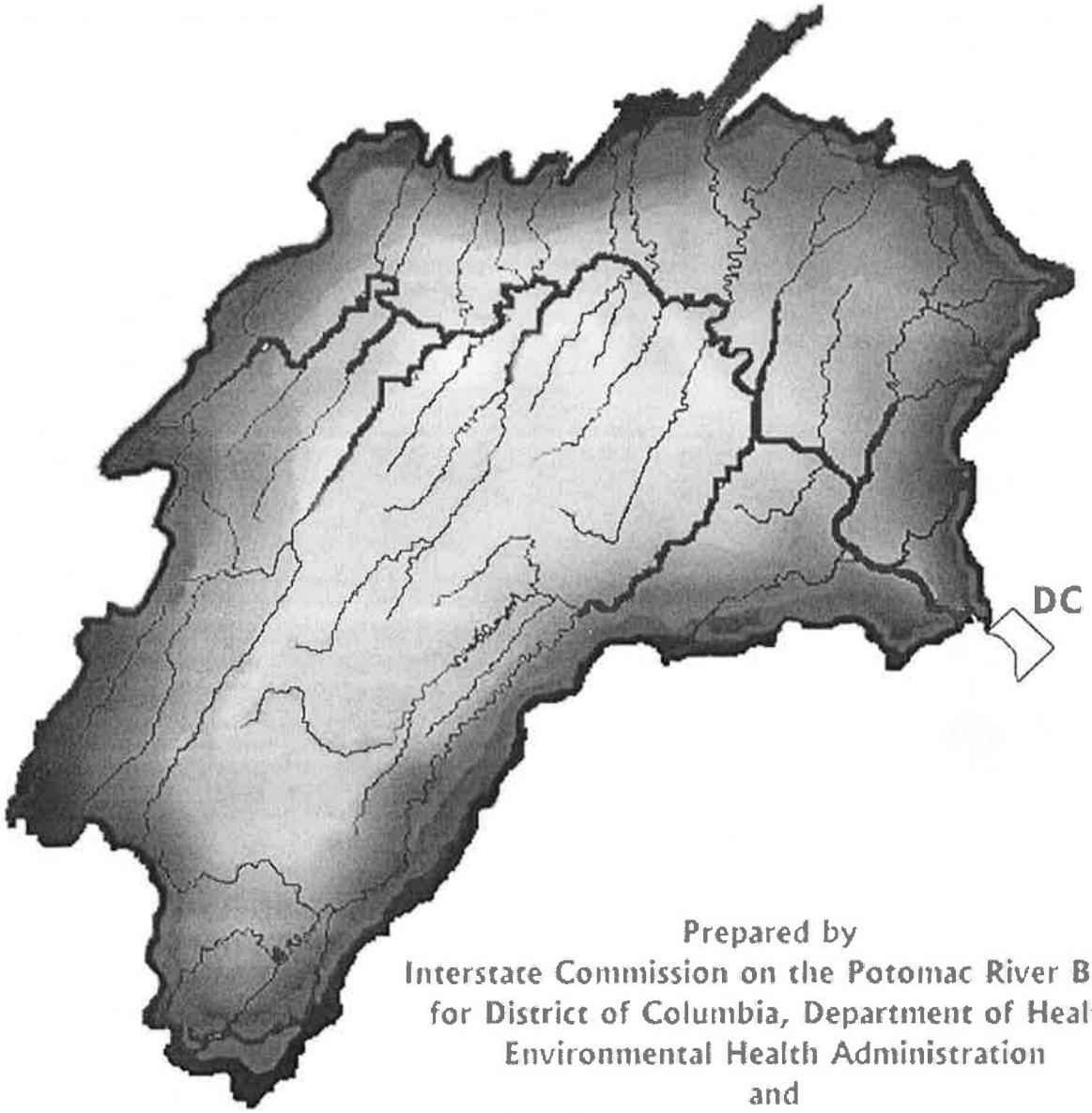
District of Columbia

Source Water Assessment Program
Program Plan
February 5, 1999



Prepared by
Interstate Commission on the Potomac River Basin
for District of Columbia, Department of Health
Environmental Health Administration
and
U.S. Environmental Protection Agency

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List of Acronyms

DC	District of Columbia
GIS	Geographic Information System
HSPF	Hydrologic Simulation Program-Fortran
HUC	Hydrologic Unit Code
ICPRB	Interstate Commission on the Potomac River Basin
MWCOG	Metropolitan Washington Council of Governments
NAWQA	National Water Quality Assessment (US Geological Survey)
NPDES	National Pollution Discharge Elimination System
SAD	Susceptibility Analysis Document (US Environmental Protection Agency)
STORET	Storage and Retrieval data base system
SWAP	Source Water Assessment Program
US EPA	US Environmental Protection Agency
USGS	US Geological Survey

I. Introduction

I.A. Motivation for Source Water Assessment

Under provisions of the Safe Drinking Water Act Amendments of 1996 (P.L. 104-182) Section 1453, each state is required to develop a Source Water Assessment Program (SWAP). The Interstate Commission on the Potomac River Basin (ICPRB), working with the Metropolitan Washington Council of Governments (MWCOG), and appropriate District of Columbia staff, produced this SWAP Plan (Plan) for an assessment of source waters, specifically for the District of Columbia. In the course of performing this work, ICPRB and MWCOG worked closely with staff in the governments of the District of Columbia and the upstream Potomac River basin states: Maryland, Pennsylvania, Virginia, and West Virginia. This effort addressed special cases, including: rivers that cross state borders, boundary rivers, and involved work with each of the basin states as they developed their program Plans. The work focused on producing this Plan to conduct the Assessment. The Plan was produced in conformity with EPA guidance (US EPA 1997[1], US EPA 1997[2], US EPA 1998) published by the US EPA Office of Water. The Assessment for which this Plan was produced is required to be completed within 2 years of approval of the Plan by the US EPA (see Appendix I).

I.B. Major Tasks

The major tasks accomplished in the production of this Plan were: (1) establishment of public participation (including citizen and technical involvement) in the development of the Plan, and (2) the development of specific elements of the Plan: (a) source delineation, (b) potential contaminant inventory, and (c) susceptibility analysis of the inventoried contaminants identified in the source delineation, which will all lead to a Source Water Assessment Program for the District of Columbia.

I.C. Source Water Assessment Program Funding

Although major funding for the production of the Plan came from the US EPA, supplementary funding and personnel time were contributed by ICPRB and the ICPRB Section for Cooperative Water Supply Operations, which derives its funding from Washington Aqueduct Division of the US Army Corps of Engineers, Washington Suburban Sanitary Commission, and Fairfax County Water Authority. Significant data and information resources were contributed by the Potomac basin states (Maryland, Pennsylvania, Virginia, West Virginia) and the District of Columbia.

The Source Water Assessment to be carried out in accordance with this Plan will be funded by an implementation grant of $400,000 to the District of Columbia from the U S EPA. The source of the funding is the FY 1997 Drinking Water State Revolving Fund, as established in Section 1452(g)(2)(B) of the Safe Drinking Water Act Amendments of 1996.

I.D. Interjurisdictional Cooperation and Coordination

The data, information, and analysis required to conduct the Assessment will be substantial and will involve issues throughout most of the Potomac River basin. Areas within each of the basin states will be examined. In order to lay the ground work for the efficient conduct of the

Assessment, the SWAP management personnel in each of the basin states have been contacted and agreed to assist in the provision of data and information relevant to their respective portions of the watershed upstream of the Potomac River intakes for the District of Columbia. The Chesapeake Bay Program has developed a large amount of useful data and information. In addition, the National Water Quality Assessment (NAWQA) program conducted by the US Geological Survey for the Potomac River basin produced a large body of data and interpretive reports which are likely to be valuable in conducting the Assessment.

The future protection of the source water will take place in the Potomac River basin upstream of the District of Columbia's intakes (see Figure 1). This area is entirely outside of the District of Columbia and falls within the states of Maryland, Pennsylvania, Virginia, and West Virginia. Therefore, during the Assessment, working relationships should be developed with those upstream states and the US Environmental Protection Agency in order to assure that as they implement source water protection programs, the water sources for the District of Columbia are also protected.

II. Source Delineation

II.A. Introduction

The delineation of source waters is the first technical step in conducting the Source Water Assessment Program. The delineation will involve identifying the locations of the water withdrawal points on a map, derivation and presentation of the boundary of the contributing catchment area, listing the states in the catchment, and estimating the land area of the catchment in each of the affected states. The District of Columbia derives all its drinking water from two surface water intakes on the Potomac River. None of the drinking water for the city is derived from ground water sources.

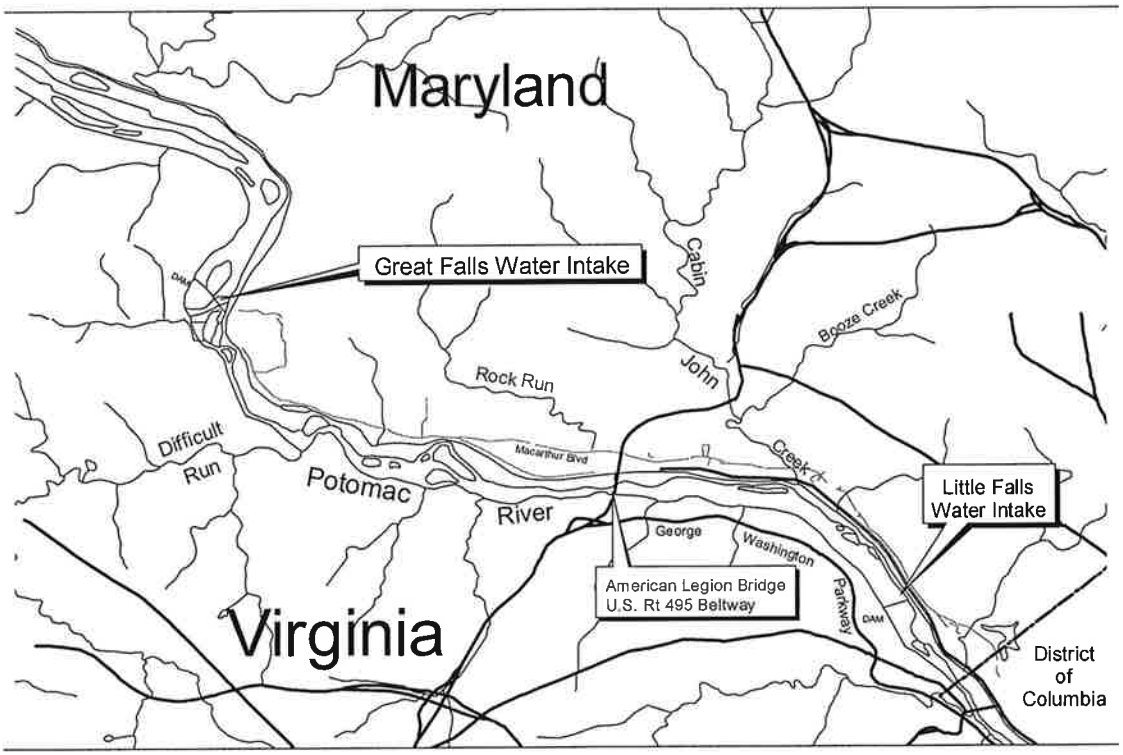
II.B. Location of Water Sources

Preliminary information includes the following elements. The water source intakes for the District of Columbia are located on the Potomac River just upstream from the District/Maryland border (see Figure 2). One intake is located just upstream of Little Falls Dam near Glen Echo, Maryland, and the second intake is located approximately eight miles farther upstream at Great Falls Dam, in Great Falls Park, Maryland. Both intakes are constructed on the Maryland bank of the River at these locations.

Figure 1. Watershed for the District of Columbia's Drinking Water Supply

(Approximate)

Figure 2. Location of Intakes for the District of Columbia's Water Supply



II.C. Contributing Area Delineation

The US EPA indicated in its SWAP guidance (US EPA 1997[1], US EPA 1997[2]) that public water supply systems relying on surface waters delineate the source water protection area to include the entire watershed upstream of the intake structure, up to the boundary of the state border. Delineation of the District of Columbia's source watershed will instead cover the whole topographic watershed extending well beyond the limitations of jurisdictional borders and into neighboring states. The whole topographic watershed approach to delineation will be conducted without regard to the status of waters courses as boundary rivers or interstate waters.

The delineation of the watersheds for both intakes will be determined. Using a combination of geographic information system (GIS) software and geographic (topographic) data supplied by the USGS, the delineation of the entire watershed will be accomplished by determining the perimeter of the surface land catchment area that provides water to the supply intakes. The catchment area exists as that land surface area to which atmospheric precipitation falls upon and flows downward to either of the intake structures for the District of Columbia. This catchment area within the Potomac River basin extends for approximately 11,560 square miles upstream of the Little Falls intake, and crosses several state lines from Maryland into Pennsylvania, Virginia, and West Virginia (see Figure 1). It is likely that very little, if any, ground water from outside this area enters the watershed; therefore, the boundaries of the Potomac River basin upstream of the intakes shall be considered the limits of influence for the source waters of the District of Columbia. The perimeter of the catchment area across these boundaries will likely be based on 1:100,000 scale topographic data produced by the US Geological Survey for the Potomac River Basin NAWQA project. Information from 1:24,000 topographical data may also be used but may serve in support of the larger scale geographic data. Digitized elevation data at the 1:24,000 scale (displayed on "quad sheets") is good for detailed analysis and may be used where the watershed boundary for the intakes is different from the river basin boundary produced by the USGS. Land surface elevation information is developed by the USGS from aerial photographs and supplemented by ground level surveys.

The width and flow conditions of the Potomac River are different for the Great Falls and Little Falls intakes. Segmentation of the source watershed appears justified in these areas because of a potential contaminant's ability (or lack thereof) to disperse across the relative wide smooth-flowing river. This issue is supported by experience from the Colonial Pipeline Company oil pipeline burst in northern Virginia during March, 1993. Medium to large sized watersheds, like the Potomac River basin, are subdivided by the USGS into smaller segments and assigned Hydrologic Unit Codes (HUCs) of varying lengths depending on the degree of segmentation. Existing geographical information from USGS 8, 11, or 14 digit HUC watersheds will also be used to further augment segmentation of the watershed in relation to the separate intake structures at the Great Falls and Little Falls locations.

II.D. Refinements to Delineation

In addition to whole topographic watershed delineation, additional work to delineate river-side assessment zones along the principal streams within the principal portions of the segmented

watersheds will be determined. Widths of these zones on the banks of either side of the streams will be delineated based on potential pollution pathways and the varying degree of susceptibility posed by the different classes of potential contaminants and sources.

Determining the length of the river-side assessment zones will involve application of travel time studies conducted by the Interstate Commission on the Potomac River Basin, US Geological Survey, and others. The lengths of the zones will depend on the amount of time it takes for a contaminant from the zone to get to one of the intakes. The determination of travel time zones will assist the susceptibility analysis regarding the fate and transport of potential contaminants once they are in the river system.

II.E. Mapping of Delineation

In general, the delineation element of the assessment will be founded upon a base map which will include man-made features helpful in establishing the geographic context of the source water area. Man-made base features such as: major roads, cities and towns, and state boundaries will be included. Hydrologic layers will include major rivers, streams, lakes and reservoirs. The mapping element of the assessment will be conducted with widely acceptable Geographic Information System (GIS) computer software. The information to support the development and displays on the map layers will also be presented for the Assessment in tabular/report format.

The data needs are estimated to include: major roads, cities and towns, state boundaries, hydrology (rivers, streams, lakes), Hydrologic Unit Code (HUC) boundaries, surface water withdrawal points, digital elevations.

III. Potential Contaminant Inventory

III.A. Introduction

The relevant potential contaminants have been identified for inclusion in the DC-SWAP Plan. They include contaminants listed in the National Primary and Secondary Drinking Water Regulations (see Appendix II).

Direct and indirect methods will be pursued to determine if these potential contaminants are likely to exist in the source watersheds for the District of Columbia water intakes on the Potomac River.

III.B. Direct Inventory Methods

Direct methods of inventorying potential contaminants refer to the examination of monitoring data to identify the contaminants that have been found in source water in the Potomac River basin. Sources of monitoring data are discussed in the following sections. Where contaminants listed in the National Primary and Secondary Drinking Water Regulations have been detected, an attempt will be made to determine the source of those contaminants.

III.B.1. Water Suppliers
The Washington Aqueduct Division of the Corps of Engineers, which operates water intakes for the District of Columbia, routinely monitors its raw water for contaminants. This monitoring is conducted according to the requirements of the Safe Drinking Water Act which is administered by the US EPA. The data from this activity provides the best record of what contaminants have been found in the Potomac River where it is withdrawn for treatment. Moreover, the intakes of the Fairfax County (VA) Water Authority, the Washington Suburban (MD) Sanitary Commission, and the City of Rockville, MD are not far upstream of the DC intakes. The monitoring records of these water utilities will also be valuable in identifying which contaminants may impact DC's source water.

III.B.2. Chesapeake Bay River Input Monitoring Program
The U.S. Geological Survey, in cooperation with the Maryland Department of Natural Resources and the Virginia Department of Environmental Quality, monitors nutrient and sediment concentrations at the downstream freshwater limit of nine major tributaries to Chesapeake Bay, including the Potomac River at Chain Bridge. Chain Bridge is just downstream from the Little Falls intake for the District of Columbia water supply. The monitoring program is a contribution to the Chesapeake Bay Program, and is described on the World-Wide Web at http://va.water.usgs/chesbay/RIMP/. The Chesapeake Bay Program and cooperating agencies, including USGS, also monitor toxics and metals at the downstream freshwater limit of the Susquehanna, James, and Potomac rivers. While monitoring programs for metals and toxics are not as extensive as those for nutrients and sediment, they still provide significant data on which contaminants may impact the water supply.

III.B.3. STORET
The states, local governments, and federal agencies, e.g. the United States Geological Survey and the Corps of Engineers, have extensively monitored water quality in the Potomac River basin. Much of this data is available on STORET, EPA's STOrage and RETrieval database system for water quality monitoring data. The DC-SWAP will examine water quality data from STORET for the Potomac River basin upstream of the intakes.

III.B.4. Potomac River Basin States
The states upstream of the District of Columbia's intakes enter much of their water quality monitoring data and information into STORET. However, there may be special investigations where the data and information is not available through STORET. The states have all agreed to provide any of this type of direct monitoring data.

III.B.5. USGS NAWQA Program
The Potomac River basin was one of the first regions of the country to be studied by the US Geological Survey in its National Water Quality Assessment Program. The program involves several years of intensive investigation alternating with periods of low level monitoring for major river basins and aquifer systems across the country. The data and findings of the NAWQA Program will provide a scientific basis for major national decisions that affect water quality policy and regulation. This is being accomplished with the products of the program, which include: (1) a nationally consistent description of current water quality conditions for a large part of the Nation's water resources; (2) long-term trends (or lack of trends) in water quality; and (3) identification, description, and explanation of the major natural and human factors that affect

observed water quality conditions and trends. The extensive data and interpretive reports resulting from the NAWQA study of the Potomac River basin are now available and should prove to be an excellent source of information concerning directly measured potential contaminants. In particular its nutrient and pesticide retrospective studies, its generalized water quality studies, and its bottom sediment and tissue study are expected to be helpful.

III.B.6. Other data

Under a grant from the Chesapeake Bay Program, the Interstate Commission on the Potomac River Basin, the Susquehanna River Basin Commission, and the USGS jointly developed an inventory of water quality monitoring programs in the nontidal areas of the Chesapeake Bay Basin. These are programs whose data is generally not available on STORET. Data from these program will be used, where appropriate, to supplement information found on STORET. The US EPA maintains a database of river and stream networks (Reach File 3) which would be helpful in determining the digital location information and presentation of potential contaminant sites on GIS-developed maps for the Assessment. The locations of linear activities such as the transportation of potential contaminants by road, rail, and pipeline will be obtained in order to facilitate their assessment.

III.C. Indirect Inventory Methods

Additionally, indirect identification and inventorying of potential contaminants will be accomplished by examination of information in the regulatory programs of the federal and state governments. These include: the National Pollution Discharge Elimination System (NPDES) under which all municipal and industrial dischargers of potential contaminants to water must obtain and abide by a permit which limits the type and amount of contaminants that can be released, the NPDES regulation of storm water runoff from paved areas, the federal Toxic Release Inventory, and other regulatory and response programs. Some permit programs may not include specific substance release information, but indirectly, will provide information on substances through general business activities. From the type of business or activity, the use, storage, and transport of potential contaminants can be inferred. Two sources of information which relate business type or activity to potential contaminant release have been identified, and more of this kind of information is expected to be available for the assessment phase. The business types and activities for which related potential contaminants are identified include those listed in Table 1 and in Appendix II. The US EPA is continuing to develop another reference document on this subject.

During the course of the development of this Plan, cooperative relationships were developed with the SWAP program personnel in each of the states in the Potomac River basin which are upstream of the intakes for the District of Columbia. They agreed to provide the type of indirect information and data that will be necessary to independently conduct the Assessment for the District of Columbia's source water.

Potential sources of nonpoint contaminants may be inferred using GIS data layers of land use in the basin. The Chesapeake Bay Program maintains a complete land use coverage of the Potomac River Basin which delineates urban, agricultural, and forested land. More detailed coverages are available for the Maryland and selected regions on other states. The characterization of land use in the basin can be supplemented by information from the U.S. Census and the Census of

Agriculture. The U.S. Census supplies information on population density, housing stock, and sewage disposal at the census district level. The next census will be conducted in the coming year. The agricultural census can supply information on crop production, farm animal population, fertilizer, and irrigation use at the county level. Limited information is also available for zip code areas. Using these various sources of land use information together with US EPA documents relating potential contaminants with business types and activities, a link between land use and potential location of contributing contaminants will be made. From the establishment of this link, the susceptibility of the District of Columbia's source water to these nonpoint contaminants can be assessed.

Table 1. Business Activities for which Related Potential Contaminants Are Identified

Land use Considerations
Agriculture/Golf Courses
Airports
Asphalt Plants
Beauty Parlors
Lumber/Buildings
Car Washes
Cemeteries
Chemical Manufacture
Clandestine Dumping
Dry Cleaning
Furniture Stripping/Painting
Hazardous Materials Storage/Transfer
Industrial Lagoons
Jewelry and Metal Plating
Junkyards
Landfills
Laundromats
Machine Shops/Metal Working
Municipal Wastewater/Sewer Lines
Photography Labs/Printers
Railroad Tracks/Maintenance Stations
Research Labs/Universities/Hospitals
Road and Maintenance Depots
Sand and Gravel Mining/Washing
Septage Lagoons and Sludge
Septic Systems
Stables, Feedlots, Kennels, Manure Pits
Stormwater Drains/Retention Ponds
Underground Storage Tanks
Vehicular Services
Wood Preserving

Other potentially contaminating activities for which contaminants should be determined include: highways, pipelines carrying fuels, incinerators, power generating plants, air-borne contamination, and degradation products that are created when chemical contaminants interact with the environment.

IV. Susceptibility Analysis

IV.A. Introduction

The District of Columbia' s susceptibility analysis is based upon the guidance on the subject (US EPA 1998). Part B below outlines the factors critical to the determination of susceptibility. Part C presents a discussion of a procedure for assessing the intra-system and inter-system susceptibility, which is the relative susceptibility of a system to different potential sources of contamination or to different categories of contaminants, and relative susceptibility among source water systems (the District of Columbia's two intakes). Part D presents a discussion of iterative assessments.

IV.B. Critical Susceptibility Factors

The susceptibility of the District of Columbia's source water to contamination is determined by the following four critical factors: (1) the structural integrity of each surface water intake, including the infrastructure delivering water to the treatment plants; (2) the sensitivity of the watershed to the transport of contamination to surface water intakes; (3) the presence of facilities or activities within the watershed that involve one or more potential contaminants, the nature and amount of those potential contaminants and the efficacy of contaminant barriers or other management measures intended to preclude contaminant release into the surrounding environment; and (4) assessing the relationships among these factors to estimate the probability that contamination will move from the potential sources of contamination into the treatment plants.

IV.B.1. Integrity of Source Water Intakes

In recognizing that source water may enter a system at unintended locations, the surface water intake is considered to include the connecting infrastructure to the treatment plants. Under negative pressure conditions, cracks or loose joints in the connections from the intake to the treatment plants can allow contaminants into the system downstream from the intake. From the intake at Great Falls, there is a ten mile length of aqueduct carrying the river water to the treatment plant; whereas the Little Falls intake is only approximately one mile from the treatment plant. Infrastructure age and maintenance records can also provide clues to structural integrity.

IV.B.2. Sensitivity of the Watershed

The potential for contamination includes that from natural or human factors. More sensitive settings have a higher potential for movement of contaminants and less sensitive settings have a lower potential for their movement. Sensitive areas in this sense would be paved or disturbed land, such as parking lots or construction sites. Less sensitive area would be undisturbed areas where less potentially contaminating activities take place, such as forested park land.

Land use is the predominant determining factor of a surface water system's susceptibility to contamination. Urban, agricultural or industrial runoff can transport sediment, pathogens, or chemical pollutants that degrade drinking water quality. Roads and other paved areas associated with commercial, industrial and residential development may reduce the filtering and breakdown of potential contaminants that occur in natural overland flow. Thus, man-made changes to the landscape frequently affect the hydrologic sensitivity of the terrain. Urbanization increases surface water flow or runoff by reducing the permeability of the ground surface. Higher flows can generate more stream channel erosion than would otherwise be the case. Agricultural practices can change sensitivity, either increasing or decreasing it, depending on the types of agricultural activities conducted. Even forests or park land may have potential contaminants in the form of pathogens from large populations of deer and other wildlife.

After water has run off into stream channels, the travel time of water in the river can be used as another factor to assess the sensitivity of the watershed. Faster travel times will occur in faster flowing, steeper portions of the watershed. The USGS has investigated the travel time of water in the Potomac and its sub-watersheds for several reaches at different flow conditions using dye-tracer analysis (Jack, 1984; Taylor, 1970, Talyor et al. 1985, 1986, Taylor and Solley, 1971). These results will be used as the basis for an investigation of travel times in the Potomac and its subwatersheds.

The travel time of a contaminant from origin to source water intake can be used to delineate the length of stream-side assessment zones and travel time horizons in order to segment watersheds. The determination of the length of stream-side assessment zones will be determined during the Assessment phase.

IV.B.3. Potential Sources of Contamination

The presence of potential contamination sources inside a delineated area is often the controlling factor for determining susceptibility. Water systems may be threatened by potential sources of contamination at or near land surface, or by contaminants already in the surface water or ground water pathways. In the absence of remedial activities, the likelihood of contaminated source water reaching an intake depends on: the geochemical, hydraulic and physical characteristics of the surface water body; travel time to the intake; water withdrawal rate; and the nature and amount of the contaminant in the source water.

Susceptibility is a function of relative natural decay characteristics of the contaminant, including whether it is volatile or non-volatile. Susceptibility is also a function of the transport characteristics of the contaminant, including whether it is a floaters or a sinker, soluble or not, and whether it attaches readily to fine grained sediment.

The susceptibility of the water systems to nonpoint source pollution is controlled by many of the same factors as pollutants from other sources. The identification of potential contaminants from nonpoint sources was discussed in Section III.C. These contaminants can be transported to surface water in runoff, eroded sediment, or when ground water discharges to surface water. The likelihood that a contaminant from nonpoint sources can pose a threat to the source water supply depends on the load of the contaminant mobilized in runoff, erosion, or ground water discharge, the frequency or prevalence of the hydrologic conditions that mobilize the contaminant, and the fate and transport of the contaminant in surface water.

IV.B.4. Relationship Among Factors

There are many ways to analyze the potential sources of contamination, their settings and the integrity of source water intake structures. One technique is to assign a numeric value to each of the factors representing a greater or smaller chance of drinking water contamination, and summing the values to estimate overall susceptibility. Another technique is to build progressively upon an estimate for one factor by combining it with an estimate for another factor in a matrix. An example of this technique is shown in Table 2 and Table 3 in the following section of this Plan in which Assessment Strategies are presented.

IV.C. Intra-system and Inter-system Susceptibility

Intra-system susceptibility is the relative susceptibility of a system to different potential sources of contamination or to different categories of contaminants. Some sources of contamination pose a greater risk than others because of pollution already detected in the drinking water, because of the health effects of the contaminants onsite, because of their proximity to the source water intake, or because of the efficacy of containment practices at the site. Determining intra-system susceptibility will help in the process of assigning priorities for source water protection.

The susceptibility determinations will distinguish factors generally relating the location of potential contaminants in the watershed relative to the intakes, and the relative impact the contaminants might have on human health in concentrations at which they have the potential to reach the intakes.

The criteria for determining, and form of expressing, relative susceptibility to different sources of contamination will incorporate sound scientific principles to yield similar results under similar circumstances when applied across the watershed. The results will identify priorities for implementing protection measures based on public health risk.

Inter-system susceptibility is the relative susceptibility of different water systems. The District of Columbia obtains source water from two intakes on the Potomac River; therefore, a limited inter-system or differential susceptibility analysis will be conducted for the District of Columbia.

In either case, the analysis will depend on data and information from several different agencies — including those in the upstream states which will be conducting their own source water assessments. The data and information obtained will be the basis for conducting independent analyses and drawing conclusions which may be different from the results of the assessments conducted in the upstream states.

IV.D. Assessment Strategies

The assessments for the two intakes will be slightly different, due to differences in their hydrologic settings. However, it is anticipated that both will be assessed by successive rounds of refinement.

Successive rounds of refinement are susceptibility assessments that are repeated in greater scope or detail for the same delineated areas. The successive rounds will consist of a preliminary assessment to identify the most serious threats of source water contamination. The value of

successive rounds is the use of preliminary susceptibility determinations as the basis for setting priorities to conduct more thorough and more extensive follow-up assessments.

IV.D.1. Assessment Round I
The following process will be followed for both intakes.

Area Delineations and Sensitivity: The District of Columbia will delineate watershed areas in two steps: (1) D.C. will use the U.S. Geological Survey's level-8, 11, or 14 hydrologic unit codes to delineate the watersheds; and (2) D.C. will make use of information available from the USGS to delineate the (upstream) watershed area for each source water intake.

Segmenting Watershed Areas: The District of Columbia will segment its source watershed areas based on travel time of streamflow to the intakes. The threshold for segmentation will be the travel time that equals an estimate of the notification and response time for the treatment plant to take action in the event of an upstream spill of a contaminant.

The inner segment will be comprised of that portion of the watershed which is within the distance derived from the threshold travel time upstream of the intake. The Washington metropolitan area has some experience with the time it takes to notify the water suppliers with intakes down stream of a contaminant spill. A regional spill response agreement was developed among the relevant authorities following a major pollution incident in March 1993. Based upon the incident and upon spill preparedness exercises conducted since, a time of ten hours would seem appropriate for the calculation of the extent of the inner segment. The inner segment would be considered to be highly sensitive to potential contamination.

The outer segment will include the rest of the watershed upstream of the inner segment. Watershed segmentation will also take into consideration differences among the pathways by which potential contaminants can or cannot get to the intakes.

Stream-side Assessment Zones: To account for potential contaminants being used, stored, transported or spilled near the river, the District of Columbia may delineate assessment zones along some banks of the Potomac and its tributaries. The width and length of assessment zones will depend on the types of potential contaminants, their possible pathways to the river in the riparian zone, and their fate and transport in the river. These issues will be addressed in detail during the Assessment phase. In the case of the intakes for the District of Columbia, the Potomac River is bordered by the C & O Canal National Historical Park for nearly 200 miles upstream of the intakes on the Maryland side of the river. Generally, private land borders the river on the other side.

Intake Integrity: This issue refers to the integrity of the intake structure and raw water mains and aqueducts delivering water to the treatment plants, and to the location of the intake. Factors might include physical condition of infrastructure, public access to the vicinity of the intakes and conveyance system to the water treatment plant, and protection of raw water settling basins from direct runoff. Another factor that affects the intakes is that they are both located at the river's edge. Here, they are potentially more susceptible to pollution which may enter the river from nearby upstream tributaries. The results of any sanitary surveys covering the intake and associated raw water mains should be considered in assessing intake integrity.

Potential Susceptibility -- Round I Assessment: The intake integrity and hydrologic sensitivity designations will be combined in a matrix to make a first round assessment of potential susceptibility. An example of this type of assessment is shown in Table 2.

Table 2: Round I Determination of Potential Susceptibility

ROUND I ASSESSMENT	HIGH SENSITIVITY SETTING	MODERATE SENSITIVITY SETTING	LOW SENSITIVITY SETTING
LOW INTEGRITY INTAKE	High Potential Susceptibility	High Potential Susceptibility	High Potential Susceptibility
HIGH INTEGRITY INTAKE	High Potential Susceptibility	Moderate Potential Susceptibility	Low Potential Susceptibility

IV.D.2. Assessment Round II

In the more general susceptibility analysis, the District of Columbia will work with the upstream states, the Interstate Commission on the Potomac River Basin, and other entities to inventory all potential sources of contamination within the inner segment. For the outer segment, the focus will be on contaminants considered to represent a particularly high public health risk, including those specifically identified by the District of Columbia Department of Health.

Susceptibility will be determined for each surface water intake by comparing the results of the *Round I Assessment* from Table 2 with the ratings of relative concern of the potential sources of contamination (PSCs). An example of this type of determination is shown in Table 3.

Table 3: Round II Determination of Potential Susceptibility

ROUND II ASSESSMENT	High Concern PSCs	Low Concern PSCs
High Round I Potential Susceptibility	HIGH	MODERATE
Moderate Round I Potential Susceptibility	HIGH	MODERATE
Low Round I Potential Susceptibility	HIGH	LOW

In a manner consistent with the recommended *Inventory Approach for Significant Potential Sources of Contamination* (US EPA 1998) the District of Columbia Department of Health identified several potential threats to its source water supply which are of particular concern. These include: pathogens, pesticides, sediments, taste and odor precursors, impacts associated with increased urbanization in metropolitan Washington upstream of intakes, and sites of known chemical contamination in the watershed (PCB contamination in Shenandoah River, mercury contamination of South Fork of Shenandoah River, and dioxin contamination in North Branch Potomac River).

An outline of the approach to the potential threats which the District of Columbia has given high priority is presented in the following paragraphs. It includes where and how the Chesapeake Bay

Program's Watershed Model (see Appendix III) can be used to help develop a susceptibility analysis for these potential threats. This model is particularly appropriate because it has been calibrated and can be used to simulate daily flows and daily concentrations of sediment, nitrogen, and phosphorus for the Potomac River fall line at Chain Bridge which is just down stream of the District of Columbia's water intakes.

Pathogens: Pathogens are probably the most ubiquitous water quality problem in the Potomac River basin. They are the number one cause of water bodies failing to meet their designated uses. The potential for the contamination of the water supply by giardia and cryptosporidium, which resist treatment by chlorination, has become an important concern.

Fecal coliform bacteria have long been used to indicate the presence of fecal matter in water. While their shortcomings as an indicator has become more apparent, they are still useful as a means of tracking sources of pathogens. The Watershed Model is capable of modeling the transport of fecal coliform bacteria, and the Watershed Model will be adapted to simulate the fate and transport of fecal coliforms. The model will be used to determine under what conditions high coliform counts are to be expected and what land uses and geographic areas are the source of coliforms at the water intakes.

The following tasks are necessary to adapt the Watershed Model to the representation of the fate and transport of fecal coliform bacteria:

- Configuration of the Watershed Model for the simulation of fecal coliforms
- Collection of literature values to identify the range of concentrations and loads associated with types of land use
- Collection of fecal coliform monitoring data
- Calibration of the model against the monitoring data

Since fecal coliform are not necessarily a good indicator for all types of pathogens, additional analysis will be necessary to make any inferences from the results of the fecal coliform simulation which apply to pathogens such as giardia and cryptosporidium.

Pesticides: In many areas of the basin, much of the land is devoted to crops. The USGS has detected several herbicides, including Atrazine, at several monitoring stations.

The Watershed Model can be used to determine under what hydrologic conditions pesticide applications could pose a threat to the water supply. The following steps will be taken to adapt the Watershed Model to simulate the impact of pesticide use:

- Collect information on pesticide sales and application permits from the states.
- Use the Agricultural Census to determine the crop land most likely to receive pesticide applications.
- Configure the Watershed Model for the simulation of pesticides.

- Perform simulations to determine which hydrologic conditions are most likely to result in elevated pesticide concentrations at the water intakes.

Sediment: Sediment transport is already simulated by the Watershed Model. Extensive monitoring data also exists for sediment concentrations at the fall line. The results of the Watershed Model will be analyzed to determine trends in sediment loading and to identify which sources are the largest contributors to sediment loads at the water intakes. The future impact of sediment controls implemented under the Chesapeake Bay Program will also be examined.

Taste and Odor Problems: Although not strictly human health issues, tastes and odors in drinking water can be very disturbing to consumers who may associate palatability with potability. Problems with the tastes and odors in drinking water are often caused by algal blooms in raw water. These algal blooms occur because of high levels of nutrients in the water. The Watershed Model calculates nutrient concentrations, as well as chlorophyll concentrations, at the fall line. (Chlorophyll concentration is an indicator of the presence of algae. The modeling results will be analyzed to evaluate the conditions under which algal blooms, and the associated taste and odor problems, are likely to take place. Other sources of taste and odor problems are ammonia generated beneath snow on decaying vegetable matter and the use of de-icing products that contain urea.

Urbanization: Urban growth is expected to occur in areas upstream of the intakes: the outer areas of Fairfax County, VA, and Montgomery County, MD, as well as Loudoun County, VA, and Frederick County, MD. The conversion of agricultural and forested land to urban land brings with it changes in water quality, and the impact of these changes on DC's source water needs to be evaluated.

The Chesapeake Bay Program is likely to be assembling data on projected future land use in the basin. If this data is not available from the Bay Program, they could be obtained from county planning departments. Once this information is obtained, some of the impacts of increased urban growth could be analyzed using the Watershed Model. Future estimates of nutrient, sediment, and pathogen loads could be estimated using the strategy outlined above.

Based on changes in the volume of urban storm water, the relative change in the load of metals and toxics from urban areas could also be estimated. The Watershed Model could be used to estimate the increase in volume of stream flow due to urban runoff. Average annual loads of contaminants in urban runoff could be calculated as the product of average annual runoff and event mean concentrations of the constituents found in storm water, using concentration data from NPDES permit applications for storm sewers. This approach has already been used by Gruesner et al (1992) to estimate current chemical contaminant loads in urban storm water.

Site-Specific Chemical Contaminants: There are three sites of known chemical contamination upstream of the water intakes that have prompted fish consumption advisories in the past and may have an impact on DC's water supply. (1) PCB contamination is associated with the

AVTEX Fibers Superfund Site in Front Royal, VA. The site is currently under remediation. (2) Mercury contamination of the South Fork of the Shenandoah River stems from a Du Pont Plant in Waynesboro, VA. The mercury was discharged from the plant between 1929 and 1950. A fish consumption advisory is in effect for the South River and the South Fork of the Shenandoah because of elevated levels of mercury found in fish, and mercury concentrations in the river continue to be monitored. (3) Dioxin contamination in the North Branch of the Potomac River was derived from effluent from a Westvaco paper mill in Luke, MD. Westvaco has spent millions of dollars to eliminate trace levels of dioxin from the plant effluent. Maryland has recently lifted the fish consumption advisory which had been in place on the North Branch and mainstem of the Potomac upstream of Cumberland, because of elevated dioxin levels found in fish.

Under the DC-SWAP, the information available on contamination from these sites, including site descriptions where appropriate, and monitoring data will be collected. The information will be evaluated to determine the likelihood of the mobilization of these contaminants and their transport downstream to the water intakes. It is not expected that modeling will be used in this effort, because although these contaminants are usually found bound to sediments, the model does not account for the mobilization and transport of sediment from specific small localities.

V. Public Participation

V.A. Introduction

EPA's Guidance on State Source Water Assessment and Protection Programs emphasized the importance of public involvement in the development of SWAP plans. To meet this requirement, MWCOG, working under contract to the ICPRB, convened and provided staff support to a Citizens Advisory Committee, solicited additional public comment on the draft Plan and provided coordination with the public outreach efforts of SWAP development in neighboring Maryland and Virginia.

V.B. Citizen Advisory Group Efforts

MWCOG sent letters soliciting interest in helping to develop the District of Columbia's SWAP Plan to more than 100 individuals. These people included all of those who attended a public meeting on drinking water issues in Washington, D.C., held by EPA Region III in March 1996. It included other representatives of civic and environmental organizations in the city, the chairs of the 29 Advisory Neighborhood Commission subdistricts in the city, and representatives of various city government agencies or other organizations involved in drinking water and public health issues.

Twenty-two people attended an organizational meeting for the Advisory Committee held November 17, 1998. The group received background information on source water protection efforts in general and plans for developing the District of Columbia plan. The participants

agreed to form an advisory committee and discussed funding and communication issues. (A roster of those who subsequently attended Committee meetings or expressed an interest in continuing to review Committee materials is attached as part of Appendix IV; the roster includes members of the ICPRB's Technical Advisory Committee, staff from EPA Region III and MWCOG staff.)

The Committee held additional meetings on December 17, 1998, and January 20, 1999. The Committee reviewed a draft outline and a portion of the Plan text at the December 17 meeting and further discussed funding and communications issues. At the January 20 meeting, the Committee provided comments on the full draft of the Plan, which was originally distributed to members on January 8, 1999. (See attached meeting summaries in Appendix IV for a record of Committee comments.)

Comments on technical aspects of the Plan by individual Committee members are addressed in the body of this Plan or in Appendix IV. In addition to these comments, the Committee as a group endorsed the recommendation that its role in providing public input into the source water assessment process should continue during the actual Assessment phase rather than end with submission of the Plan to EPA. The Committee also supported a continuing role for ICPRB and MWCOG in the project, as well as having the US Geological Survey involved in technical aspects of the Assessment.

V.C. Public Involvement

In addition to the Advisory Committee efforts, MWCOG and ICPRB made the following efforts to obtain public input on the draft Plan:

- MWCOG issued a press release on January 7, 1999 to publicize the developing Plan and invite comments on it at a public meeting January 20 (to be held in conjunction with the Advisory Committee meeting).

- MWCOG distributed a flyer advertising the public meeting to all branch libraries in the District of Columbia along with Advisory Neighborhood Commissions and District of Columbia government offices.

- Copies of the draft Plan were made available for review at public library branches and the MWCOG Information Center prior to the public meeting.

- Copies also were available through e-mail, in response to a recommendation from the Advisory Committee.

- The ICPRB also posted the draft Plan on its World Wide Web site at: www.potomacriver.org.

V.D. Future Public Involvement

As noted previously, the Advisory Committee believes that a continuation of its formal role in the process is a key to continued public involvement. The members noted that many key issues involving the scope and direction of the assessment will not be determined until the actual Assessment phase.

The Committee also made several recommendations for keeping the public informed of results from the Assessment phase. These include developing maps or other graphical data representations whenever possible, defining the many technical terms as clearly as possible either in the text or in an attached glossary, and providing a World Wide Web site where the plan and subsequent Assessment documents can be accessed by the public. Committee members also emphasized the need to communicate the results of the District of Columbia's Assessment to citizens in neighboring states in the Potomac River basin, who will have to be major participants in any future source water protection efforts.

V.E. Technical Advisory Committee

A Technical Advisory Committee was formed to advise on the more technical aspects relating to the preparation of this Plan. The membership included representatives from the following entities:

District of Columbia, Department of Health
Washington Aqueduct Division of the Corps of Engineers
District of Columbia, Water and Sewer Authority
US Geological Survey
US Environmental Protection Agency, Region III
Virginia Department of Health
Maryland Department of the Environment
Fairfax County Water Authority
Washington Suburban Sanitary Commission

Members of the Technical Advisory Committee participated in the advisory meetings organized by MWCOG, and they submitted comments on the written drafts of the Plan.

VI. Presentation of Results

Important information will result from the Potomac River basin watershed-based source water assessment. The findings of the Assessment will be presented in a report. In addition to paper copies, and in order to facilitate the widest possible dissemination of results, the findings will be made available on the internet with linkage to the US EPS's "Surf Your Watershed" world wide web site.

The results of the Assessment will be made available to the public in easily understandable form and content. Maps will be created in GIS software to show the delineated watersheds for the District of Columbia's source waters. The maps will also show locations of potential contamination which are described in the inventory. Site locations on those maps will be linked to tables which provide more detailed information about the specific sites/potential contaminants. The susceptibility determinations will be produced in narrative form, supplemented by maps as necessary to clarify spatial descriptions.

Notification of the availability of results will be accomplished by direct mailings to participants in the Citizens Advisory Group and through a wide distribution of a news release to broadcast and printed media outlets. A notice of the availability of results should also be part of information that accompanies bills to retail and wholesale customers of the Water and Sewer Authority (WASA). The notice of availability of results may be incorporated into the Consumer Confidence Reports which are distributed to consumers.

VII. References

Gruesner, Barry, Ross Mandel, Deborah Caraco, Merrily Pierce and Stuart S. Schwartz. 1998. "Chemical Contaminant Loads in Urban Stormwater Runoff from the Chesapeake Bay Basin." Interstate Commission on the Potomac River Basin Report # 98-2, Rockville, MD.

Jack, A.R. 1984 "Traveltime and Dispersion of a Soluble Dye in the South Branch of the Potomac River, Petersburg to Green Spring, West Virginia." U.S. Geological Survey Water Resources Investigation Report 84-41677, Towson, MD.

Taylor, K.R. 1970 "Traveltime and Concentration Attenuation of a Soluble Dye in the Monocacy River, Maryland." Maryland Geological Survey Information Circular 9, Towson, MD.

Taylor, K.R., and R.W. James Jr., and B. M. Helinsky. 1985. "Traveltime and Dispersion in the Potomac River, Cumberland, Maryland, to Washington, D.C." U.S. Geological Survey Water Supply Paper No. 2257, Towson, MD.

Taylor, K.R., and R.W. James Jr., and B. M. Helinsky. 1986. "Traveltime and Dispersion on the Shenandoah River and its Tributaries, Waynesboro, Virginia, to Harper's Ferry, West Virginia." U.S. Geological Survey Water Resources Investigations Report 86-4065, Towson, MD.

Taylor, K.R., and W.B. Solley. 1971. "Traveltime and Concentration Attenuation of a Soluble Dye in Antietam and Conococheague Creeks, Maryland." Maryland Geological Survey Information Circular 12, Towson, MD.

US EPA. 1997[1]. "State Methods For Delineating Source Water Protection Areas For Surface Water Supplied Sources of Drinking Water," Office of Water, EPA 816-R-97-008, Washington, D.C.

US EPA. 1997[2]. "State Source Water Assessment And Protection Programs Guidance, Final Guidance, Source Water Protection," Office of Water, EPA 816-R-97-009, Washington, D.C.

US EPA. 1998. "Draft Susceptibility Assessment Document." Prevention & Support Branch, Washington, D.C.

Appendix I. Development Schedule for Source Water Assessment Program

September 11, 1998	Interstate Commission on the Potomac River Basin (ICPRB)/US EPA Region III work agreement finalized to develop the DC-SWAP Plan covering: public involvement, source delineation, potential contaminant inventory, and susceptibility analysis by February 6, 1999.
October 16, 1998	Washington Metropolitan Council of Governments (MWCOG) took responsibility for public involvement efforts.
November 17, 1998	Organizational meeting of the DC-SWAP Citizens' Advisory Committee.
December 17, 1998	Second meeting of the DC-SWAP Citizens' Advisory Committee, with members of the Technical Advisory Committee invited, to discuss Plan outline and some expanded text.
January 20, 1999	Third meeting of the DC-SWAP Citizens Advisory Committee, with members of the Technical Advisory Committee and wider public invited, to discuss full draft of the DC-SWAP Plan.
January 27, 1999	Last day to submit comments on draft DC-SWAP Plan.
February 6, 1999	Final DC-SWAP Plan mailed to US EPA Region III.
November 6, 1999*	End of 9-month EPA Plan approval period.
November 6, 2001*	End of 2-year Assessment period.
May 6, 2003*	End of 18-month extension to Assessment period.

*Assessment period begins when Plan is approved.

Appendix II. National Primary and Secondary Drinking Water Regulations: Chemicals

National Primary Drinking Water Regulations are legally enforceable standards that apply to public water systems. Primary standards protect drinking water quality by limiting the levels of specific contaminants that can adversely affect public health and are known or anticipated to occur in public water systems. Table A.II.1. divides these contaminants into Inorganic Chemicals, Organic Chemicals, Radionuclides, and Microorganisms.

Table A-II.1. National Primary Drinking Water Regulations

Contaminants	MCLG[1] (mg/L)	MCL[2] or TT[3] (mg/L)[4]	Potential Health Effects from Ingestion of Water	Sources of Contaminant in Drinking Water
Inorganic Chemicals				
Antimony	0.006	0.006	Increase in blood cholesterol; decrease in blood glucose	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder
Arsenic	none[5]	0.05	Skin damage; circulatory system problems; increased risk of cancer	Discharge from semiconductor manufacturing; petroleum refining; wood preservatives; animal feed additives; herbicides; erosion of natural deposits
Asbestos (fiber >10 micrometers)	7 million fibers per Liter	7 MFL	Increased risk of developing benign intestinal polyps	Decay of asbestos cement In water mains; erosion of natural deposits
Barium	2	2	Increase in blood pressure	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits
Beryllium	0.004	0.004	Intestinal lesions	Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries
Cadmium	0.005	0.005	Kidney damage	Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints
Chromium (total)	0.1	0.1	Some people who use water containing chromium well in excess of the MCL over many years could experience allergic dermatitis	Discharge from steel and pulp mills; erosion of natural deposits
Copper	1.3	Action Level=1.3; TT[6]	Short term exposure: Gastrointestinal distress. Long term exposure: Liver or kidney damage. Those with Wilson's Disease should consult their personal doctor if their water systems exceed the copper action level.	Corrosion of household plumbing systems; erosion of natural deposits; leaching from wood preservatives

Cyanide (as free cyanide)	0.2	0.2	Nerve damage or thyroid problems	Discharge from steel/metal factories; discharge from plastic and fertilizer factories
Fluoride	4.0	4.0	Bone disease (pain and tenderness of the bones); Children may get mottled teeth.	Water additive which promotes strong teeth; erosion of natural deposits; discharge from fertilizer and aluminum factories
Lead	zero	Action Level=0.015; TT[6]	Infants and children: Delays in physical or mental development. Adults: Kidney problems; high blood pressure	Corrosion of household plumbing systems; erosion of natural deposits
Inorganic Mercury	0.002	0.002	Kidney damage	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills and cropland
Nitrate (measured as Nitrogen)	10	10	"Blue baby syndrome" in infants under six months - life threatening without immediate medical attention. Symptoms: Infant looks blue and has shortness of breath.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Nitrite (measured as Nitrogen)	1	1	"Blue baby syndrome" in infants under six months - life threatening without immediate medical attention. Symptoms: Infant looks blue and has shortness of breath.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Selenium	0.05	0.05	Hair or fingernail loss; numbness in fingers or toes; circulatory problems	Discharge from petroleum refineries; erosion of natural deposits; discharge from mines
Thallium	0.002	0.002	Hair loss; changes in blood; kidney, intestine, or liver problems	Leaching from ore-processing sites; discharge from electronics, glass, and pharmaceutical companies
Organic Chemicals				
Acrylamide	zero	TT[7]	Nervous system or blood problems; increased risk of cancer	Added to water during sewage/wastewater treatment
Alachlor	zero	0.002	Eye, liver, kidney or spleen problems; anemia; increased risk of cancer	Runoff from herbicide used on row crops
Atrazine	0.003	0.003	Cardiovascular system problems; reproductive difficulties	Runoff from herbicide used on row crops
Benzene	zero	0.005	Anemia; decrease inblood platelets; increased risk of cancer	Discharge from factories; leaching from gas storage tanks and landfills
Benzo(a)pyrene	zero	0.0002	Reproductive difficulties; increased risk of cancer	Leaching from linings of water storage tanks and distribution lines
Carbofuran	0.04	0.04	Problems with blood or nervous system; reproductive difficulties	Leaching of soil fumigant used on rice and alfalfa
Carbon tetrachloride	zero	.005	Liver problems; increased risk of cancer	Discharge from chemical plants and other industrial activities
Chlordane	zero	0.002	Liver or nervous system problems; increased risk of cancer	Residue of banned termiticide

Chlorobenzene	0.1	0.1	Liver or kidney problems	Discharger from chemical and agricultural chemical factories
2,4-D	0.07	0.07	Kidney, liver, or adrenal gland problems	Runoff from herbicide used on row crops
Dalapon	0.2	0.2	Minor kidney changes	Runoff from herbicide used on rights of way
1,2-Dibromo-3-chloropropane (DBCP)	zero	0.0002	Reproductive difficulties; increased risk of cancer	Runoff/leaching from soil fumigant used on soybeans, cotton, pineapples, and orchards
o-Dichlorobenzene	0.6	0.6	Liver, kidney, or circulatory system problems	Discharge from industrial chemical factories
p-Dichlorobenzene	0.075	0.075	Anemia; liver, kidney or spleen damage; changes in blood	Discharge from industrial chemical factories
1,2-Dichloroethane	zero	0.005	Increased risk of cancer	Discharge from industrial chemical factories
1-1-Dichloroethylene	0.007	0.007	Liver problems	Discharge from industrial chemical factories
cis-1, 2-Dichloroethylene	0.07	0.07	Liver problems	Discharge from industrial chemical factories
trans-1,2-Dichloroethylene	0.1	0.1	Liver problems	Discharge from industrial chemical factories
Dichloromethane	zero	0.005	Liver problems; increased risk of cancer	Discharge from industrial chemical factories
1-2-Dichloropropane	zero	0.005	Increased risk of cancer	Discharge from industrial chemical factories
Di(2-ethylhexyl)adipate	0.4	0.4	General toxic effects or reproductive difficulties	Leaching from PVC plumbing systems; discharge from chemical factories
Di(2-ethylhexyl)phthalate	zero	0.006	Reproductive difficulties; liver problems; increased risk of cancer	Discharge from rubber and chemical factories
Dinoseb	0.007	0.007	Reproductive difficulties	Runoff from herbicide used on soybeans and vegetables
Dioxin (2,3,7,8-TCDD)	zero	0.00000003	Reproductive difficulties; increased risk of cancer	Emissions from waste incineration and other combustion; discharge from chemical factories
Diquat	0.02	0.02	Cataracts	Runoff from herbicide use
Endothall	0.1	0.1	Stomach and intestinal problems	Runoff from herbicide use
Endrin	0.002	0.002	Nervous system effects	Residue of banned insecticide
Epichlorohydrin	zero	TT[7]	Stomach problems; reproductive difficulties; increased risk of cancer	Discharge from industrial chemical factories; added to water during treatment process
Ethylbenzene	0.7	0.7	Liver or kidney problems	Discharge from petroleum refineries
Ethelyne dibromide	zero	0.00005	Stomach problems; reproductive difficulties; increased risk of cancer	Discharge from petroleum refineries

Glyphosate	0.7	0.7	Kidney problems; reproductive difficulties	Runoff from herbicide use
Heptachlor	zero	0.0004	Liver damage; increased risk of cancer	Residue of banned termiticide
Heptachlor epoxide	zero	0.0002	Liver damage; increased risk of cancer	Breakdown of hepatachlor
Hexachlorobenzene	zero	0.001	Liver or kidney problems; reproductive difficulties; increased risk of cancer	Discharge from metal refineries and agricultural chemical factories
Hexachlorocyclopentadiene	0.05	0.05	Kidney or stomach problems	Discharge from chemical factories
Lindane	0.0002	0.0002	Liver or kidney problems	Runoff/leaching from insecticide used on catttle, lumber, gardens
Methoxychlor	0.04	0.04	Reproductive difficulties	Runoff/leaching from insecticide used on fruits, vegetables, alfalfa, livestock
Oxamyl (Vydate)	0.2	0.2	Slight nervous system effects	Runoff/leaching from insecticide used on apples, potatoes, and tomatoes
Polychlorinated biphenyls (PCBs)	zero	0.0005	Skin changes; thymus gland problems; immune deficiencies; reproductive or nervous system difficulties; increased risk of cancer	Runoff from landfills; discharge of waste chemicals
Pentachlorophenol	zero	0.001	Liver or kidney problems; increased risk of cancer	Discharge from wood preserving factories
Picloram	0.5	0.5	Liver problems	Herbicide runoff
Simazine	0.004	0.004	Problems with blood	Herbicide runoff
Styrene	0.1	0.1	Liver, kidney, and circulatory problems	Discharge from rubber and plastic factories; leaching from landfills
Tetrachloroethylene	zero	0.005	Liver problems; increased risk of cancer	Leaching from PVC pipes; discharge from factories and dry cleaners
Toluene	1	1	Nervous system, kidney, or liver problems	Discharge from petroleum factories
Total Trihalomethanes (TTHMs)	none[5]	0.10	Liver, kidney or central nervous system problems; increased risk of cancer	Byproduct of drinking water disinfection
Toxaphene	zero	0.003	Kidney, liver, or thyroid problems; increased risk of cancer	Runoff/leaching from insecticide used on cotton and cattle
2,4,5-TP (Silvex)	0.05	0.05	Liver problems	Residue of banned herbicide
1,2,4-Trichlorobenzene	0.07	0.07	Changes in adrenal glands	Discharge from textile finishing factories
1,1,1-Trichloroethane	0.20	0.2	Liver, nervous system, or circulatory problems	Discharge from metal degreasing sites and other factories
1,1,2-Trichloroethane	0.003	0.005	Liver, kidney, or immune system problems	Discharge from industrial chemical factories
Trichloroethylene	zero	0.005	Liver problems; increased risk of cancer	Discharge from petroleum refineries
Vinyl chloride	zero	0.002	Increased risk of cancer	Leaching from PVC pipes; discharge from plastic factories

Xylenes (total)	10	10	Nervous system damage	Discharge from petroleum factories; discharge from chemical factories
Radionuclides				
Beta particles and photon emitters	none[5]	4 millirems per year	Increased risk of cancer	Decay of natural and man-made deposits
Gross alpha particle activity	none[5]	15 picocuries per Liter (pCi/L)	Increased risk of cancer	Erosion of natural deposits
Radium 226 and Radium 228 (combined)	none[5]	5 pCi/L	Increased risk of cancer	Erosion of natural deposits
Microorganisms				
Giardia lamblia	zero	TT[8]	Giardiasis, a gastroenteric disease	Human and animal fecal waste
Heterotrophic plate count	N/A	TT[8]	HPC has no health effects, but can indicate how effective treatment is at controlling microorganisms.	n/a
Legionella	zero	TT[8]	Legionnaire's Disease, commonly known as pneumonia	Found naturally in water; multiplies in heating systems
Total Coliforms (including fecal coliform and E. Coli)	zero	5.0%[9]	Used as an indicator that other potentially harmful bacteria may be present[10]	Human and animal fecal waste
Turbidity	N/A	TT[8]	Turbidity has no health effects but can interfere with disinfection and provide a medium for microbial growth. It may indicate the presence of microbes.	Soil runoff
Viruses (enteric)	zero	TT[8]	Gastroenteric disease	Human and animal fecal waste

Notes:

[1] Maximum Contaminant Level Goal (MCLG) - The maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on the health effect of persons would occur, and which allows for an adequate margin of safety. MCLGs are non-enforceable public health goals.

[2] Maximum Contaminant Level (MCL) - The maximum permissible level of a contaminant in water which is delivered to any user of a public water system. MCLs are enforceable standards. The margins of safety in MCLGs ensure that exceeding the MCL slightly does not pose significant risk to public health.

[3] Treatment Technique - An enforceable procedure or level of technical performance which public water systems must follow to ensure control of a contaminant.

[4] Units are in milligrams per Liter (mg/L) unless otherwise noted.

[5] MCLGs were not established before the 1986 Amendments to the Safe Drinking Water Act. Therefore, there is no MCLG for this contaminant.

[6] Lead and copper are regulated in a Treatment Technique which requires systems to take tap water samples at sites with lead pipes or copper pipes that have lead solder and/or are served by lead service lines. The action level, which triggers water systems into taking treatment steps if exceeded in more than 10% of tap water samples, for copper is 1.3 mg/L, and

for lead is 0.015 mg/L.

[7] Each water system must certify, in writing, to the state (using third-party or manufacturer's certification) that when acrylamide and epichlorohydrin are used in drinking water systems, the combination (or product) of dose and monomer level does not exceed the levels specified, as follows: Acrylamide = 0.05% dosed at 1 mg/L (or equivalent) Epichlorohydrin = 0.01% dosed at 20 mg/L (or equivalent).

[8] The Surface Water Treatment Rule requires systems using surface water or ground water under the direct influence of surface water to (1) disinfect their water, and (2) filter their water to meet criteria for avoiding filtration so that the following contaminants are controlled at the following levels:

> Giardia lamblia: 99.9% killed/inactivated
> Viruses: 99.99% killed/inactivated
> Legionella: No limit, but EPA believes that if Giardia and viruses are inactivated, Legionella will also be controlled.
> Turbidity: At no time can turbidity (cloudiness of water) go above 5 nephelolometric turbidity units (NTU); systems that filter must ensure that the turbidity go no higher than 1 NTU (0.5 NTU for conventional or direct filtration) in at least 95% of the daily samples for any two consecutive months.
> HPC: NO more than 500 bacterial colonies per milliliter.

[9] No more than 5.0% samples total coliform-positive in a month. (For water systems that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive). Every sample that has total coliforms must be analyzed for fecal coliforms. There cannot be any fecal coliforms.

[10] Fecal coliform and E. coli are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause diarrhea, cramps, nausea, headaches, or other symptoms.

National Secondary Drinking Water Regulations

National Secondary Drinking Water Regulations are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply. However, states may choose to adopt them as enforceable standards. See Table A-II.2.

Table A-II.2. Secondary Drinking Water Regulations

Contaminant	Secondary Standard
Aluminum	0.05 to 0.2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	noncorrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor number
pH	6.5-8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids	500 mg/L
Zinc	5 mg/L

Appendix III. Watershed Model as an Assessment Tool

The Chesapeake Bay Program maintains a computer simulation model of the tributaries and the watershed draining into Chesapeake Bay, referred to as the Watershed Model. The model traces the flow of water in the hydrologic cycle, representing precipitation, evaporation, runoff, ground water flow, and transport in river reaches. It also represents erosion from the land surface and the transport of sediment in river reaches. The nitrogen and phosphorus cycle--from the application of fertilizer to crops and lawns to its discharge in runoff and ground water--is also represented. The Watershed Model calculates the concentration of nutrients and sediment in each phase of the hydrologic cycle. The model is used to estimate flows, nutrient loads, and sediment loads to the bay on a daily basis. It has been calibrated to simulate daily flows and daily concentrations of sediment, nitrogen, and phosphorus at the Potomac River fall line at Chain Bridge, just downstream of the District of Columbia water intakes.

In the Potomac Basin, upstream of the fall line, the Potomac River and its tributaries are divided into eleven segments. Each segment is represented by a river reach and the area of land that contributes to it. The contributing area is classified by land use--urban pervious, urban impervious, forest, pasture, etc. Each land use has different hydrologic characteristics, and the human activities which characterize the land use help determine its contribution to the nonpoint nutrient loads in its segment. Point sources, such as the effluent loads from sewage treatment plants, are also represented in the model.

Under ordinary circumstances, as the US EPA guidance recognizes, the effort to develop a model of the fate and transport of pollutants in a basin as large as the Potomac would be prohibitively expensive. The cost of developing, calibrating, and testing the model, however, have already been borne by the Chesapeake Bay Program. The Source Water Assessment can take advantage of the existence of the Watershed Model to help evaluate the susceptibility of the waters supply to potential pollutants. Several of the priority potential threats listed above, like sediment and taste and odor problems from eutrophication, can be directly evaluated from the simulations currently performed by Watershed Model. The computer simulation model underlying the Watershed Model, Hydrologic Simulation Program--Fortran (HSPF), can be configured to represent pollutants other than nutrients.

The existence of an HSPF model of the Potomac Basin, fully-calibrated to predict flows and concentrations of nutrients and sediment at the fall line, makes it cost-effective to use modeling as one part of the DC-SWAP susceptibility analysis, in addition to the methods outlined in Section IV of the Plan. Modeling can contribute to the susceptibility analysis in several respects. (1) In a large basin like the Potomac, modeling can be used to assess the relative impact of different land uses, point sources, and geographic areas. (2) Modeling can help identify which hydrologic conditions pose the greatest threat to the source water supply and the relative chance that those conditions will be realized. (3) Modeling can be used to assess the impact of changes in land use such as urban growth, or changes in land management practices such as the introduction of agricultural best management practices (BMPs), on water quality near the intakes.

The Watershed Model is only one of the tools used in DC Source Water Assessment. It provides a means of relating, on a broad scale, point source discharges and land use practices throughout the basin to constituent concentrations at the fall line. The Watershed Model is best used to simulate the fate and transport of pollutants that are primarily transported dissolved in water and are not bound to sediments. While HSPF is capable of representing the transport of material bound to sediments, the simulation of sediment-bound constituents usually requires substantial data collection efforts and a model with finer resolution than the current Watershed Model. In particular, the cost of collecting and analyzing enough sediment samples across the Potomac Basin to adequately represent fate and transport of sediment bound toxics and metals is prohibitively expensive. The cost of these additional efforts is beyond the resources of the DC-SWAP.

Appendix IV. Public Participation

This Plan was reviewed and commented upon by Citizens' and Technical Advisory committee members. A Citizens' Advisory Committee organizational meeting was held at the Metropolitan Washington Council of Governments on November 17, 1998. A second meeting, of the combined committees, to review an early draft of this Plan and receive comments was held on December 17, 1998. A third meeting, of the combined committees with invitations extended to the public, was held on January 20, 1999. Committee rosters, summaries of meeting discussions, and written comments received are provided as follows:

Roster: Citizens' Advisory Committee

Wesley A. Brown	
James Booze	
Neal Fitzpatrick	Audubon Naturalist Society
Rodney Livingston	CEC
Erik Olson	Natural Resources Defense Council
Steve Donkin	
Phillip A. Flemming	
Grace Fleming	
John W. Finney	Coalition for Responsible Urban Disposal at Dalecarlia
Mary D. Jackson	ANC 7E Chairperson
Luci Murphy	League of Women Voters
Maria Holleran-Rivera	District of Columbia Corporation Council
James H. Jones	
Carla Pappalardo	Clean Water Action
Tricia McPherson	Clean Water Action
Regina Owens	District of Columbia City Administrator's Office
Davelene Renshaw	

Roster: Technical Advisory Committee

Jerusalem Bekele	District of Columbia Department of Health
Miranda Brown	Washington Aqueduct Division
Michael Marcott	District of Columbia Water and Sewer Authority
Gary Fisher	US Geological Survey
Frederick Mac Millan	US Environmental Protection Agency, Region III
Gerald Peaks	Virginia Department of Health
John Grace	Maryland Department of the Environment
Traci Kammer-Goldberg	Fairfax County Water Authority
Robert Buglass	Washington Suburban Sanitary Commission

Three meetings were held to discuss the Plan and its development, and a number of written comments were received and incorporated. Summaries of these activities are provided on the following pages.

Meeting Summary
Source Water Assessment Program (SWAP)
Citizens' Advisory Committee Meeting

November 17, 1998
6:00 pm
Metropolitan Washington Council of Governments

The meeting was opened by Karl Berger of the Council of Governments (MWCOG). Introductions were made around the table. Attention was called to the handouts that included the program guidance for the EPA Source Water Assessment Programs; as well as a draft outline for a source water assessment plan for the District.

Fred Mac Millan, EPA Region III, (Philadelphia), described the SWAP Program. The SWAP is the most proactive part of the Safe Drinking Water Act of 1996. He described five primary parts of the Multi - Barrier Approach

1. To prevent contamination of and protect drinking water sources
2. Propose design and treatment options
3. Provide well trained personnel
4. ?
5. Develop proper standards

SWAP for the District has five steps:

1. Getting Started and the public involvement
2. Where are the well heads, water intakes, etc.?
3. What are we going to protect our source water from?
4. Are our source water managers doing the best job they can to protect source water?
5. Contingency planning for contamination events.

This meeting represents the start of the SWAP plan process. The draft final plan is due to EPA on February 6, 1999. This plan will be reviewed, amend (if necessary) and approved within nine months. The entire project will take two years to implement with an 18 month extension at most.

Jim Collier - DC Department of Health (DoH), The DC DoH is overseeing the development of this SWAP for the District of Columbia with help from ICPRB and MWCOG. The District and its water intakes are situated at the bottom end of the nontidal portion of the Potomac River Watershed which includes four states, Virginia, Maryland, West Virginia and Pennsylvania. While there are intakes throughout these subwatersheds, there are also, effluent or outfall pipes into the same body(s) of water. This is an area of many concerns and common interests.

To be prepared for proper treatment of this water, the wastewater treatment operators have to determine the primary land use where the water originates; Urban (developed) Land or Rural Land.

The long term assumption is that the land use pattern of the past 50 years will continue until all rural land is converted to urban land use. In order for treatment facilities to prepare for proper treatment operations, these land uses must be understood. That is because the water coming off of these types of land use are very different. One is not necessarily better than the other, just different.

The drinking water intakes for the District are located in the nontidal section of the Potomac River.

Ross Mandel - Interstate Commission on the Potomac River Basin (ICPRB), explained ICPRB's role in the oversight of the Potomac River. He described how the Source Water assessment plan is to be carried out.

The Plan Assessment has four major tools:

1. Public participation
2. Delineate watershed
3. Identify potential contributors
4. Conduct susceptibility analysis

Mr. Mandel passed out a map showing the watershed for the Potomac River and locating the District of Columbia's drinking water intakes.

1. Public participation

Form a citizens' advisory committee.

2. Delineate Source Water Area (The Watershed)

Identify the location of Intakes and other sources. The District has two intakes near Great Falls on the Potomac and a few ground water wells. The groundwater wells total five, and are not used for drinking water, only for groundwater monitoring purposes and some other non-drinking water purposes.

3. Identify the Potential Contaminants

- Make a list of potential contaminants
- Use existing water quality data
- Use existing NPDES (National Pollution Discharge Elimination System) permitting information and urban and regional forest cover data
- Have information on feed lots, farms, etc. for fecal coliform contributions
- Have information on air deposition of contaminants
- Use data for nonpoint source pollution, runoff from fields etc.

Mr. Mandel said that each state will perform their own assessment. A question was raised regarding Virginia agencies cooperation for data exchange. How will their data overlap with ours. It was pointed out that this is an important point because Virginia's data is a subset of DC's data set as are all the surrounding states. The states will be performing their own separate assessments and DC use this data to form their own conclusions.

4. Susceptibility Analysis

Decisions to be made on the potential threat from each contaminant.

The Susceptibility Analysis will look at transport, integrity of the system, intakes themselves. It will also examine the source water taken in and the finished water.

Comment made to establish a feedback loop between the technical group and the citizens advisory group

Mr. Berger opened the discussion to the group. He stated that the next meeting would occur during the week of January 18 - 22, when the plan would be in draft form for comment by the group. Mr. Berger stated that all attendees at the meeting are considered to be on the citizens group unless they indicate otherwise.

Discussion of the workplan time line. A great concern arose over the short time line and the citizens groups expressed a strong desire to meet in late December or early January in addition to the late January meeting.

A general concern was whether ICPRB could meet this deadline for having a working draft available to the committee for comment.

There was also a great concern over the citizens access to the document over the internet. DC, ICPRB and COG will explore the possibility of doing this.

A comment was made about putting information in water billing statements, however, it was pointed out that the billing cycle had already occurred.

The group indicated that if a draft plan was not available, that they want to meet in late December or early January and can look at plans from other states to become familiar with them and be prepared when reviewing the Districts plan.

A question arose over who was on the Technical Advisory Committee for the DC plan. The technical committee will be comprised of staff from the District, ICPRB, The Washington Aqueduct, and COG. It will not be a formal technical committee per se. A suggestion was made to have someone from the U.S. Geological Survey to participate on the technical committee.

Suggestions were made on how to notify citizens about the next meetings; press releases, newspaper notification, DC Cable Television,

The next meeting is tentatively scheduled for the week of December 14th whether the draft was ready or not. Potentially, December 16th or 18th.

The meeting adjourned at 8:20 P.M.

Meeting Summary

Meeting of Citizens' Advisory Committee for the District of Columbia Source Water Assessment Plan

December 17, 1998
Metropolitan Washington Council of Governments

The meeting was called to order at approximately 6 p.m. by Karl Berger of the Metropolitan Washington Council of Governments (COG).

Presentation by Roland Steiner:

Mr. Steiner of the Interstate Commission on the Potomac River Basin (ICPRB) provided background information on the development of EPA's Source Water Assessment initiative, noting that the three main issues to be addressed by source water assessment plans (SWAPs) are:

1) Delineation of the drinking water source (the Potomac River upstream of the Washington Aqueduct intakes)

2) Contaminant identification (This can include everything from household chemicals to potentially hazardous materials stored in large quantities by commercial enterprises.)

3) Susceptibility analysis (What are the risk factors and which materials potentially pose the greatest and least risks?)

Mr. Steiner said that ICPRB staff currently is developing a plan to conduct the assessment. EPA regulations require and ICPRB is seeking citizen input into the plan. In particular, ICPRB is expecting input from the Citizens Advisory Committee (CAC), which is designed to be representative of the views of District citizens in general.

Mr. Steiner also noted that people with knowledge of drinking water issues from both the District and neighboring states are represented on a Technical Advisory Committee (TAC) that ICPRB has formed. The members include:

Jerry Peaks, source water coordinator for the Virginia Department of Health;
John Grace, source water coordinator for the Maryland Department of the Environment;
Jerusalem Bekele, project manager for D.C. Dept. of Health, Environmental Health Admin.;
Miranda Brown, Washington Aqueduct Division of the U.S. Army Corps of Engineers;
Mike Marcotte, Deputy Director, D. C. Water and Sewer Administration;
Gary Fisher, U.S. Geological Survey;
Fred Mac Millan, EPA Region III;
Robert Buglass, Washington Suburban Sanitary Commission;
Tracy Goldberg, Fairfax County Water Authority.

Although there are no separate meetings of the TAC planned, ICPRB staff will coordinate with its members to obtain review and comment on the plan. In addition, TAC members have and will be invited to all CAC meetings.

Mr. Steiner noted the following highlights in the schedule for developing the plan:

Jan. 20, 1999 - next meeting of the CAC (public comment meeting)

Jan. 27, 1999 - final date for any comments on the plan

Feb. 5, 1999 - final plan transmitted to EPA Region III.

Approximately 7 - 10 days prior to the Jan. 20 meeting, a draft of the plan will be sent to members of the Citizens Advisory Committee. This draft will include comments received to date and any responses to those comments.

Comment: Tricia McPherson asked if there will be other opportunities to comment on the plan aside from the Jan. 20 meeting.
Response: Mr. Steiner said that ICPRB will accept comments directly via phone, FAX or email at any time up to the Jan. 27 comment deadline.

Mr. Steiner noted that after the plan is submitted, EPA has up to nine months to review it, request any changes and approve it.

Comment: Erik Olson asked what happens if EPA does not approve a plan by the Nov. 6 deadline.
Response: Fred Mac Millan said that EPA intends to work with the submitting agencies to ensure that all SWAPs are approved by the Nov. 6 deadline.

Discussion of outline/draft framework of the plan (Roland Steiner):

Advisory group members asked a number of questions and raised several concerns regarding the current incomplete draft of the plan. However, because of time constraints, not all of their comments and questions were registered at the meeting. The members agreed, where possible, to post questions via email for all members of the group.

Among the questions raised at the meeting were:

> What assumptions will be used to determine time or travel estimates for potential contaminants, particularly as regards river flow?
>
> Who will determine the environmental decay rate for pesticides and other contaminants?
>
> How well can the Chesapeake Bay Program watershed model, which was desinged to estimate nutrient and sediment loads to the bay, estimate concentrations of contaminants in the Potomac River?

Comment: Neal Fitzpatrick expressed concern that any results from modelling be verified by actual monitoring data.

Overall concerns:

Comment: Rodney Livingston recommended that questions, responses and all other information regarding the plan be published on the Internet through a dedicated site that would have a "chat room" feature.
Response: Mr. Steiner said this is not possible with the time and money allocated to this phase of the project. However, ICPRB staff will list any questions it receives through other means as an appendix to the draft plan.

Comment: John Finney, noting that the quality of the drinking water for the District is dependent on what happens in a watershed outside of its boundaries, recommended that the District SWAP be conducted as part of a regional Potomac River effort in which all of the upstream states participate. Conducting a regional SWAP also would avoid duplication and minimize the costs of the project, he said.
Response: Ross Mandel and **Mr. Steiner** noted that they are working with staff from these states and that some aspects of the plan will be coordinated. However, there are some aspects that will be unique to the District plan.

Comment: Mr. Olson enquired about the cost of actually doing the assessment.
Response: Mr. Steiner said it will depend in part on what's called for in the final version of the plan. He also noted that the District's Department of Health is responsible for conducting the assessment either directly or through

contractors.

Comment: Mr. Olson asked how much money the District has budgeted for conducting the assessment and what is the source of any such funds.
Response: Jerusalem Bekele said the Department of Health currently has budgeted about $250,000 for this task. She was not certain of the source of those funds.

Discussion of public outreach activities (Karl Berger):

Mr. Berger noted that COG staff plans to produce a news release for submission to a series of community papers in the District. It also will produce and distribute a flyer that will publicize the Jan. 20 meeting and encourage additional public comment. The flyer could be distributed through District government agencies, the city's Advisory Neighborhood commissions and civic groups.

Mr. Berger further noted that the members had recommended that a means be found to post the draft plan on an Internet site prior to the public meeting, but that none of the agencies involved could promise that such a posting could occur within the required time frame. COG staff will attempt to provide copies of the draft, when available, to the various branches of the D. C. Public Library and in the COG Information Center for public access.

Comment: Mr. Livingston complained that no means of either Internet or cable television access to the draft plan would be provided as he had requested at the previous CAG meeting.
Response: Mr. Steiner said that the currently involved agencies lack the resources to implement these suggestions.

Comment: Ms. McPherson suggested that community groups could put information concerning the plan and plan drafts on their own Internet access sites.

Comment: Davelene Renshaw recommended that copies of the flyer be made available to CAG members who may be able to further distribute them.

Comment: Mr. Olson asked whether the CAG would continue to be able to provide input into the District SWAP process once the plan is submitted on Feb. 5. The members strongly supported continued involvement.
Response: Mr. Berger noted that, at present, ICPRB and COG's involvement is scheduled to end with the submission of the plan to EPA, hence this request will have to be addressed by EPA and the District Department of Health. However, the members' strong support for continued involvement can be noted as a recommendation in the plan.

Ms. Bekele further noted that Jim Collier and Ted Gordon of the Department of Health's Environmental Health Administration will be the main District government contacts on the SWAP process.

Summary actions:

Mr. Steiner provided a comment sheet that provided instructions for providing comments to ICPRB via phone, fax or email. He recommended that CAG members provide comments directly to ICPRB staff.

The meeting was adjourned at 8 p.m.

List of Handouts

Draft Outline of Framework, D.C. Source Water Assessment and Protection Program Plan
Draft Framework, D.C. Source Water Assessment and Protection Program Plan
Comments on Draft Plan submitted by John Finney

List of Attendees

Neal Fitzpatrick	Audubon Naturalist Society
Davelene Renshaw	
Macara Lousberg	
Rodney Livingston	CEC/DICEE
Erik Olson	NRDC
Roland Steiner	ICPRB
Ross Mandel	ICPRB
Jan Ducnuigeen	ICPRB
Erik Hagen	ICPRB
John Finney	CRUDD
Tracy Goldberg	FCWA
Maria Holleran-Rivera	DC Corporation Counsel
Carla Pappalardo	Clean Water Action
Tricia McPherson	Clean Water Action
Jerusalem Bekele	Environmental Health Administration, D. C. Dept. of Health
Sharon Gonder	Environmental Health Administration, D. C. Dept. of Health
Fred Mac Millan	EPA Region III

Meeting Summary

Third Meeting of the Citizens Advisory Committee for the District of Columbia Source Water Assessment Plan

January 20, 1999
Metropolitan Washington Council of Governments

The meeting was called to order at approximately 6:15 p.m. by Karl Berger of the Metropolitan Washington Council of Governments. The group agreed on an informal discussion of their comments on the draft source water assessment plan (SWAP).

Presentations:

Fred Mac Millan, EPA Region III noted that source water protection is one aspect of EPA's multi-barrier approach to drinking water safety. Summarizing the activities of the District's project to date, he noted that the last day for public comment on the plan is Jan. 27 and the deadline for the SWAP to be submitted to EPA is Feb. 6.

Roland Steiner, Interstate Commission on the Potomac River Basin (ICPRB) noted that all the states in the Potomac basin have agreed to share source water data with each other, a process that ICPRB will facilitate. He also addressed concerns about the accuracy of data from other states by noting that there are major treatment plants on the Potomac River whose intakes are just upstream from those of the Aqueduct which serve Maryland and northern Virginia. Hence, these states should be just as interested in good assessments as the District is. Mr. Steiner also noted that work is proceeding to update the draft SWAP, including the address of public comments.

Comments from Citizen Advisory Committee members:

Mr. Steiner read the text of FAX comments received from **Charles Verharen**, who is concerned about the potential impact on the District's drinking water of discharges from water treatment plants located upstream. **Mr. Steiner** responded by noting that although this could be investigated, there are no known toxic materials in these discharges. Based on her interpretation of these comments, **Carla Pappalardo** asked if combined sewer overflow discharges pose a threat to drinking water supplies. **Mr. Steiner** response was that these would be investigated where applicable upstream of the intakes.

There were several comments and questions about the source and amount of funds for the actual assessment phase of the project. **Mr. Finney**, for example, stated his interpretation, derived from a conversation with an EPA Region III official, that the District would receive a $400,000 grant from EPA to conduct the assessment, partly as a means of building environmental expertise in the District's Department of Health. However, **Mr. Mac Millan** said that the $400,000 has been set aside from the District's share of the state revolving loan funds disbursed by EPA.

Erik Olson noted continuing concern with the future of public participation once the plan is submitted and the assessment phase begins. He said it is critical for citizen input to continue in this phase and suggested that the current advisory committee should continue. In response, **Mr. Steiner** noted that there has been support for this idea among state and EPA officials. **Jerusalem Bekele** of the District Department of Health said the department is giving serious consideration to this recommendation.

The Citizens Advisory Committee members approved a motion in support of continuing to function during the assessment phase.

Mr. Olson asked whether COG and ICPRB would have a role during the assessment phase. In response, **Mr. Steiner** said that the District Health Department will be conducting the assessment and have indicated plans to seek bids from entities interested in doing the assessment work, Thus, he said, there are no guarantees that COG and

ICPRB will continue to be involved in the project, even assuming that they choose to submit bids. **Ms. Bekele** confirmed that the Department of Health intends to seek bids to do the assessment work, which, she said, is a required by the department's procurement rules.

Mr. Olson asked how nonpoint sources would be inventoried and identified under the District's assessment. In response, **Mr. Steiner** noted that the plan calls for use of federal Agricultural Census data, which can quantify cropland acres or animal numbers in individual counties. However, it was noted that there may be issues regarding the confidentiality of such data.

Mr. Olson strongly expressed the view that potential nonpoint sources of pollutants should be identified just as point sources are. Identifying sources by name will be one of the main means by which the public can exert pressure to clean up any problem sources, he said.

Steve Donkin asked if the budgeted $400,000 will be sufficient to conduct the plan. **Mr. Steiner** said that, in cooperation with the other states, the District should be able to locate and name all major sources for that amount. However, **Ross Mandel of ICPRB** noted that other states may not agree to disclosure of the names of all potential polluters.

Mr. Olson asked who would make decisions about the disclosure of data and **Ms. Pappalardo** asked how will the District be able to reconcile differing approaches to susceptibility analysis (e.g., fixed radius delineation in Virginia versus Maryland's strategy of using sub-watershed delineations). She also is concerned with the quality of data the District may get from Virginia.

In response, **Mr. Mac Millan** said that EPA will be evaluating each of the plans submitted by the various states and compatibility will be an issue. **Mr. Mandel** noted that data collection should not be a problem for the District even if there were minimal cooperation from the other states in the basin given the existence of other, easily accessible data sets. **Ms. Bekele** noted that the District will be able to independently analyze the data and draw conclusions that may be different than the conclusions drawn in other states.

Mr. Olson asked if the plan considers the possibility of getting new monitoring data to assess such things as temporal variations in the level of Cryptosporidium found in the river. He expressed concern with an over-reliance on modeling results to assess the impact of nonpoint pollution sources. In response, **Mr. Steiner** said the assessment could be that detailed, depending on funding and other priorities.

Mr. Olson also expressed an interest in having U. S. Geological Survey involvement in the assessment phase. **Mr. Steiner** said this is possible provided funding is available. **Mr. Berger** noted that the other basin states and the District could jointly contract for USGS services.

Several comments were made concerning word choice and clarity in the draft plan, which **Mr. Steiner** promised to address.

The meeting was adjourned at approximately 7:50 p.m.

List of Handouts

Meeting Summary from December 17, 1998
Draft Outline of Framework, D.C. Source Water Assessment and Protection Program Plan
Appendix III from the Draft Plan - National Primary Drinking Water Regulations

Comments on Draft Plan submitted by Charles Verharen
Comments on Draft submitted by WSSC
Comments on Draft Plan submitted by John Finney

List of Attendees

Davelene Renshaw	
Erik Olson	NRDC
Roland Steiner	ICPRB
Ross Mandel	ICPRB
Jan Ducnuigeen	ICPRB
Steve Donkin	DC Green Party
John Finney	CRUDD
Tracy Goldberg	FCWA
Carla Pappalardo	Clean Water Action
Tricia McPherson	Clean Water Action
Jerusalem Bekele	Environmental Health Administration, D. C. Dept. of Health
James Booze	
Fred Mac Millan	EPA Region III
Geri Albers	LWVDC

Written Comments Were Received From:

John W. Finney	December 13, 1998
Davelene Renshaw	December 18, 1998
Neal Fitzpatrick	December 21, 1998
Gary Fisher	December 28, 1998
John W. Finney	January 12, 1999
Robert Buglass	January 19, 1999
Charles C. Verharen	January 20, 1999
Neal Fitzpatrick	January 21, 1999
Carla Pappalardo & Tricia McPherson	January 27, 1999

Date: Sun, 13 Dec 1998 17:20:17 -0500
To: kberger@mwcog.org
From: John Finney <finneyj@worldnet.att.net>
Subject: Comments on Draft Plan
Cc: thomas.p.jacobus@wad01.usace.army.mil, ppagano@ids2.idsonline,
nvj@epaibm.rtpnc.epa.gov

To: Karl Berger COG Department of Environmental Programs
RE: Draft dated 12/11/98 of D.C. Source Water Assessment and Protection.

Dear Mr. Berger:

Thank you for sending along the Draft of the Program Plan for protecting the sources of drinking water for the District of Columbia. I must say that as written, it is an ambitious plan whose worthwhile points sometimes get lost in bureaucratic use of the English language. But then I am not sure the Plan was written for members of the civilian advisory council that you have so kindly assembled but rather for the officials who will pass upon and enact the plan eventually adopted. With some termerity, therefore, I offer the following comments on the Draft:

1. It seems here is a case whether the District of Columbia should stake out a claim for recognition and uniqueness in more forceful terms than contained in the report. When it comes to sources of drinking water in the Potomac River Basin, the District of Columbia is unique. It has no drinking water resources of its own. Its discharges do not pollute the drinking water resources of any other state. Rather, it is dependent upon all the other states in the Potomac Basin for its water supplies. Correspondingly it is the recipient of the cummulative contaminants that other states let flow into the Potomac and its tributaries. Therefore, it follows that the burden of protecting the drinking water resources of the District (and Falls Chruch and Arlington) in the future depends not upon actions taken by the District of Columbia but rather upon the individual and collections actions of the states in the Potomac River Basin. The District of Columbia presents a prime example of the need for regional action in protecting its drinking water supplies, for only by regional action can they be protected.

In a way the Draft states that in the third pargraph on p. 2 when it says: "Delineation of DC's source watershed will instead cover the whole topgraphic watershed extending well beyond the limitations of jurisdictional borders and into neighboring states." Try swallowing that sentence for its verbal pollution! Why not give a little zing to the report by pointing out, as described above, how the District is at the mercy of other states when it comes to its water supply. Here is a case where the District can stand on its soapbox and show a little independence as well as point the finger at all those states that are so indifferent to the tribulations of the District. I need not tell you that water involves not just numbers but also politics.

[Section on interjurisdictional cooperation and coordination added to Introduction. The compound sentence was divided into two simpler ones.]

2. I was particularly glad to see in the first pgh of page 3 reference to the need for river-side buffer strips to curb runoff of potential contaminants. That, of course, is one of the major solutions to protecting the water sources of the District of Columbia, the Potomac River and the Cheseapeake Bay. May I suggest that we go beyond buffer strips to study the concept of set aside or trade-offs of land so as to reduce sedimentary runoffs. Thus, a waterworks could offset the post-treatment sediments it returns to the river by buying land upstream and reducing the sedimentary runoff by an equivalent amount.

[It was not intended that buffer strips be set up in the assessment process; therefore, the wording now refers to stream-side assessment zones.]

3. At the bottom of page 3, the draft states that "the relevant potential contaminants have been ideintified in the DC-SWAP Plan. Where are they identified? What are they? It is not enough, if this is to be a Plan understandable to the general public, to say that the inventory "include contaminants listed in the National Primary

and Secondaryt Drinking Water." I know you are all acting in the public behalf; but you have to describe your actions in words and terms that are understandable to the public. That means avoiding insider terms, such as "contaminant transport" on page 6.

*[**Appendix II.** National Primary and Secondary Drinking Water Regulations: Chemicals, has been added. "Contaminant transport" has been re-worded.]*

4. I was glad to see sediments listed among the potential contaminants. From my limited knowledge, I think sediments (in other words sand and soil that have run off into the river) are the principal pollutant in the drinking water sources of the District of Columbia. The Washington Aqueduct Authority goes to considerable expense --costs that are passed on to the water users-- in getting rid of the sediment before distributing the water to the District of Columbia, Arlington and Falls Church. In the process, certain coagulants are used, such as forms of alum. There is an unresolved debate over whether the treated sediments represent a pollutant, either to human of to fish and plant life. In the case of the Washington Aqueduct Authority, the treated sediments presumably do not present a hazard to human life since, so far as I know, no city or state draws drinking water from the Potomac below the fall line where the river becomes tidal. A new scientific study is about to be launched on whether the discharged sediments are harmful to fish and plant life in the Potomac.

What to do with the sediments raises all kinds of enviornmental questions. The Washington Aqueduct currently discharges the sediments into the river at time of high river flow to assure dispersal. The EPA has raised the prospect of stopping discharge of the sediments into the river. If that is done, the sediments would have to be trucked out of the Washington Aqueduct complex, which sits next to a residential neighborhood. If that were done, it would raise enviornmental hazards for residents of the District of Columbia, in diesel exhausts, cited as dangerous by the EPA, in noise pollution in residental neighborhoods, in safety to the elderly and young on neighborhood streets since dump trucks are notoriously uninspected for safety or exhausts, and to the quality of life (and the price of housing) in residential neighborhoods.

The obvious answer is to reduce the sediments, and that brings us back to the initial observation that the District of Columbia should stand up and fight for old D.C. by insisting that states upstrream in the Potomac watershed drastically reduce the runoff of sediments into the river. It can be done, as demonstrated by the initial, encouraging results of the Chesapeake Bay plan.

At the bottom of page 7, you talk about assigning numeric values to each of the pollutants. What numeric value do you place on sediments. I think it should be a high one as far as the District of Columbia is concerned.

[Sediment is universally acknowledged as a serious water treatment problem. The relative numerical values will be assigned by those tasked with conducting the Assessment.]

I had trouble understanding the paragraph at the bottom of page l0 and at the tp of page 11 talking about The Watershed Model. The Draft states that the Watershed Model can not simulate (or measure) sediment-bound constituents and "the cost of these addisional efforts is beyond the resources of the DC-SWAP. If these sediment-bound consituents pose a public health hazard, then surely ways can be found to obtain the money to make the necessary studies.

[Clarifying language has been added to the section describing the use of the Watershed Model. Sampling and modeling programs for sediment-bound constituents are usually conducted on a smaller scale than the Potomac River Basin. The cost of the collection and analysis of sediment samples is greater than $1000 per sample. Implementation of a monitoring/modeling program for toxics and sediment would cost many times the budget of the entire DC-SWAP. This cost cannot be justified unless it is shown that a potential for a significant threat from sediment-bound constituents exists. The activities outlined in the SWAP will attempt to assess how significant that threat is.]

5. On page 12, The Draft has trouble deciding whether data is singular or plural . The common usage according to Fowler is that the word is plural in Latin, singular in English, just as in the case of agenda.

[Fowler is followed.]

Please feel free to distribute these comments, for what they are worth, before or during the meeting on Dec. 17. I hope to see you there.

Respectfully submitted,

John W. Finney

Co-Chairperson of the Coalition for Responsible Urban Disposal at Dalecarlia (CRUDD)

Date Sent: Friday, December 18, 1998 11:25 AM
From: MAIL <"MAIL@SMTP {Bendavie@aol.com}"@c2smtp.potomac-commission.org
To: COMMENTS <COMMENTS@c2smtp.potomac-commission.org
Subject: DC Source Watter Assessment & Protection Program Plan

---

This is to reiterate my offer to distribute flyers of notice of the Draft Plan to my neighborhood (Southwest) and also that I understand that you will provide me with a copy of that Draft Plan. I also concur that it would be a very good idea to place copies in the Public Libraries and, if you have electronic data, to send in an attached file to those of us who have E-Mail.
Thanks, Davelene Renshaw
1245 4th St., S. W., E-501
WDC 20024
(202) 488-1926

[Attempts will be made to get flyers to you and distribute copies of the Plan to libraries.]

AUDUBON NATURALIST SOCIETY, 8940 Jones Mill Road, Chevy Chase, MD 20815
Phone: 301-652-9188, Fax: 301-951-7179, http:/www.audubonnaturalist.org

12/21/98

Roland Steiner
ICPRB

Thanks for providing the opportunity to comment on Draft Framework for the DC Source Water Assessment and Protection.

On page 4, I suggest that a sentence be added that explains EPA's role in setting rules for monitoring raw water for contaminants.

[Done]

Add highways, pipelines, incinerators, power plants to table 1, page 5.

[Table 1 is a list of activities for which potential contaminants have been identified. Highways, pipelines, incinerators, power plants have been identified as needing similar information.]

What data is already available about the structural integrity of DC's surface water intakes? While I agree this is a factor, I question why it is listed first. Should all of these factors be given equal weight? How will priorities be set for determining susceptibility given limited resources?

[Structural integrity of system components is the first assessment item mentioned in the US EPA guidance. It is included in the Plan mostly for completeness.]

More explanation is needed to justify using time of travel of water as a surrogate to assess the sensitivity of the watershed.

[Travel time analysis has been restated to refer only to instream issues.]

On page 9, will DC attempt to delineate buffer zones in MD, VA, PA, WV?

[It was not intended that buffer strips be set up in the assessment process; therefore, the wording now refers to stream-side assessment zones.]

More explanation is needed to justify using the HSPF model as an assessment tool. What experience can be used to justify the significant reliance placed on HSPF? For example, what does the HSPF say about sediment loads in the Cabin John Creek, Difficult Run, Watts Branch, Muddy Branch watersheds upstream of DC water intakes? How will protection of DC source water from upstream sediment loads be achieved?

[Clarifying language has been added to the section describing the use of the Watershed Model. The Watershed Model has been calibrated to predict fall line nutrient and sediment concentrations on the basis of upstream land use and point source discharges. The model has been successfully verified, and is being used by Maryland, Virginia, Pennsylvania, the District of Columbia, and federal agencies involved in the Chesapeake Bay Program to plan regulatory and voluntary programs to reduce nutrients and sediment loads to the Chesapeake Bay. One of the purposes of the model is to predict the effects of implementing these programs, and most of the uses of the model envisioned in the DC-SWAP are extensions of the use of the model's predictive capability in the Bay Program. The model does not simulate the transport of sediment and nutrients in smaller tributaries directly. It does, however, simulate, on a broad scale, how land use activities and point sources in the watersheds of upstream

tributaries contribute to the sediment and nutrient loads at the fall line. It can therefore, on a broad scale, be used to measure the relative contribution of geographic regions to fall line loads, to determine under what hydrologic conditions the greatest fall line impacts are likely to occur, and, in many respects, how future changes in upstream land use activities will affect water quality at the fall line.]

What efforts will be made to assess chemical contaminants from airborne sources? For example, mercury emissions have contaminated the food chain in farm ponds near Dickerson.

What efforts will be made to evaluate the susceptibility of source water contamination from degradation products that are created when chemical contaminants interact with the environment?

[Air-borne and degradation products have been added to the list of activities to be considered as potentially contaminating source water.]

Evidence from numerous places indicate that protecting natural systems - especially forests, wetlands, and open spaces - plays a significant role in protecting source waters around the country. No mention of this option is included in the Draft Framework. This option would require all states within the Potomac River watershed to coordinate a basinwide approach. John Finney raised the question at the December 17 meeting about cooperation among states that share the Potomac River. Why wasn't a basinwide approach used?

[The present project is to develop a Plan to guide the Assessment of potential contamination to source waters. Forests, wetlands, and open spaces might follow as remediation and protection measures. The 1996 Amendments to the SDWA were developed with significant "stakeholder input" resulting in state-by-state responsibility for implementation.]

Neal Fitzpatrick
Conservation Director

WATER RESOURCES DIVISION
8987 Yellow Brick Road
Baltimore, Maryland 21237
(410)238-4200 FAX (410)238-4210
December 28, 1998

Dr. Roland Steiner
Interstate Commission on the Potomac River Basin
6110 Executive Boulevard, Suite 300
Rockville, MD 20852-3903

Dear Roland:

Thank you for the opportunity to review the draft framework for the Washington, D.C. Source Water Assessment and Protection Program Plan. The framework seems to be well thought out and is consistent with other documents that we have seen from EPA and MDE. Although we are not able to participate fully on your Technical Advisory Group, we have several comments and suggestions for your consideration.

A general observation is that the framework does not take advantage of the large body of data and interpretive reports that have been produced by the USGS National Water-Quality Assessment (NAWQA) project in the Potomac River Basin. These products may provide a good foundation for much of your data gathering and analysis activities. Information can be found on the World-Wide Web at http://md.usgs.gov/pnawqa/ or you can contact Joel Blomquist at (410)238-4260.

You mention (page 2) that delineation of the watershed above the two D.C. surface-water intakes will be based on USGS 1:250,000 and 1:24,000 scale mapping. The Potomac NAWQA project has produced watershed delineations for the Potomac River at Chain Bridge and for selected upstream subwatersheds where fixed-site sampling was conducted. These were based on 1:100,000 mapping and any discontinuities at map sheet boundaries have already been addressed. You may contact the NAWQA project through Joel Blomquist at (410)238-4260 to discuss availability of this data layer. It is important that watershed boundaries do not vary between agencies and that major agencies agree on watershed delineations. You will likely want to add delineations of watersheds above selected water withdrawal points.

The section on Chesapeake Bay Fall Line Monitoring Program (page 4) needs revisions. It is important to directly acknowledge the federal and state participants in that effort, which is done not by the Chesapeake Bay Program but in support of it. The following (underlined) is suggested to replace the current text. Also, note that the title of the monitoring program has been changed to be more precise.

Chesapeake Bay River Input Monitoring Program

The U.S. Geological Survey, in cooperation with the Maryland Department of Natural Resources and the Virginia Department of Environmental Quality, monitors nutrient and sediment concentrations at the downstream freshwater limit of nine major tributaries to Chesapeake Bay, including the Potomac River at Chain Bridge. Chain Bridge is just downstream from the Little Falls intake for Washington's water supply. The monitoring program is a contribution to the Chesapeake Bay Program, and is described on the World-Wide Web at http://va.water.usgs/chesbay/RIMP/. The Chesapeake Bay Program and cooperating agencies, including USGS, also monitor toxics and metals at the downstream freshwater limit of the Susquehanna, James, and Potomac Rivers. These stations are at or near where the physiographic Fall Line crosses the rivers, and the locations are sometimes called Fall-Line stations. While monitoring programs for metals and toxics are not as extensive as those for nutrients and sediment, they still provide significant data on which contaminants may impact the District's raw water supply.

In the section on Sensitivity of the Watershed (page 6), we are uncomfortable with stating that time-of-travel "implicitly incorporates consideration of these sensitivity factors". We agree that it would be a good surrogate to

assess watershed sensitivty closer to headwaters. However, at points farther downstream, the complexity of a watershed such as the Potomac would negate the usefulness of time-of-travel as single representative parameter. Nonetheless, time-of-travel is a critical parameter for assessing susceptibility to effects from upstream inputs of any pollutant.

Your general direction of using existing HSPF watershed modeling as a starting point is good.

For Assessment Round I (page 8), you should incorporate obtaining any GIS data from sources such as USGS, and in particular the delineation of the watersheds. You should also incorporate any data and interpretive products available from sources such as USGS NAWQA, in particular its nutrient and pesticide retrospective studies, its synoptic water-quality studies, and its bottom sediment and tissue study.

In the References, note that Jack (1984) should state "Petersburg to Green Spring", and that Taylor (1970) and Taylor (1971) are both Maryland Geological Survey Information Circulars.

[All comments have been incorporated.]

If you have any questions about our comments, please contact me at (410)238-4259 or gtfisher@usgs.gov.

For the District Chief, MD-DE-DC
Gary T. Fisher, P.E.
Hydrologist, Surface-Water Specialist

cc: Jerusalem Bekele, DC DoH
Miranda Brown, WAD
Michael Marcott, WASA
Frederick MacMillan, EPA Region III
Gerald Peaks, VA DoH
John Grace, MDE
James Gerhart, USGS MD-DE-DC District
Ward Staubitz, USGS VA District
Joel Blomquist, USGS Potomac NAWQA

>>Return-Path: <finneyj@worldnet.att.net>
>>X-Sender: finneyj@postoffice.worldnet.att.net
>>Date: Tue, 12 Jan 1999 23:05:21 -0500
>>To: kberger@mwcog.org
>>From: John Finney <finneyj@worldnet.att.net>
>>Subject: Jan. 8 Draft of Source Water Assessment Plan
>>Cc: thomas.p.jacobus@wad01.usace.army.mil, nvj@epaibm.rtpnc.epa.gov,
>> hamner.rebecca@epamail.epa.gov, ppagano@ids2.idsonline.com
>>
>>Dear Mr. Berger:
>>
>> Thank you for sending me a revised copy of draft plan for the District of
>>Columbia's Source Water Assessment Program.
>> I find the revised draft, while still awfully wordy, a great improvement
>>over the earlier draft. For me, the statement of purpose of the project, as
>>explained on pages 6 and 7, is much clearer and more understandable.
>>Indeed, it finally is made clear that the future protection of D.C. water
>>supplies depends on what takes place upstream from the District. The plan,
>>therefore, proposes that the District survey the entire watershed for
>>future contaminants of its water supply, drawing upon information supplied
>>by the upstream states and federal agencies, but acting on its own.
>> I still find this a very ambitious project for a District government
>>which has trouble fixing water pipes in its own domain. And I still believe
>>a regional approach would be preferable. But after talking with Vicky
>>Bennetti of EPA, I have a better understanding of why it is proposed the
>>the District do the study on its own.
>>
>> I gather there is a touch of paternalism (or in this case maternalism) in
>>EPA urging the District to conduct the study on its own. The hope within
>>the EPA is that the District will develop knowledge, skills and competence
>>in environmental matters in doing the study on its own but with federal
>>financing. I am not sure that such paternalism, however well-intended,
>>falls within the mandate of the EPA. But if the effect is to prepare the
>>District government to defend its citizens against neighborhood pollution
>>ordered by the EPA, then I can only applaud the effort.
>>
>> As I understand the funding, EPA has made a grant of $400,000 to the
>>District to conduct the basin-wide study, with the expectation the study
>>will be carried out by the Interstate Commission on the Potomac River
>>Basin under the direction of a staff person from the District's Office
>>Environmntal Health. The $400,000 is not an insignificant sum given the
>>needs of the District of Columbia, but it still is small enough to keep
>>the study from becoming a big boondoggle.
>> In connection with the funding, I wonder whether the statement at the top
>>of page 6 that the source of funding will be a set aside from the 1997
>>allotment to the District (I believe for $12.5 million) is correct. My
>>understanding is that the funding is a direct grant from EPA since the
>>District does not have a Drinking Water Revolving Fund, as do the states.

[The funding statement has been clarified in the document.]

>> I initially was skeptical about the capability of the District government

>>to manage such a project. But I gather from D.C. Council Member Kathy
>>Patterson that the Environmental Health Administration of the D.C.
>>Department of Health has gathered together a competent group of officials,
>>including my Palisades neighbor Nick Kaufman, for whom I have the highest
>>regard.
>> So after my initial reservations, I say let's get to it. Let the District
>>demonstrate it can stand on its own two feet in defending its drinking
>>water sources against contamination by the uperiver states. I am not sure
>>the states, which tend to treat our distirct as an orphan, will cooperate
>>fully or will pay much attention to the conclusions reached by the
>>District study. But at least the Disgtrict will have a study to shove in
>>the faces of the states if they continue to disregard the interests of the
>>District in protecting the purity of the Potomac River above the fall line.
>>(Incidentally, on page 16, the fall line is just downstream of one but not
>>both of the District's water intakes.)

[The term 'fall line' as used in this document means the location at which the flow in the Potomac River reaches sea level. This is near Chain Bridge in the District of Columbia.]

>> Before you go to the printer, however, you may want to find another word
>>for anthropormorphic at the bottom of page 12. Anthropomorphic refers to
>>the attribution of human characteristics to non-human objects. Thus, for
>>example, the EPA has anthropomorphic feelings about the bullhead minnows
>>that swim in the shadow of Chain Bridge. I think the word you are looking
>>for is "mamade."

[The suggested replacement was made in the document.]

>> Congratulations on your efforts to get this project underway. I know that
>>you and Mr. Steiner have worked hard on this in the face of carping from
>>civilians on an advisory panel. But I think the study will be all the
>>better for being blessed with the observations of those who eventually
>>will drink the water you are trying to protect.
>> If you would, please send along a copy of this to Mr. Steiner, and
>>circulate it in any way you wish.
>>
>> Sincerely yours,
>>
>> John W. Finney
>> Co-Chair of CRUDD>>

Date Sent: Tuesday, January 19, 1999 6:01 PM
From: "Buglass, Bob" <"MAIL@SMTP {bBuglas@wssc.dst.md.us}"@c2smtp.potomac-commission.org>
To: RSTEINER <RSTEINER@c2smtp.potomac-commission.org>
Subject: DC SWAP Draft Comments

Roland -

This draft looks very well done to me. I have a few minor comments/suggestions for your consideration. Some may not be appropriate to the current stage; feel free to ignore or defer.

* Page 6 and page 15, may want to note whether both intakes are shore intakes, which are more susceptible to effects of local tributary runoff water quality.
* Page 9, may be worthwhile to mention and get data from the Rockville water plant, with its intake located about halfway between WSSC's plant and the Great Falls intake.
* Page 11, besides sand and gravel, other types of mining (active and abandoned) may be significant. "Biosolids" is the current preferred term for municipal wastewater plant sludge.

[The list of activities in the Plan is for those activities which contaminants have been associated.]

* Page 12, last paragraph, may want to emphasize that urbanization increases surface runoff peak flows far more than would be predicted by the increase in impervious area, because of hydrologic/hydraulic modification. The result is often extensive stream channel erosion from fairly minor storms.
* Page 13, under Potential Sources of Contamination, even undeveloped areas have potential sources of contamination, e.g. pathogens from large deer populations.
* Page 13, under Susceptibility, may want to consider biodegradability along with the listed removal mechanisms.
* Page 18, under Taste and Odor, runoff from snow melt, and when the ground is frozen, often contains ammonia which results in taste and odor problems. Also, some roadway deicing chemicals contain urea, another nitrogen source, and another taste and odor precursor.
* Page 19, minor typos, second paragraph, Westvaco is spelled differently; third paragraph "their transport".

[All comments incorporated except as noted above.]

I'm not sure if I can come to the meeting tomorrow night. If any questions, please call at 301-206-8082, or return e-mail.

January 20, 1999

Mr. Roland Steiner
Interstate Commission on the Potomac River Basin
6110 Executive Boulevard
Suite 300
Rockville, MD 20852

Dear Mr. Steiner:

Thank you for inviting me to have these remarks read into the record at the Source Water Assessment Plan public meeting tonight.

With Mr. John Finney, I am concerned that sediment deposition in the Potomac above the Washington Aqueduct Water Treatment Plant adds to the water quality and waste disposal problems of the Aqueduct Plant.

I am particularly concerned that the drinking water treatment plants above Washington add to this problem by discharging their waste directly into the Potomac.

You indicated in our phone conversation that around twenty drinking water treatment plants may be sited above Washington. You also indicated that the WSSC treatment plant now discharges all its solid waste directly back into the Potomac some few miles above the Aqueduct intakes.

Mr. Karl Berger at the Metropolitan Washington Council of Governments said to me by phone today that WSSC was contracting for a plant that would eliminate some but by no means all solid discharge.

I would like to see the current SWAP plan (January 8, 1999) revised to include assessment of the threats posed by all water treatment plants in the Potomac River Basin to the quality of Washington's drinking water.

> *[Water treatment plant discharges are subject to NPDES permits, and as such will be considered in the Assessment.]*

I would also like to see the current SWAP plan include arguments for and against the discharge of the Washington Aqueduct Water Treatment plant's own waste products back into the Potomac.

> *[The DC treatment plant solids are discharged to the river down stream of the intakes; therefore, they are outside the scope of the DC Source Water Assessment. The fact that there are no other drinking water withdrawals down stream of those discharges makes it unlikely that they will be considered in any Source Water Assessment.]*

Thank you for your attention.

Sincerely,

Charles C. Verharen
1207 35th Street, Northwest
Washington, DC 20007
Phone: 202-338-6033
Fax : 202-965-4735

1/21/99

Roland Steiner
ICPRB

Thanks for the opportunity to submit these additional comments and questions about the Draft Source Water Assessment and Protection Program Plan for the District of Columbia.

Page numbers refer to the December 11, 1998 Draft. So far, I have not taken the time to compare the 12/11/98 Draft with the 1/8/99 Draft. It would help to have new language delineated.

Sincerely,

Neal Fitzpatrick

General Comments

The Watershed Model and the Hydrologic Simulation Program-Fortran (HSPF) are both existing tools, which were developed for specific purposes other than those described in this document. While models and simulations can be extended, evolved, improved and otherwise modified, it is extremely risky for modifications of the type described in this document to be done by those who developed the original model or simulation. Typically many assumptions, both explicit and implicit, are necessary in the process of developing models and simulations. No matter how well documented, important assumptions will not be apparent to other users, which can lead to significant problems.

The biggest problem with modeling and simulation is believability of the results. It is very important, particularly when adding capabilities to an existing model, to first establish a baseline of the characteristics of the model before modification. As important capabilities are added, incremental checks of specific functions or characteristics should be examined very carefully. The objective of these checks should be to determine if the tool produces results that make sense; for a set of inputs that correspond to an intuitive case, does the tool produce results that are consistent with expectations? This type of systematic approach is not discussed in the document.

Modeling and simulation can easily become open-ended activities. The trial and error approach rarely yields the desired results.

Specific Comments

The Potomac River, upstream of the fall line, is divided into eleven segments with each segment representing a river reach and the area of land that contributes to it. Are the characteristics of each segment the same for the entire segment, or can there be multiple land uses within a segment?

[There are multiple land uses within each segment.]

What does "fully-calibrated hydrology" mean? Does it mean that the HSPF models the flow of water in the hydrological cycle, representing precipitation, evaporation, runoff, ground water flow, and transport to some level of agreement with measured data for all of the types of land use to be considered? What about transpiration? Infiltration?

[In this case, "fully-calibrated" means that the average daily flows calculated by the model are in agreement with the daily flows measured at the USGS monitoring station at Chain Bridge. The flows predicted by the model are also calibrated to observed data at other locations, such as Millville, WV, for the Shenandoah River and Shepherdstown, WV, for the upper Potomac. All aspects of the hydrologic cycle, including transpiration and infiltration, are represented in the model.]

It is stated on page 12 that the HSPF is capable of modeling the transport of fecal coliform bacteria, and that the Watershed Model will be adapted to simulate the fate and transport of fecal coliforms. To what extent has the HSPF be validated for this use? Have the predicted results from HSPF been compared to measured results at the upper end of the contamination level? Interpolation is vastly preferable to extrapolation.

[HSPF is a flexible model that can be used to study the fate and transport of a wide range of contaminants. The user determines the contaminant of interest and specifies the parameters that describe its behavior in an input file. The model itself does not need to be validated; it will be calibrated against observed monitoring data. Neither interpolation or extrapolation should be necessary. The Watershed Model, in a sense, is just a set of input files for HSPF, though, of course, it takes an enormous effort to develop and maintain the input files, calibrate the model, and analyze the results.]

At the bottom of page 12 there are several tasks identified as "necessary to adapt the Watershed Model to the representation of the fate and transport of fecal coliform bacteria." If HSPF is the underlying simulation and it already covers these effects, then shouldn't the modifications to the Watershed Model be minimal?

[As stated above, the user must specify which constituents are modeled and the parameters to describe their fate and transport. Currently, the Watershed Model does not simulate fecal coliforms, so the parameters necessary to represent them will have to be added to the input files that currently run the model. The underlying model hydrology and hydraulics, however, will not change, therefore much of the work in developing a model has already been done.]

At the top of page 13 it states, "Additional analysis will be necessary to make inferences from the results of the fecal coliform simulation which apply to pathogens such as giardia and cryptosporidium." What types of analysis? Fecal coliforms are probably not good indicator for other pathogens in all conditions. How will this be included?

[The statement was intended to express the recognition that fecal coliforms are not necessarily a good indicator of other pathogens, and has been changed to reflect that. Many states, including Pennsylvania and Maryland, have studies to examine the sources, fate, and transport of cryptosporidium., and the DC SWAP will make use of the results of those studies to determine the susceptibility of DC's drinking water supply to contamination from it.]

On page 13 it states "The Watershed Model calculates nutrient concentrations, as well as chlorpophyll concentrations, at the fall line." Where are the intakes relative to the fall line? Is it not necessary to calculate these concentrations at the intakes to correlate cause and effect?

[Chain Bridge is 1.5 miles below the intake at Little Falls and about 10 miles below the intake at Great Falls. Since the purpose of using the Watershed Model is to evaluate the relative contribution of different regions in the watershed to fecal coliform concentrations at the intakes, it should not be necessary to correct the model for the exact location of the intakes. In determining, for example, whether the South Branch of the Potomac or the Conococheague Creek contributes more to the concentration of fecal coliform concentrations at the intakes, there is no need to correct for the 1.5 or 10 mile difference in location, because those distances are small compared to the size of the basin.]

Date Sent: Wednesday, January 27, 1999 11:46 PM
From: CWA Program Staff <"MAIL@SMTP dccwa@cleanwater.org}"@c2smtp.potomac-commission.org>
To: RSTEINER <RSTEINER@c2smtp.potomac-commission.org>,
kberger <"MAIL@SMTP {kberger@mwcog.org}"@c2smtp.potomac-commission.org>
Subject: Final SWAP Comments

District of Columbia
SOURCE WATER ASSESSMENT PROGRAM

Comments Submitted by:

Carla Pappalardo, Tricia McPherson, and Clean Water Action

Prepared by: Carla Pappalardo and Tricia McPherson

January 27, 1999These written comments regarding the District of Columbia's Draft Source Water Assessment Plan are submitted by Carla Pappalardo and Tricia McPherson (a District resident) as members of the required Citizens' Advisory Committee (as stated in the EPA guidelines for the Source Water Assessment Plans each state, including the District of Columbia, must submit to the EPA for approval). This documentation is submitted by Carla Pappalardo as the Chesapeake Regional Coordinator and Tricia McPherson as the Field Canvass Director for Clean Water Action's National Headquarters in the District of Columbia. Where comments directly relate to specific parts of the Draft SWAP, those sections will be identified.

Funding Constraints:

We want to thank the Council of Governments for its role in this process as well as the EPA and ICPRB for their work in providing answers to our questions. Regarding funding for the Plan and the actual Assessment, it was quite clear through meetings of the CAC, that the Department of Health is unclear as to the actual amount of money set aside for this and where it comes from. We therefore urge ICPRB to continue its role through the actual assessment by submitting a bid. Our hope is for the Department of Health to open up the bidding process and not take on the role themselves.

Furthermore there are concerns as to the sufficiency of the allotted EPA grant of $400,000 that was given to the District, to not only complete the assessment, but carry out the plan. Some concerns arise as to if this allocated sum of money is in fact sufficient. Will there be enough to fully implement an assessment of the potential and relevant contaminants? Will there be enough to carry out the "massaging" of other states' data as needed for DC's Plan? And finally, will there be enough to incorporate all data into an effective plan that would essentially protect and prevent source water contamination? If this grant is in fact the only available source of funding, and required findings for a comprehensive assessment exceed that amount, then does this mean that some contaminant sources will not be included? Or will additional monies be made available, such as what was suggested at the last "public" meeting in regards to states in the watershed area pooling money to do a regional study?

> *[Until a budget and scope of work are developed for the Assessment, it is difficult to address the issue of supplemental funds for the Assessment phase.]*

Public Participation/Inter-jurisdictional Coordination:

In some ways DC is ahead of other states in public participation even though the process was started much later in other places. One question that still needs to be addressed is, what range of residents was contacted in the District and did this represent a well-rounded group of residents? We are requesting that a list of these outreach efforts be sent to us.

[MWCOG sent letters soliciting interest in helping to develop the District of Columbia's SWAP Plan to more than 100 individuals. These people included all of those who attended a public meeting on drinking water issues in Washington, D.C., held by EPA Region III in March 1996. They included other representatives of civic and environmental organizations in the city, the chairs of the 29 Advisory Neighborhood Commission subdistricts in the city, and representatives of various city government agencies or other organizations involved in drinking water and public health issues.]

Thank you for the "extra" meeting that the CAC requested for further comment on these draft plans. In light of the importance of these Assessments (for protection of our drinking water), and the fact that in part, we must rely on the neighboring states of Maryland, Virginia, West Virginia, and Pennsylvania (for their state plans' data), we foresee a potential need for additional comments beyond the submission date requirements. Any future comments will be submitted to EPA, Region III or the District of Columbia Department of Health.

There are still major concerns regarding "Inter-jurisdictional Cooperation and Coordination." As mentioned above, DC will need to rely on the data provided to us by our neighbors. In the last SWAP meeting it was clarified that we will use only their data and not their plans or assessments, and that once we have that data, it will be massaged for the District's plan. Perhaps it is the suggestion of massaging the data that brings concern. Or perhaps it is the question of overall sufficiency of that data. Yes, the EPA still has to approve those state plans. However, with no citizen oversight there can be no guarantee our concerns will be addressed, particularly since we are unaware as to who will actually carry out the plan.

[It is noted in the Plan that the Citizens' Advisory Committee recommended a continuing role for public involvement.]

Potential Contaminants:

The topographic watershed approach to source delineation is important in the necessity to meet the EPA indications for Source Water Assessment Plans. In regards to Section II.D and Section III. there are concerns which have been mentioned in CAC meetings, but not fully addressed. There is discussion in Section II.D of Zone Segmentation and subsequent delineation to be "based on potential pollution pathways and the varying degree of susceptibility posed by the different classes of potential contaminants and sources." Who will determine these issues?

[These issues will be determined by the staff conducting the Assessment.]

It is recognized that there are funding "limitations." However, all potential contaminants, not just "relevant" ones (Section III.A.) must be searched for, their pathways and travel times to water sources projected. We must be certain that the data received from the other states in the Potomac River Basin Watershed covers all potential contaminants and potential travel times, even if they are not considered "relevant," which usually means "expected." Through accidents such as human error or even through natural causes the unexpected can become the expected.

In Section II.E dealing with Mapping Delineation, it is sited that the hydrologic layer will include "major" rivers, streams, lakes, and reservoirs. All reservoirs are "major" to those who draw their drinking water from them. There are concerns regarding what constitutes "major." Sources of contamination to our source waters do not choose to locate themselves only on "major" waterways. When taking the inventory of business types and activities, for which related potential contaminants are identified (Section III, Table 1.) the hydrologic layer of mapping should include all "pertinant" rivers, streams, lakes, and reservoirs. In determining which are pertinent, it will be necessary to evaluate what businesses or activites may in fact be located on "minor" rivers, streams, lakes, and reservoirs. Since the delineation element of the Assessment will be founded on this base map, to have an Assessment done on source water which is accurate, complete, and cost effective this would need to be addressed in the SWAP Plan. The same would hold true for "minor" roads as a potential source for contamination, unless this solely deals with a base map for viewing purposes only and not as an actual basis for where to do assessments.

[Your latter statement is nearer to our thinking. It is intended that rivers and roads be shown down to some level of detail which is not too crowded. If a potential contaminant source exists, it will be assessed regardless of whether it is located on a mapped river or road.]

It is our understanding that monitoring is not as extensive in some states as in other states. In addition, enforcement on that monitoring has been seen as problematic. We are once again dependent upon our neighbors for their monitoring data, which may or may not be adequate. Section III.B states that an "attempt" will be made to determine the source of identified contaminants of "concern" as they are discovered in the monitoring data. The District's Plan should be clear on what contaminants are of concern to DC and if those contaminants are not a part of the monitoring data from a neighboring state, should be identified and data obtained.

[Contaminants found in the water demonstrate susceptibility; therefore, the Assessment is a priori done. We are trying to push a little farther here if we can — into what would be the watershed protection phase.]

Referencing Table 1 again, some minor adjustments in wording of certain activites and additions to that list are recommended. The list mentions Municipal Wastewater/Sewer lines and Septage lagoons and sludge. We would suggest language include Combined Sewer Overflows. Retention ponds at wastewater treatment facilities may reach capacity, and overflow is not treated before discharge. Another potential contaminant would be superfund sights. Although the Front Royal site in Virginia is listed there is no mention of other sites. Highways and different types of land uses are mentioned, however, areas of extensive residential development are not. These areas can be a contributing factor to source water contamination due to various practices including pesticide applications, runoff, oil changes, accidental dumping of toxic household chemicals, etc.

[We propose two methods of determining if a potential contaminant is present in the watershed: (1) direct assessment = presence in water monitoring data, and (2) potential contaminant assumed to be associated with a known activity in the watershed. Table 1 and other similar information sources allow us to translate from activity to presumed presence of potential contaminant when that contaminant has not been found in water quality monitoring. Therefore, Table 1 is one source of information we found to translate from "activity" to possible presence of potential contaminant. We know that other such tables exist and are more complete — covering activities you mention above.]

Enforcement:

There is currently no enforcement mechanism to "assure that as they [the states] implement source water protection programs the water sources for the District of Columbia are also protected" (from section I.D of the Introduction). One issue discussed frequently at our DC SWAP meetings has been the suggestion to continue the involvement of the Citizens' Advisory Committee in the actual assessment. This could be an effective way of including more public participation in the Assessment, as well as ensuring the information available to DC is extensive enough to meet the needs of protecting the water supply of our nation's Capitol. We strongly urge the continued presence of the Citizen's Advisory Board in the furthering of this project. This could also be a way for citizen's to take ownership over ensuring clean water for the District and to assist with fostering the necessary working relationships with "upstream" states. Clean Water Action would be more than willing to help forge relationships with our neighbors, and with the capability of reaching almost 100,000 member households, can have an effective impact in this campaign for clean and safe water.

[Again, it is noted in the Plan that the Citizens' Advisory Committee recommended a continuing role for public involvement.]

Please respond in writing regarding our public comments. We look forward to the continuance of the Citizens' Advisory Committee in an official capacity.

Appendix V. Glossary

Atrazine. Water-soluble herbicide used extensively in corn production.

Base Map. A map containing geographic features, used for reference locations.

Basin. Entire area having a common outlet for runoff. Synonymous with **Catchment**, **Watershed**.

Catchment. Entire area having a common outlet for runoff. Synonymous with **Basin**, **Watershed**.

Chlorophyll. The green colored substance of leaves and plants.

Coliform. See Fecal Coliform.

Contaminant. Substance which renders water unfit for its intended use.

Contaminant Source Inventory. The process of identifying and inventorying potential contaminant sources within delineated source water protection areas through recording existing data, describing sources with the source water protection area, targeting likely sources for further investigation, collecting and interpreting new information on existing or potential sources through surveys, and verifying accuracy and reliability of the information gathered.

Cryptosporidium. Protozoan parasite affecting the gastrointestinal tract of humans and animals. Can cause diarrhea and abdominal cramps.

Delineation. Determining the boundary of a watershed or catchment area by analyzing its topographic features.

Dioxin. Family of chlorinated hydrocarbon compounds formed as by-products in chemical reactions, usually under high temperatures.

Erosion. Wearing away of land or stream channel by running water, glaciers, winds, etc.

Eutrophication. The increasing accumulation of **Nutrients**, usually leading to increased plant growth.

Fall Line. The location on a river where the flow reaches sea level at the head of tide, or the zone in a river where the slope is typically steep as the flow approaches sea level at the head of tide.

Fecal Coliform. Family of bacteria, associated with the fecal matter of warm-blooded animals, which is used to indicate the presence of fecal matter in water.

Giardia. Protozoan whose ingestion can cause diarrhea, cramps, nausea, and general weakness.

Ground Water. Subsurface water occupying the saturated zone from which wells and springs are fed.

Herbicides. Synthetic chemicals that kill plants or inhibit their growth.

Hydrologic. Pertaining to the occurrence, distribution, and circulation of water in the cycle from the atmosphere to the earth and back to the atmosphere, through stages or processes like precipitation, runoff, stream flow, infiltration, and evaporation.

Hydrologic Unit Codes (HUC). Cataloguing system which divides the United States into drainage basins and subregions of drainage basins.

Intake. Structure at the location where water is taken from a source of supply into a conduit for transportation to other locations.

Monitoring. Systematic sampling and analysis of water over a period of time on a regular basis.

Nutrients. Nitrogen, phosphorus, and carbon compounds used by algae and other organisms for growth and maintenance.

Pathogen. Organism that produces disease.

PCBs. Polychlorinated biphenyls. Type of synthetic chlorinated hydrocarbon compounds. Formerly used as lubricant in transformers and electric switching equipment. Very persistent in environment.

Permeability. Property of a porous medium which allows for the movement of liquids and gases under gravity or pressure.

Pesticide. Any chemical designed to kill or inhibit the growth of undesirable organisms.

Raw Water. Untreated water; usually the water entering the first treatment unit of a water treatment plant. Sometimes synonymous with **Source Water**.

Runoff. The part of precipitation that flows toward a stream on the ground surface.

Segmentation. Dividing a watershed into subwatersheds or non-topographic subunits, such as a corridor within a given distance of a section of a river.

Sediment(s). Any material carried by water, which will ultimately settle to the bottom after the water loses velocity.

Source Water. Water used as a source of water supply taken from a natural or impounded body of water, such as a stream, lake, pond, or underground aquifer.

Surface Water. All the water on the surface, in rivers, lakes, streams, etc., as distinguished from ground water.

Susceptibility Analysis. An analysis to determine, with a clear understanding of where the significant potential sources of contamination are located, the susceptibility of public water supplies in the source water protection area to contamination from these sources.

Topographic. Relating to the features of the landscape, such as hills, valleys, mountains, slope of land, etc., that exhibit changes in elevation.

Toxics. Substances that are harmful or fatal to human beings and other living organisms.

Travel Time. Period of time required for water in a stream to travel from a given point to some other point downstream.

Volatile. Capable of being evaporated at relatively low temperatures.

Watershed. Topographic boundary area that is the perimeter of a catchment area of a stream or river. See **Basin**, **Catchment**.