease of information exchange.

ICPRB obtained data formatting information from each of the Potomac River basin states so as to be able to efficiently effect the exchange of data as required. ICPRB's data handling resources appear to be sufficient to assist such exchanges.

ICPRB extended offers of assistance to each of the Potomac River basin states with regard to providing information and data from other states occupying interstate source watersheds.

References:

State Methods for Delineating Source Water Protection Areas for Surface Water Supplied Sources of Drinking Water, 1997-1, EPA 816-R-97-008, U.S. Environmental Protection Agency, Office of Water.

State Source Water Assessment and Protection Programs Guidance, Final Guidance, 1997-2, EPA 816-R-97-009, U.S. Environmental Protection Agency, Office of Water.

Draft Susceptibility Analysis Document, 1998, U.S. Environmental Protection Agency, Mike Muse, Prevention & Support Branch, personal communication.

December 4, 1998

To: Potomac River Basin and Delaware Source Water Assessment Program Lead
Personnel:

John Barndt, DE

Jerusalem Bekele, DC

John Grace, ME

Gerald Peaks, VA

Joseph Lee, PA

William Toomey, WV

From: Roland Steiner

Subject: Interstate Coordination of SWAP Plan Preparation

At our recent meeting in Martinsburg, WV, I undertook to summarize the states' Plan information available to me then, and get the summaries to you. I have summarized the main points from the material I had from West Virginia, Maryland and Pennsylvania, and presented it in a reasonably consistent manner. It is intended that these summaries will help you understand what your Potomac River Basin/Region III colleagues are proposing for SWAP Plan development. They are not stapled, in the hope that will facilitate their side-by-side examination. I expect this to be an iterative process getting out successively more complete and refined material as it is developed. A future iteration is intended to include reference to the specific types of data and their format.

Could you help me help you by reviewing the summaries and let me know of changes that need to be made, or provide me with more source material and I will modify the summaries accordingly. I will add summaries for Virginia and the District of Columbia when I have the relevant reference material.

I hope you find these summaries useful. Let me know if you would like other issues covered.

Thank you for your cooperation.

Enclosure

cc: Gary Miller, EPA III

Interstate Coordination Notes

West Virginia (Nov 3, 1998)

I. DELINEATION

Ground Water - wellhead protection

“... using the delineation techniques developed under the Wellhead Protection Program (WHPP) with the modification of adding a fixed radius as a delineation technique.” The WHPP techniques are complex and vary across the state’s six hydrogeologic environments.

Time-of-travel minimum of 5 years for all geologic settings.

Flow boundaries delineating the edges of aquifers are used:

Computer models, hydrogeologic mapping, volumetric methods.

Fixed radius “... delineation will only be used on the smaller systems consisting of the non-community non-transient and non-community transient systems in West Virginia on an interim basis.”

Surface Water

Interstate waterways

Broad watershed delineation area (WSDA)

“... the entire watershed area upstream of the PWSS intake structure, up to the boundary of the state borders...”

Zone of Critical Concern

“... a corridor along the streams, lakes, and reservoirs within the WSDA that warrants a more detailed inventory and management due to its proximity to the source water and the susceptibility to potential contaminants.”

Free flowing streams: Width: “1,000 feet on each bank of the principal stream and 500 feet on each bank of the tributaries...” Length: “5-hour time of travel and using an estimated 90 percent high flow rate or up to the next upstream intake...” or 5-MPH if flow rate data is not available.

Reservoirs or lakes: width: same as for streams, length to be determined or up to the next upstream intake.

Ohio River (locked): 3 zones

Ground Water Under the influence of Surface Water (Conjunctive Delineations)

Requires surface water delineation in addition to the WHPP method

II. INVENTORY

Contaminants having a Maximum Contaminant Level (MCL)

Contaminants having a Secondary Maximum Contaminant Level

Contaminants that are targeted for regulatory review on the federal contaminant list

Contaminants having Federal Safe Drinking Water Act or state monitoring requirements

Contaminants included in West Virginia Water quality Standards as developed under the

Clean Water Act

Contaminants regulated under the Surface Water Treatment Rule

Cryptosporidium

Potential Significant Contaminant Sources (PSCS) will be inventoried from regulatory records and linked to specific contaminants

PSCS's will be determined from the following databases:

CERCLIS and NPL (Superfund and National Priority Sites)

RCRIS (large and small quantity generators and disposers)

NPDES (National Pollution Discharge Elimination System)

TRI (Toxic Release Inventory sites)

Ground Water Remediation not under CERCLIS and RCRIS

Oil and Gas Wells

Mining Permits

Abandoned Mine Lands

Under Ground Storage Tanks

UIC - Class Five Wells (only Ground Water Systems):

Automotive Services Station Disposal Wells

Industrial Process Disposal Wells

Large Capacity Cesspools

Improved Sinkholes

Storm Water Drainage Wells

Other Class Five Wells as warranted

Other Records:

Landfills/Dumps

Spills and Releases

Industrial and Municipal Lagoons

Concentrated Animal Feeding Operations

Two Level Inventory: Level One: West Virginia Environmental Engineering Division will conduct a search of federal and state regulatory data bases to find PSCS. Level Two: results of the first level inventory will be provided to each Public Water Supply System (PWSS) for review, correction and addition of any omitted information.

III. SUSCEPTIBILITY

Ground Water Systems (4 factors)

Integrity of the source water intake

Sensitivity of the hydrologic setting between intake and boundary of delineated area

Evaluating the potential contamination located between the intake and the boundary of the delineated area

Relationship among the factors to estimate the sensitivity or susceptibility of the system

Components to be considered

Hydrologic characteristics

Land cover and potential contaminant sources

Physical integrity of the well

Water quality

Surface Water Systems

“... all surface water sources of public drinking water are susceptible to contamination.”

The same factors and components used for ground water susceptibility analysis will be used for surface water sources

Maryland: reference Chapter II March 20, 1998 version

I. DELINEATION

Ground Water: - use the delineation techniques developed under the Wellhead Protection Program (WHPP) The WHPP techniques are complex and vary across the state's five hydrogeologic environments.

For systems $\geq 10,000$ gpd:-

Unconfined: use EPA's WHPA Code ground water model

Zone 1: one year time of travel for micro-organisms

Zone 2: ten year time of travel for chemical contamination

Zone 3: (Optional) outside of ten year time of travel up to boundary of recharge area

Semi-confined: use MODFLOW-MODPATH modeling and up to boundary of recharge area

Confined: ten year time of travel

Bedrock: hydrogeologic mapping

Carbonate Rock: hydrogeologic mapping and field studies for wells under the influence of surface waters

For systems $< 10,000$ gpd: methods vary and include fixed radii in some cases

Surface Water

Entire watershed area upstream of the PWSS intake structure, up to the boundary of the state borders, augmented by segmenting streams which contribute to reservoir or river intakes and include sub-watershed area, time of travel, and set-back buffer considerations. Nested watersheds will be used for intakes on large rivers such as the Potomac and Susquehanna.

USGS Quad Sheets and GIS variable scale maps will be used for presentation of results to the public.

II. INVENTORY

Consider general contaminant groups

Contaminants regulated under the Federal Safe Drinking Water Act

Contaminants addressed by the Ground Water Disinfection Rule

Contaminants addressed by the Enhanced Surface Water Treatment Rule

Precursors for the Disinfection By Product Rule

Other potential contaminants with known or potential impact on water supplies

Orthophosphates/algae

Non-point sources from selected land use categories

For surface water supplies

- NPDES: municipal, industrial and agricultural
- Sewer infrastructure
- Pipelines (fuel)
- Transportation (land, air)
- Land disposal (landfills, CERCLA, Superfund, old dumps)
- Mining sites
- HAZMAT responses
- Golf courses
- Gas stations
- SARA (Title III)

For ground water supplies

- Ground Water Discharge Permits
- Land disposal (landfills, CERCLA, Superfund, old dumps)
- Leaking Underground Storage Tanks or fuel lines
- Underground Storage Tanks

Some contaminants may be eliminated from the inventory by the Groundwater Monitoring Waiver Program and other means.

III. SUSCEPTIBILITY ANALYSIS

Ground Water Systems

Unconfined Aquifers

>= 10,000 gpd: as for wellhead protection plans plus water quality data for IOCs.

VOCs, SOCs and radioactivity

< 10,000 gpd: analysis conducted on a regional basis, with contaminants from the general contaminant groups listed in the Inventory section. Wells with data indicating a contaminant > 50% of MCL will be listed and given extra attention.

Confined Aquifers

Community and NTNC systems will be reviewed potential of direct contaminant injection. Monitoring results will be used to demonstrate the lack of susceptibility of other systems.

Surface Water Systems

Review water quality monitoring information for data > 50% MCL, from:

Water treatment plant files

NPDES discharge reports

Section 305(b) reports

Chesapeake Bay Tributary Strategy Reports

If contaminant > 50% MCL, map potential sources of contamination

Fate and transport of specific potential contaminant sites may be undertaken

Examine degree of eutrophication of rivers and reservoirs

All PWSSs will be examined for potential microbial contamination

Pennsylvania: reference: October, 1998 Working Points

I. DELINEATION (PA)

Ground Water

Use the delineation techniques developed under the Wellhead Protection Program (WHPP) The WHPP techniques are complex and vary across the state's five hydrogeologic environments.

For systems with population served $\geq 3,300$:- Pennsylvania Wellhead Protection Program

- Refine hydrogeologic flow model

- Water table mapping or estimates

- Boundary conditions

- Application of appropriate methods, including 10-year time of travel

- Map vulnerable ground water areas

For systems with population served $< 3,300$:- Terrain Analysis

- Default WHPA Zone II = $\frac{1}{2}$ mile radius

- Refine with hydrogeologic flow model through GIS analysis

- Map ground water vulnerability for susceptibility analysis

More rigorous delineation will be given to sensitive wells serving small CWSs and NTNCWSs serving schools and hospitals

Surface Water

Entire watershed area upstream of the PWSS intake structure, augmented by segmenting larger watersheds.

Non-conservative contaminants — Segmentation

- Zone 1: 1/4 mile on either side of the river, 1/4 mile downstream to 5-hour travel time upstream using max river velocities in the period Feb 1995 to Feb 1998.

- Zone 2: first direct flow 14 digit HUC watersheds on either side of the river extending upstream to a 25-hour travel time using max river velocities in the period Feb 1995 to Feb 1998.

- Zone 3: the remainder of the watershed.

Conservative contaminants

Critical area analysis based on: water quality data, and physical characteristics of watershed, including critical areas for nitrate, pathogens and sediment loading

II. INVENTORY (PA)

Consider general contaminant groups

- Contaminants with Federal Primary and Secondary Contaminant Levels

- Giardia and Cryptosporidium

- Turbidity

Disinfection by Product precursors
Taste and Odor Precursors

Significant Potential Sources of Contamination:

CWS

Ground Water

Pathogenic Protozoa (if under direct influence of surface water)
Nitrate / Nitrite
VOCs
Metals / Heavy Metals
SOCs

Surface Water

Pathogenic Protozoa
Turbidity
Nitrate / Nitrite
Disinfection By Product Precursors
VOCs
SOCs

NTNCWS

Microbiological: Total/Fecal Coliform, Viruses
Pathogenic Protozoa (GW, if under direct influence of surface water)
Nitrate / Nitrite
VOCs
Metals / Heavy Metals
SOCs

TNCWS

Microbiological: Total/Fecal Coliform, Viruses
Pathogenic Protozoa (GW, if under direct influence of surface water)
Nitrate / Nitrite

Inventory Method

Ground Water

Method 1

Area-wide inventory from all available databases and landuses
Zone I - all potential sources of contamination
Zone II - all significant potential sources of contamination
Zone III - all significant potential sources of contamination for contiguous area

Method 2: GIS analysis

Area-wide inventory from all available databases and landuses
Refine inventory over time with sanitary survey data

Surface Water

Method : whole watershed

Area-wide inventory from all available databases and landuses

All potential sources of contamination

Method 2: Segmentation

Zone I (critical segment) - all potential sources of contamination

Zone II (second segment) - all significant potential sources of contamination

Zone III (remainder) - area-wide inventory from all available databases and landuses

III. SUSCEPTIBILITY (PA)

A qualitative measure (low, medium, high) of relative risk of different potential and existing sources of contamination based on:

Drinking water source vulnerability - surface water generally considered high

Potential impact posed by source of contaminant if uncontrolled release were to occur

Potential for release of contaminant of concern

Many other issues are in the process of being considered

January 15, 1999

To: Potomac River Basin States Source Water Assessment Program Lead
Personnel:

Jerusalem Bekele, DC

John Grace, MD

Joseph Lee, PA

Gerald Peaks, VA

William Toomey, WV

From: Roland Steiner

Subject: Interstate Coordination of SWAP Plan Preparation

At our meeting in Martinsburg, WV, I undertook to summarize the states' Plan information available to me then, and get the summaries to you. A preliminary summarization of the three main tasks: source delineation, inventory of potential contaminants, and susceptibility analysis was conducted and mailed to you under a cover letter dated December 4, 1998.

Those three main points have just been re-examined with the most current information, and presented it in a reasonably consistent manner. It is intended that these summaries will help you understand what your Potomac River Basin/Region III colleagues are proposing for SWAP Plan development. They are not stapled, in the hope that will facilitate their side-by-side examination.

I hope you find these summaries useful.

The current draft of the SWAP Plan for the District of Columbia is accessible for comparison through a link on the home page of web site: www.potomacriver.org.

Thank you for your cooperation.

Enclosure

cc: Garrison Miller, EPA III
Frederick Mac Millan, EPA III

West Virginia (Nov 3, 1998 Draft)

[Note: Some modifications are being made to the West Virginia Plan, including clarification of Susceptibility Analysis; however, the Nov 3, 1998 Draft is still the latest available documentation. Therefore the following outline summary is unchanged from the one distributed December 4, 1998.]

I. DELINEATION (WV)

Ground Water

“... using the delineation techniques developed under the Wellhead Protection Program (WHPP) with the modification of adding a fixed radius as a delineation technique.” The WHPP techniques are complex and vary across the state’s six hydrogeologic environments.

Time-of-travel minimum of 5 years for all geologic settings.

Flow boundaries delineating the edges of aquifers are used:

Computer models, hydrogeologic mapping, volumetric methods.

Fixed radius “... delineation will only be used on the smaller systems consisting of the non-community non-transient and non-community transient systems in West Virginia on an interim basis.”

Surface Water

Interstate waterways

Broad watershed delineation area (WSDA)

“... the entire watershed area upstream of the PWSS intake structure, up to the boundary of the state borders,...”

Zone of Critical Concern

“... a corridor along the streams, lakes, and reservoirs within the WSDA that warrants a more detailed inventory and management due to its proximity to the source water and the susceptibility to potential contaminants.”

Free flowing streams: Width: “1,000 feet on each bank of the principal stream and 500 feet on each bank of the tributaries...” Length: “5-hour time of travel and using an estimated 90 percent high flow rate or up to the next upstream intake...” or 5-MPH if flow rate data is not available.

Reservoirs or lakes: width: same as for streams, length to be determined or up to the next upstream intake.

Ohio River (locked): 3 zones

Ground Water Under the influence of Surface Water (Conjunctive Delineations)

Requires surface water delineation in addition to the WHPP method

II. INVENTORY (WV)

Contaminants having a Maximum Contaminant Level (MCL)

Contaminants having a Secondary Maximum Contaminant Level

Contaminants that are targeted for regulatory review on the federal contaminant list

Contaminants having Federal Safe Drinking Water Act or state monitoring requirements
Contaminants included in West Virginia Water quality Standards as developed under the
Clean Water Act

Contaminants regulated under the Surface Water Treatment Rule
Cryptosporidium

Potential Significant Contaminant Sources (PSCS) will be inventoried from regulatory records
and linked to specific contaminants

PSCS's will be determined from the following databases:

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RCRIS (large and small quantity generators and disposers)

NPDES (National Pollution Discharge Elimination System)

TRI (Toxic Release Inventory sites)

Ground Water Remediation not under CERCLIS and RCRIS

Oil and Gas Wells

Mining Permits

Abandoned Mine Lands

Under Ground Storage Tanks

UIC - Class Five Wells (only Ground Water Systems):

Automotive Services Station Disposal Wells

Industrial Process Disposal Wells

Large Capacity Cesspools

Improved Sinkholes

Storm Water Drainage Wells

Other Class Five Wells as warranted

Other Records:

Landfills/Dumps

Spills and Releases

Industrial and Municipal Lagoons

Concentrated Animal Feeding Operations

Two Level Inventory: Level One: West Virginia Environmental Engineering Division will
conduct a search of federal and state regulatory data bases to find PSCS. Level Two:
results of the first level inventory will be provided to each Public Water Supply System
(PWSS) for review, correction and addition of any omitted information.

III. SUSCEPTIBILITY (WV)

Ground Water Systems (4 factors)

Integrity of the source water intake

Sensitivity of the hydrologic setting between intake and boundary of delineated area

Evaluating the potential contamination located between the intake and the boundary of
the delineated area

Relationship among the factors to estimate the sensitivity or susceptibility of the system

Components to be considered

Hydrologic characteristics
Land cover and potential contaminant sources
Physical integrity of the well
Water quality

Surface Water Systems

“... all surface water sources of public drinking water are susceptible to contamination.”
The same factors and components used for ground water susceptibility analysis will be used for surface water sources

Maryland: reference: December 1998 Draft

[Note: The December 1998 Draft replaces the earlier referenced material.]

I. DELINEATION (MD)

Ground Water

Use the delineation techniques developed under MDE's Wellhead Protection Program (WHPP). The WHPP techniques are complex and vary across the state's five hydrogeologic environments. For systems $\geq 10,000$ gpd:-

Unconfined: use EPA's WHPA Code ground water model

Zone 1: 1-year time of travel for micro-organisms

Zone 2: 10-year time of travel for chemical contamination

Zone 3: (Optional) outside of ten year time of travel up to boundary of recharge area

Semi-confined: use MODFLOW-MODPATH modeling and up to boundary of recharge area

Confined: 10-year time of travel

Fractured rock: watershed drainage area modified by geological boundaries, ground water divides, and annual average recharge needed to supply the well

Carbonate Rock: as for fractured rock and field studies for wells under the influence of surface waters

For systems $< 10,000$ gpd: methods vary and include fixed radii in some cases

Surface Water

Entire watershed area upstream of the PWS's intake structure, covering the whole topographic watershed. For areas outside of Maryland, information will be requested from Interstate Commissions and Chesapeake Bay Programs. This will be augmented by segmenting streams which contribute to reservoir or river intakes and include sub-watershed area, time of travel, and set-back buffer considerations. Nested watersheds will be used for intakes on large rivers such as the Potomac and Susquehanna.

USGS Quad Sheets and GIS variable scale maps will be used for presentation of results to the public.

II. INVENTORY (MD)

Consider general contaminant groups

Contaminants regulated under the Federal Safe Drinking Water Act

Contaminants addressed by the Ground Water Disinfection Rule

Contaminants addressed by the Enhanced Surface Water Treatment Rule

Precursors for the Disinfection By Product Rule

Other potential contaminants with known or potential impact on water supplies

Orthophosphates/algae
Non-point sources from selected land use categories

For *surface water* supplies

- NPDES: municipal, industrial and agricultural
- Sewer infrastructure
- Pipelines (fuel)
- Transportation (land, air)
- Land disposal (landfills, CERCLA, Superfund, old dumps)
- Mining sites
- SARA (Title III)

For *ground water* supplies

- Ground Water Discharge Permits
- Land disposal (landfills, CERCLA, Superfund, old dumps)
- Leaking Underground Storage Tanks or fuel lines
- Underground Storage Tanks
- Coal Mining Areas

Some contaminants may be eliminated from the inventory by the Groundwater Monitoring Waiver Program and other means.

III. SUSCEPTIBILITY (MD)

Ground Water Systems

Unconfined Aquifers

>= 10,000 gpd: as for wellhead protection plans plus water quality data for IOCs.

VOCs, SOCs and radioactivity. Wells with data indicating a contaminant > 50% of MCL will be listed and given extra attention.

< 10,000 gpd: analysis conducted on a regional basis, with contaminants from the general contaminant groups listed in the Inventory section. Wells with data indicating a contaminant > 50% of MCL will be listed and given extra attention.

Confined Aquifers

Community and NTNC systems will be reviewed potential of direct contaminant injection. Monitoring results will be used to demonstrate the lack of susceptibility of other systems.

Surface Water Systems

Review water quality monitoring information for data > 50% MCL, from:

- Water treatment plant files
- NPDES discharge reports
- Section 305(b) reports
- Chesapeake Bay Tributary Strategy Reports

If contaminant > 50% MCL, map potential sources of contamination

Fate and transport of specific potential contaminant sites may be undertaken
Examine degree of eutrophication of rivers and reservoirs
All PWSSs will be examined for potential microbial contamination

Pennsylvania: reference: October 1998 Working Points

[Note: Pennsylvania has significantly expanded its SWAP Plan preparation beyond the October Working Points; however, that information is not ready for release outside PA DEP at this time.]

I. DELINEATION (PA)

Ground Water

Use the delineation techniques developed under the Wellhead Protection Program (WHPP). The WHPP techniques are complex and vary across the state's five hydrogeologic environments.

For systems with population served $\geq 3,300$:- Pennsylvania Wellhead Protection Program

- Refine hydrogeologic flow model

- Water table mapping or estimates

- Boundary conditions

- Application of appropriate methods, including 10-year time of travel

- Map vulnerable ground water areas

For systems with population served $< 3,300$:- Terrain Analysis

- Default WHPA Zone II = $\frac{1}{2}$ mile radius

- Refine with hydrogeologic flow model through GIS analysis

- Map ground water vulnerability for susceptibility analysis

More rigorous delineation will be given to sensitive wells serving small CWSs and NTNCWSs serving schools and hospitals

Surface Water

Entire watershed area upstream of the PWSS intake structure, augmented by segmenting larger watersheds.

Non-conservative contaminants — Segmentation

- Zone 1: $\frac{1}{4}$ mile on either side of the river, $\frac{1}{4}$ mile downstream to 5-hour travel time upstream using max river velocities in the period Feb 1995 to Feb 1998.

- Zone 2: first direct flow 14 digit HUC watersheds on either side of the river extending upstream to a 25-hour travel time using max river velocities in the period Feb 1995 to Feb 1998.

- Zone 3: the remainder of the watershed.

Conservative contaminants

Critical area analysis based on: water quality data, and physical characteristics of watershed, including critical areas for nitrate, pathogens and sediment loading

II. INVENTORY (PA)

Consider general contaminant groups

Contaminants with Federal Primary and Secondary Contaminant Levels
Giardia and Cryptosporidium
Turbidity
Disinfection by Product precursors
Taste and Odor Precursors

Significant Potential Sources of Contamination:

CWS

Ground Water

Pathogenic Protozoa (if under direct influence of surface water)
Nitrate / Nitrite
VOCs
Metals / Heavy Metals
SOCs

Surface Water

Pathogenic Protozoa
Turbidity
Nitrate / Nitrite
Disinfection By Product Precursors
VOCs
SOCs

NTNCWS

Microbiological: Total/Fecal Coliform, Viruses
Pathogenic Protozoa (GW, if under direct influence of surface water)
Nitrate / Nitrite
VOCs
Metals / Heavy Metals
SOCs

TNCWS

Microbiological: Total/Fecal Coliform, Viruses
Pathogenic Protozoa (GW, if under direct influence of surface water)
Nitrate / Nitrite

Inventory Method

Ground Water

Method 1

Area-wide inventory from all available databases and landuses
Zone I - all potential sources of contamination
Zone II - all significant potential sources of contamination
Zone III - all significant potential sources of contamination for contiguous area

Method 2: GIS analysis

Area-wide inventory from all available databases and landuses
Refine inventory over time with sanitary survey data

Surface Water

Method : whole watershed

Area-wide inventory from all available databases and landuses

All potential sources of contamination

Method 2: Segmentation

Zone I (critical segment) - all potential sources of contamination

Zone II (second segment) - all significant potential sources of contamination

Zone III (remainder) - area-wide inventory from all available databases and landuses

III. SUSCEPTIBILITY (PA)

A qualitative measure (low, medium, high) of relative risk of different potential and existing sources of contamination based on:

Drinking water source vulnerability - surface water generally considered high

Potential impact posed by source of contaminant if uncontrolled release were to occur

Potential for release of contaminant of concern

Many other issues are in the process of being considered

Virginia (Dec 15, 1998 Draft)

[Note: the Virginia December 15, 1998 Draft provides material that was not incorporated in the earlier version of this summary of Potomac River basin states' SWAP Plans.]

I. DELINEATION (VA)

Ground Water

The fixed radius method will be used because it is consistent with contaminant release permitting requirements and other regulatory programs of the Commonwealth.

Zone 1: 1000-foot radius for a wide range of land use activities.

Zone 2: 1-mile radius for potential sources of contamination sites shown on GIS layers available from other regulatory authorities.

Surface Water

The fixed distance of 5 miles in the watershed upstream of the intake was chosen because it is the distance used by the Virginia Department of Health and the Virginia Department of Environmental Quality in regulations to control pollution of drinking water sources.

Zone 1: watershed bounded by a 5-mile radius for a wide range of land use activities.

Zone 2: watershed >5-mile radius for potential sources of contamination sites shown on GIS layers available from other regulatory authorities.

Ground Water Under the Direct Influence of Surface Water (GUDIS)

Zone 1: 1000-foot radius for a wide range of land use activities, and potential conduits to ground water.

Zone 2: 1-mile radius for potential sources of contamination sites shown on GIS layers available from other regulatory authorities.

II. INVENTORY (VA)

The Virginia Department of Health has developed a list of 72 land use activities which will be used to inventory potential contaminants in the following classes: microbiological, nitrate/nitrite, volatile organic chemicals, synthetic organic chemicals, inorganic chemicals, and radiological contaminants. Also, waterworks using ground water will be assessed for: abandoned wells, caves/sinkholes, elevator shafts, other wells in use, ponds, streams, and vertical ground source heat pump systems.

The inventory will include the name and address of the land owner.

III. SUSCEPTIBILITY (VA)

Susceptibility will be based on the combination of two factors: sensitivity of the source to contamination and the occurrence of potentially contaminating land use activities. Detailed descriptions of sensitivity and ranking of potentially contaminating land use activities are given in the Plan.

Ground Water Systems

Determination of sensitivity: based on the area's potential to promote contaminant migration

The presence of various land use activities within zone 1 will influence susceptibility.

Susceptibility determination for each ground water source will be based on the degree of either/both sensitivity and presence of potentially contaminating land uses .

Resulting classes of susceptibility include: very low, low, moderate, high.

Surface Water Systems

All surface waters will be determined as sensitive because they are exposed to contamination through a variety of pathways.

Surface water sources will be rated with a susceptibility of moderate or high.