

**RECOMMENDATIONS AND GUIDANCE**

**PERTAINING TO**

**THE DEVELOPMENT AND IMPLEMENTATION**

**OF SOURCE WATER PROTECTION PLANS**

**FOR PUBLIC WATER SUPPLIES RELYING**

**ON SURFACE WATERS**

## TABLE OF CONTENTS

	<u>Page No.</u>
<b>CHAPTER 1 - Introduction</b>	
Purpose of this Document .....	1
Background .....	1
Protection Defined .....	3
Goals for Source Water Protection Planning .....	4
Description of Minnesota's Source Water Intakes .....	4
Summary .....	4
<b>CHAPTER 2 - The Relationship of Source Water Protection Plans to Other Water     Planning and Water Protection Activities in Minnesota</b> .....	5
Water Planning in Minnesota .....	5
Relationship Between Other Plans and Source Water Plans .....	5
Role of the Lead Agency in Source Water Protection .....	6
Role of State Agencies/Boards in Source Water Protection .....	6
Role of Federal Agencies in Source Water Protection .....	7
Role of an Oversight Entity to Guide the Development and Implementation of Source Water Protection Plans Within a Watershed or Throughout a River Basin .....	8
Reasons for Oversight Entities .....	8
Principles Governing Oversight Entities .....	8
Barriers That Exist With an Informal Oversight Entity .....	9
Formation of a Task Force as the Oversight Entity .....	9
<b>CHAPTER 3 - Overview of the Application and Implementation of the Source     Water Protection Guidance</b> .....	11
Using the Priority A Designation in the SWPA to Address Acute Health Concerns .....	11
Using the Priority B Designation in the SWPA to Address Chronic Health Concerns .....	12
Bringing It All Together in the Drinking Water supply Management Area .....	12
Identifying the Geographic Location of the Drinking Water Supply Management Area in the Source Water Protection Watershed .....	12
Schedule for Development of Plan Elements and Approval Process .....	12
Transient Noncommunity Public Water Supply Systems .....	12
General Content of an SWP Plan .....	13
Data Reporting Guidelines .....	13
<b>CHAPTER 4 - Getting Started and Involving the Public</b> .....	15
Identify an SWP Plan Manager .....	15
Appoint an SWP Team .....	15
Develop a Public Participation Process .....	16

## Table of Contents - Continued

	<u>Page No.</u>
<b>CHAPTER 5 - Part 1 - Delineations and Analysis of the Sensitivity and Susceptibility</b> .....	18
Criteria for Delineating Priority A and B Designations of the Source Water Protection Areas .....	18
Criteria for Delineating the Drinking Water Supply Management Area .....	19
Criteria for Delineating the Source Water Protection Watershed .....	20
Analyzing the Sensitivity and Susceptibility of the Source Water to Contamination .....	20
Scoping 1 Meeting Regarding Delineation and Analysis of the Sensitivity and Susceptibility (Part 1) .....	20
Submitting Part 1 to MDH for EQB Approval .....	21
Submitting Part 1 to Units of Government .....	22
Public Meeting Regarding Part 1 Approval by EQB .....	22
<b>CHAPTER 6 - Part 2 - Preparing a Plan of Action to Manage Potential Contaminant Sources</b> .....	23
Scoping 2 Meeting Regarding Contaminant Source Inventory and Management (Part 2) .....	23
Conducting a Potential Contaminant Source Inventory .....	23
Identifying Contaminants of Concern .....	24
Identifying the Impact of Expected Changes to Land and Water Resources on the Public Water Supply .....	24
Identifying the Issues, Problems, and Opportunities .....	24
Establishing SWP Goals .....	24
Objectives and Plan of Action .....	25
Identifying a Strategy to Evaluate the Effectiveness of Management Strategies .....	26
Preparing the Contingency Strategy for an Alternate Water Supply .....	26
<b>CHAPTER 7 - Review and Endorsement/Approval of Part 2 of the SWP Plan</b> .....	27
Submitting Part 2 of the SWP Plan to Local Units of Government .....	27
Holding a Public Hearing/Public Information Meeting Regarding Part 2 of the SWP Plan .....	27
Submitting Part 2 of the SWP Plan to MDH for State Agency Review .....	27
Submitting Part 2 of the SWP Plan to EQB for State Endorsement/Approval .....	28
Submitting the Approved Part 2 to Units of Government .....	28
<b>CHAPTER 8 - Implementing an SWP Plan</b> .....	29
<b>CHAPTER 9 - Updating an SWP Plan</b> .....	30

# CHAPTER 1

## Introduction

### Purpose of this Document

The purpose of this document is to provide recommendations to the State of Minnesota for public drinking water suppliers relying on surface waters regarding the:

- Identification of the meaning of “protection.”
- Identification of the lead state agency for coordinating the development of protection.
- Identification of the content of a source water protection plan.
- Identification of the method(s) and criteria for the delineation of source water protection areas.
- Identification of a method of potential contaminant source inventory that is practical.
- Identification of a consistent statewide procedure for the development and implementation of the source water protection plans.
- Identification of a review and endorsement/approval process.
- Exploration of the establishment of an oversight entity to guide the development and implementation of source water plans within a watershed or throughout a river basin.
- Identification of funding sources for the development and implementation of source water protection plans; and
- Relationship of source water protection plans with other plans, such as local water plans, watershed plans, basin plans, and other local land-use plans.

It is recognized that the development of source water protection plans is voluntary. However, if a plan is to be endorsed/approved by the state and local units of government, there are certain minimum elements that must be met and these are described in this guidance document. This document was prepared with the advice of the Source Water Protection Plan Development for Surface Water Systems Advisory Ad Hoc Workgroup (Appendix I is a listing of workgroup members) and has been recognized by the Environmental Quality Board as Minnesota’s source water protection program for public water supplies relying on surface waters for drinking water.

### Background

When Congress enacted the Safe Drinking Water Act (SDWA) amendments in 1996, the concept of source water assessment (SWA) was put into place. The purpose of SWA was to provide users of public drinking water supplies with a new tool to understand the potential contamination issues relative to their drinking water. This federal act gave the states until May of 2003 to complete **source water assessments** for all public water supplies, groundwater and surface water alike. The Minnesota Department of Health (MDH) responded to the 1996 act by utilizing a statewide ad hoc workgroup to help decide how the Department would respond to the federally-mandated program affecting public water suppliers.

The resulting Minnesota Source Water Assessment Program document, published in 1998, required the following for assessments of surface water intakes: 1) determine the source of the water that is used by the public water supplier; 2) determine the susceptibility of the source water; 3) determine the potential contaminants of concern to the source water intake; and 4) to the extent practical, determine the locations of the contaminants of concern. The MDH completed the Source Water Assessment as a state obligation with the assistance of a local team of public water suppliers, resource officials and citizens. Three assessment areas were delineated. For emergency response (to address acute health issues) an **inner source management area** was defined to allow advance notice to the water plant operator for preparation of possible shutdown of the intake. For contaminants that are cumulative in their impact on drinking water users (chronic health issues), an **outer source management area** was delineated as an area that can be realistically managed so that positive results can be expected. The **entire watershed** is the remaining area that is managed for specifically identified source water concerns. For surface intakes, susceptibility is always high; for groundwater systems susceptibility can be high, medium or low depending on the protection that may exist due to soils and geology. While drinking water users are now seeing the completed assessments with little reaction, the public water utilities with surface inlets have realized that assessments alone will not provide additional barriers to potential contamination unless some level of protection is developed beyond the treatment plant. Because the SDWA does not require the development of a "protection plan" for surface water systems following completion of the SWA, a number of public water suppliers have been asking about the development of voluntary plans that would be recognized by the State.

A presentation and discussions by public water suppliers at a Source Water Protection Plan Development for Surface Water Systems Advisory Ad Hoc Workgroup meeting included the following reasons they support the development and implementation of source water protection plans:

1. The mandated source water assessments inform of threats to a source water supply, but don't resolve any of the issues.
2. Now that source water assessments are complete as a result of the mandate of the federal Safe Drinking Water Act and have raised awareness of the issues, public water suppliers feel they must respond with a plan to address the identified issues.
3. The need to coordinate drinking water issues with the different federal, state, and local agencies involved in land use and water quality.
4. Regulations, such as the Clean Water Act, allow contaminants to be legally discharged to the source water and it becomes the responsibility of the public water supplier to remove them.
5. Present Clean Water Act regulations appear to address fishing and swimming issues rather than the "drinking water issues."
6. Suppliers need to start with as clean a source of water as possible or spend significant amounts of money to improve the water for consumption.
7. Increasing variability in the quality of the source water makes it progressively more difficult to process drinking water without over- or under-treating the water, either increasing the cost or endangering the health of the users of the water.
8. Approved discharges upstream of an intake can cost a public water supplier an additional \$300-\$500 per day.
9. Increased contamination of the source water demands increased use of disinfectants, making the balancing act between the amount of disinfectants and the allowable levels of disinfection by-products more challenging.

10. Reducing turbidity levels in the source water would help public water suppliers meet the recently enacted Safe Drinking Water standards requiring turbidity to be reduced from 0.5 NTU units to 0.3 NTU units in finished water.
11. Surface waters are very vulnerable to contamination because of the mismanagement of potential sources of contamination adjacent to the water and upstream.
12. Management of water quantity, such as flood retention, can adversely impact the quality and quantity of drinking water.
13. Local source water protection plans are needed to help identify risk to the water supply that can be integrated into other plans, such as county water plans and watershed plans.
14. Public water suppliers are expected to measure levels of contamination at a greater degree of precision (parts per million vs. parts per billion), which means standards could be exceeded quickly. This means the only real way to eliminate this risk is to prevent the contamination of the source water by properly managing potential contamination at the source.
15. There are large quantities of contaminants transported by rail, road, and pipelines within thousands of feet of public intakes. This requires a plan to notify public water suppliers and to address spills that could reach an intake within a very short period of time.

The MDH has recognized that guidance is necessary to address procedures, content, coordination of plan development and implementation, endorsement by agencies, and other policy issues. The MDH prepared the SWA as the basis for the next step, that of a full **source water protection plan**. The MDH encourages drinking water suppliers to take the next step and it is possible that most municipal public water suppliers using surface water are expected to want a higher level of protection.

### **Protection Defined**

A definition of protection is necessary so that the proper understanding of what is accomplished upon adoption of a source water "protection" plan is realized. Following are some examples of protection being implemented, with an explanation that additional vigilance is necessary.

- A management strategy may be to implement **grass buffer strips** along a river, stream or ditch. The rationale behind the strategy may be that a native grass buffer will reduce sediment input to the source water, thereby reducing contaminant transport. Upon complete implementation, protection may be only temporary due to factors of change that will occur as time passes. Ownership changes on property may result in land use practices which change and which could very well eliminate the benefits of the original grass buffers. Over time, wear and tear on the buffers could be a factor which reduces their effectiveness such that replanting maintenance may be necessary every so many years. Also, the original calculation to determine how much buffer was required may have been in error, as discovered by later monitoring.
- A management strategy to establish **spill response equipment** at 16 sites along the Mississippi River was accomplished through the efforts of the River Defense Network, with funds appropriated by the Minnesota Legislature. Now that the equipment has been distributed to the emergency responders and training provided to the users, is protection accomplished? What about the need for replacement equipment when the present equipment is used? What happens when local volunteer fire departments or first responders experience a change in personnel; is there need for training again? Is it possible to become complacent about spills because the responders are equipped and prepared when the event of a lifetime could come along that simply overwhelms the capability of the local teams?

Before we attempt to define "protection" in terms of source water protection, we need to consider the factors in the examples above. For instance, any definition of protection must consider that, over time, **changes** occur in people and land use, and any installation of equipment or implemented land practice usually requires **maintenance**. **Monitoring** could determine whether protection is adequate or inadequate. Any plans for management of this type must also always consider the **unpredicted event**.

From evaluation of the above paragraphs we see that "protection" is never fully completed or accomplished. The susceptibility of surface water will always be high and that is the overriding influence in defining source water protection. For the purpose of this guidance document, the following will establish the meaning of protection: Measures *have been implemented or are in the process of being implemented to reduce the risk of potential contamination of the source water.*

### **Goals for Source Water Protection Planning**

Goals of Minnesota's source water protection program for surface water systems are:

- ❑ Address contaminants that can potentially impact the **acute and chronic health of human beings**;
- ❑ Engage appropriate parties such that **implementation buy-in** is accomplished;
- ❑ Reduce the incidents of potential drinking water contamination occurrences by **establishing barriers of protection** before the source water reaches the treatment plant;
- ❑ Increase awareness of drinking water protection through **information and education**;
- ❑ Provide a **sustainable source water resource**;
- ❑ Provide for **cost-effectiveness**;
- ❑ Build an **aesthetic acceptance and confidence** by the user;
- ❑ Accomplish **pollutant reduction** in light of the need to balance demands of multiple users of the resource.

### **Description of Minnesota's Source Water Intakes**

There are 23 community public water supply systems in the state that use surface intakes for a drinking water supply (Appendix II is a list of the community public water supply systems). These systems serve close to 1.4 million users in the state. There are three noncommunity nontransient public water supply systems using surface water; and there are between 63 and 65 noncommunity transient public water supply systems in the state that have surface water intakes for drinking water. These are primarily resorts and campgrounds located in five northern counties. The transient systems typically use between 1000 to 4000 gallons per day, while the largest community draws an average of 65 million gallons per day. The transient systems draw from 27 lakes and are located on Lake Superior, or adjacent to the Boundary Waters Canoe Area Wilderness or Voyageur's National Park.

### **Summary**

The Source Water Protection Plan Development for Surface Water Systems Advisory Ad Hoc Workgroup (Ad Hoc Workgroup) recognizes the importance and need for public water suppliers to develop and implement source water protection plans on a voluntary basis, without the promulgation of a State rule. The Ad Hoc Workgroup also recognizes the importance of having recommended and consistent guidelines for the development and implementation of source water protection plans. The purpose of this document is to provide this guidance.

## CHAPTER 2

# **The Relationship of Source Water Protection Plans to Other Water Planning and Water Protection Activities in Minnesota**

The institutional and legal framework which has been established to protect and manage Minnesota's surface waters is complex. Numerous federal, state and local agencies have duties and responsibilities related to surface water that may support or impact source water protection for public water supplies using surface water. For the state's Source Water Protection program to be effective, it is critical that there is an understanding of the roles and responsibilities of the various water- and land-use planning entities and that they work together in a coordinated fashion to achieve the common goals of source water protection identified in Chapter One.

### **Water Planning in Minnesota**

Water planning occurs throughout the State of Minnesota and is undertaken by a variety of State and local agencies. These agencies include Minnesota Planning, Minnesota Pollution Control Agency, Board of Water and Soil Resources, Minnesota Department of Health, Minnesota Department of Natural Resources, Soil and Water Conservation Districts, water management organizations and counties. These plans cover geographic areas varying from the entire state, a water basin, a watershed, a wellhead protection area, or a county. Often these plans can be general in nature or specific in nature, such as the water quantity issue of flooding. To obtain a more comprehensive understanding of these various planning efforts that were presented to the Ad Hoc Workgroup, it is recommended that one visit the various agencies' websites.

It is the finding of the Ad Hoc Workgroup that most of these planning activities can address drinking water concerns but are not required to address them and have not identified them. The decision to include drinking water concerns and the degree it is addressed is left to the discretion of the state or local agency in charge of the water planning activity. To improve the effectiveness of these existing planning efforts, the Ad Hoc Workgroup considers it important for public water suppliers to voluntarily develop source water protection plans that define drinking water concerns and the management strategies required to address the concerns, so they can be integrated into other existing federal, state, and local plans and programs.

### **Relationship Between Other Plans and Source Water Plans**

To date, none of the planning activities undertaken by state agencies or local units of government are required to address the management of potential sources of contamination from a drinking water point of view. Many of the existing programs are based on the Clean Water Act; consequently "fishable and swimmable" goals are addressed. However, some state and local plans voluntarily address drinking water issues. This approach leaves gaps, and developing and implementing a plan or program for drinking water goals to be addressed is left to the discretion of the entity. In the past it has been difficult to include drinking water considerations into existing plans and programs because the issues and goals of drinking water protection were not clearly expressed. SWP plans that are developed by

public water suppliers will help public water suppliers identify issues and implementation actions to help protect source water from contamination. The development of SWP plans will serve as a means to identify drinking water goals and management strategies that then can be integrated into existing plans and programs.

### **Role of the Lead Agency in Source Water Protection**

The Minnesota Department of Health (MDH) will be the lead State agency for the development and implementation of source water protection plans for surface water systems. The Ad Hoc Workgroup recommends MDH as the lead agency because MDH: 1) is the primacy agency for the implementation of the Federal Safe Drinking Water Act in Minnesota and 2) has the experience of implementing source water protection for groundwater systems. It is also worth noting that it will help the public to see that the primary reasons for the management of potential sources of contamination are health and safety. As the lead agency, MDH will be responsible for:

- Coordinating state and local efforts and public participation in developing, implementing and evaluating the state's SWP program for public water supplies relying on surface water;
- Developing policies and procedures and providing general program direction;
- Assisting public water suppliers and local governments with developing and implementing SWP plans;
- Developing and implementing agreements with appropriate state agencies to define their roles and involvement in SWP;
- Coordinating the review and endorsement/approval of SWP plans submitted by public water suppliers;
- Developing an automated SWP data management system;
- Coordinating the preparation of guidance documents and conducting workshops;
- Coordinating and delivering SWP training and education; and
- Serving as the state liaison to U.S. EPA.

### **Role of State Agencies/Boards in Source Water Protection**

Other state agencies administer data and programs that can assist public water suppliers with the delineation of the source water protection areas and identifying and managing potential contaminant sources in those source water protection areas. Their support is essential to the successful implementation of management strategies for public intakes. Communication and coordination between state and local governments is needed to fully implement or adapt contaminant source control programs for SWP. The principal state agency programs that can be used to support the implementation of source water protection plans are presented in Appendix III.

The level of involvement by state agencies with SWP is based on their mission, statutory authority, policies, resources and priorities. Regulatory and resource limitation, in particular, may reduce possible state agency assistance in addressing some contaminant source types.

The following state agencies and boards will be most directly involved in SWP:

The Minnesota Department of Agriculture(MDA) is the lead agency for controlling the use of agricultural chemicals. MDA will assist public water suppliers in identifying, monitoring, and controlling agricultural chemical sources and practices within the source water protection areas. Support will be provided through the programs listed in Appendix III. More information is available at <http://www.mda.state.mn.us>.

The Minnesota Pollution Control Agency (MPCA) is the lead agency for controlling non-agricultural point and non-point sources of contamination because they have the primary responsibility for the Federal Clean Water Act in Minnesota. MPCA will assist public water suppliers in identifying, monitoring and/or controlling these potential contamination sources in the source water protection areas. MPCA also has surface water quantity and quality information that will be helpful in the delineation of source water protection areas. MPCA will integrate State endorsed/approved SWP plans into basin planning, point and non-point programs and the Total Maximum Daily Load program. Support will be provided through the programs listed in Appendix III. More information is available at <http://www.pca.state.mn.us>.

The Minnesota Department of Natural Resources (DNR) is the lead agency for controlling the use of shorelands and floodplains. DNR will assist public water suppliers in identifying and controlling shorelands and floodplains. DNR also has surface water quantity and quality information that will be helpful in the delineation of source water protection areas. Support will be provided through the programs listed in Appendix III. More information is available at <http://www.dnr.state.mn.us>.

The Board of Water and Soil Resources (BWSR) oversees the county water planning process, the wetlands program and provides technical and financial assistance to counties, watershed districts, watershed management organizations, and soil and water conservation districts for various water and soil activities, including water planning, monitoring and potential contaminant source inventories. BWSR will assist MDH by using their liaison role to promote SWP during the development and implementation of county water plans, Soil and Water Conservation plans, Metro surface water plans and Metro groundwater plans. Support will be provided through the programs listed in Appendix III. More information is available at <http://www.bwsr.state.mn.us>.

The Environmental Quality Board (EQB) is comprised of state agency commissioners and citizens appointed by the Governor and is staffed by Minnesota Planning. EQB staffs the newly formed Governor's Water Cabinet. EQB develops inter-agency water policy, reviews state agency programs, prepares the state water plan, develops biennial water priority recommendations, oversees the environmental review process, reviews proposed legislation, and resolves interagency conflicts on environmental matters. EQB will integrate State endorsed/approved SWP plans into their programs. Also, EQB will be the state agency to endorse/approve SWP plans upon the recommendation of the MDH. Support will be provided through the programs listed in Appendix III. More information is available at <http://www.mnplan.state.mn.us>.

All state agencies with environmental programs will assist the MDH with its responsibilities as the lead agency and will review SWP plans that are submitted to the State for endorsement/ approval.

### **Role of Federal Agencies in Source Water Protection**

MDH will work with federal agencies to encourage the integration of State endorsed/approved SWP plans into the various federally administered programs.

## **Role of an Oversight Entity to Guide the Development and Implementation of Source Water Protection Plans Within a Watershed or Throughout a River Basin**

### **Reasons for Oversight Entities**

The Ad Hoc Workgroup reasons for an oversight entity are:

1. The geographic areas that will be included in source water protection plans for surface water intakes are significant in size. For example, the combined source water assessment areas for St. Paul, Minneapolis and St. Cloud encompass 1200 square miles, 10 counties and approximately 64 cities.
2. There is a need to integrate and coordinate efforts for both source water protection areas (SWPA) for surface intakes and wellhead protection areas for wells that lie within source water protection areas of surface water intakes. This is needed so that individuals residing within these protection areas receive consistent messages.
3. The fragmentation that is built into government structure constrains communication and cooperation for drinking water issues and concerns. An oversight entity could support communication, provide a framework for cooperative work among other levels of government and interested parties, and sustain relationships among these groups from a drinking water perspective.
4. It provides an opportunity for public water suppliers to collaborate and cost-share expenses when they share a common source water.

### **Principles Governing Oversight Entities**

The Ad Hoc Workgroup recommends the following governing principles for oversight entities:

1. Several oversight entities will need to be formed **for the various surface water bodies** that are used as a source of drinking water.
2. These oversight entities should be **coordinating bodies** for source water protection and less formal than a Joint Powers Board or a Watershed District.
3. The main mission of these oversight entities would be to address water and land use from a **drinking water protection perspective**.
4. The **foremost roles** of the entities would be to provide: 1) links among local units of government within the source water protection areas of each surface intake or cluster of intakes; 2) links between local government and state government; 3) accessibility and coordination of technical, resource management, and policy development expertise. The role should not include regulatory control, sharing governmental powers or taxing authority.
5. The **membership** of each oversight entity shall include: 1) all managers of the involved public water supplies; 2) all wellhead protection managers within the source water protection areas of the surface intake; 3) all county water planners; 4) the State agencies of Department of Health, Pollution Control Agency, Department of Natural Resources, Department of Agriculture, Department of Public Safety, Environmental Quality Board, and Board of Water and Soil Resources; 5) a staff person from each regional development commission in the affected area; 6) one representative from each watershed district or watershed organization within the SWPA; and 7) at least three representatives of elected officials, one representing townships, one representing cities, and one representing counties.

Because the size of the oversight entity could potentially be too large and difficult to manage, there should be an option for the entity to convene an executive committee. The committee must have representation from the seven categories described earlier in this paragraph. The entire oversight entity will meet annually, for informational updates and discussion of broad policy issues.

The oversight entity may establish subcommittees to address issues as determined by the oversight entity.

6. Each oversight entity will emphasize:

- a. **Information, education and outreach** – Source water protection establishes a new culture for water suppliers, and defines new roles for those whose actions and decisions influence source water. It is necessary to identify and reach the various and diverse audiences that need to be involved in source water protection, frame the messages to deliver to these audiences, and provide the mechanism to communicate across jurisdictional and institutional barriers.
- b. **Evaluate and provide advice** – Source water protection will require evaluation and advice regarding technical, policy and management issues and new responsibilities for public water suppliers, as well as local and state government. This means existing programs need to be evaluated and modified; advice can be given, as needed, on implementing new technology, policy, and management. This is of importance as source water protection measures are integrated with the existing resource management framework in Minnesota.
- c. **Source water planning** – Because water suppliers lack the authority to protect source water, and because the jurisdiction of local units of government ends at their respective borders, source water protection cannot occur without a well-defined framework for cooperation. There needs to be a mechanism to implement source water protection that crosses jurisdictional boundaries. Because local units of government have land use authority in Minnesota, they will be at the forefront of source water protection implementation and there will need to be a means of support for their cooperative work.
- d. **Advocacy** – Because many local, state and federal water and land use programs focus on fishable, swimmable objectives and goals, there is a need to have a mechanism to obtain support for drinking water issues and concerns at all levels of government. There is a need to integrate source water protection strategies into: 1) local government land use control, 2) state and federal government technical expertise, 3) state and federal government authorities, and 4) state and federal water regulatory programs.

### **Barriers That Exist with an Informal Oversight Entity**

1. They are unable to receive and disburse funds, which means a formal entity would need to be identified for each oversight entity that could serve as a fiscal agent if money grants were to be envisioned.
2. They don't have the authority to regulate.

### **Formation of a Task Force as the Oversight Entity**

Based on the description of the reasons, the desired structure and barriers, it is the recommendation of the Ad Hoc Workgroup, that oversight entities be formed and be known as **Source Water Protection Task Forces**. To provide these entities with some structure, but one which isn't as formal as a joint powers board or a watershed district, the Ad Hoc Workgroup recommends:

- Each task force develop a mission statement and by-laws of operation;
- Each task force identify its geographic areas and membership;
- Each task force elect officers, such as a chairperson, vice-chairperson and secretary;

- Each local government involved adopt a resolution accepting the mission statement and by-laws, and appoint representatives to the task force;
- Each task force prepare a scoping document that outlines goals and strategies for its geographic area;
- Each task force report annually in writing or verbally to the governing body of the public water supplier, the governing body of local units of government involved, and to the Water Resource Committee of the Environmental Quality Board;
- Each task force meet at least quarterly;
- Each task force identify a fiscal agent in the by-laws of operation.

In addition to the responsibilities described earlier in this chapter, the Minnesota Department of Health will be responsible for the initial establishment and lead staff support of each Source Water Protection Task Force. In addition to the responsibilities described earlier in this chapter, the other State agency Commissioners will appoint a staff person to attend Source Water Protection Task Force meetings and act as the agency liaison.

The funding of the administrative functions of the task force would come from the member public water suppliers on a pro-rated basis, if grants were not available. The funding for the implementation of management strategies would come from a variety of sources, such as grants, loans, fees, taxes, and in-kind contributions.

The Source Water Protection Plan Development for Surface Water Systems Advisory Ad Hoc Workgroup recommends that the Minnesota Department of Health convene an ad hoc workgroup in five years to assess the effectiveness of this approach and prepare a set of recommendations. If the formation of these task forces does not accomplish the stated goals, the Source Water Protection Plan Development for Surface Water Systems Advisory Ad Hoc Workgroup suggests the establishment of a State Drinking Water Commission to oversee the implementation of effective source water and wellhead protection plans.

## CHAPTER 3

# Overview of the Application and Implementation of the Source Water Protection Guidance

**Development of source water protection plans is voluntary. However, for the plans to be endorsed/approved by state agencies and local units of government, certain minimum elements must be met. When the words “requirements” or “must” are used in this guidance, it means that the elements being described have been agreed to by the workgroup members and endorsed/approved by the Environmental Quality Board (EQB). Public water suppliers relying on surface water that use this guidance in development of their source water protection plans will be in the strongest position to obtain cooperation and assistance as they implement their plans. A plan will not be endorsed/approved by EQB if it does not follow the protocols of this guidance document.**

This chapter outlines general requirements for Source Water Protection (SWP) for those public water supplies that rely on surface waters. It outlines the responsibilities of public water suppliers relating to 1) their level of obligation for meeting these requirements, and 2) specific actions which must be taken to implement management strategies for their intakes.

It is important to define a geographic area as the protection area. This area will be known as the Source Water Protection Area (SWPA). The SWPA will be further delineated into two areas designated as Priority “A” and “B.” To better understand the geographic location of the SWPA, the Source Water Protection Watershed (SWPW) needs to be defined as well. The explanation and methodology of defining these areas will be discussed briefly below and in Chapter 5.

### **Using the Priority A Designation in the SWPA to Address Acute Health Concerns**

The Priority A SWPA (Priority A Designation) is to be delineated for all community and noncommunity public water supply intakes. The purpose of the Priority A Designation is to help public water suppliers inventory and manage potential sources of contamination which present an acute (immediate) health concern to water users. The eventual goal is that the supplier will work cooperatively with others to prepare and implement management strategies to reduce the risk of contamination which presents an acute health concern to the consumers of the water in the Priority A Designation of the SWPA.

The following criteria would be used to define the Priority A Designation:

1. Time period required to notify the public water supplier of a contaminant release to the source water and when it is anticipated to pass by the water supply intake;
2. Time period required to shut off the surface-water intake so that contaminated source water does not enter the water supply distribution system;
3. Time period that will accommodate unanticipated delays in notification and shut down of the water supply system, and
4. Time period that will provide sufficient time to fill water storage facilities.

### **Using the Priority B Designation in the SWPA to Address Chronic Health Concerns**

All community and noncommunity (types) of public water suppliers must identify a Priority B SWPA (Priority B Designation). This area is designed to protect water users from chronic health effects related to low levels of chemical contamination or the periodic presence of contaminants at low levels in the source water. Also, this area should protect users from contaminants such as pathogens that may be 1) usually found at treatable levels in the source water, but 2) occasionally present an acute health concern within the Priority B Designation. The eventual goal is that the supplier will work cooperatively with others to prepare and implement management strategies for inventoried potential sources of contamination in the Priority B Designation.

### **Bringing It All Together in the Drinking Water Supply Management Area**

The delineated SWPA, including the “Priority A and B Designations,” often will not be easily visible and will frequently cross a parcel of land in such a manner that it is difficult to inventory and manage potential sources of contamination. To address this concern, a Drinking Water Supply Management Area (DWSMA) needs to be delineated for the SWPA and each priority designation. This will be further discussed in Chapter 5.

### **Identifying the Geographic Location of the DWSMA in the Source Water Protection Watershed (SWPW)**

It is also important to understand that the DWSMA is located in a larger watershed. The delineation of the SWPW will depend on the type and size of the public water supply and the type and size of the water body. The delineation of the SWPW will also be discussed in Chapter 5.

### **Schedule for Development of Plan Elements and Approval Process**

The time and the resources available to MDH, other state agencies, local units of government and public water suppliers necessitate that public water suppliers be phased into the program. Plans are to be developed for new intakes when established. For existing intakes, MDH and the public water supplier together would determine the start-up date and timeline of plan development, based on available resources. The completed Source Water Protection plan must be finalized within two years. If additional time is required, the size of the source water protection area, the susceptibility of the intake, available resources and the number of people served must also be taken into account when determining the time needed beyond two years to develop a plan.

### **Transient Noncommunity Public Water Supply Systems**

Source water protection plans for the transient noncommunity public water supply systems may follow the procedures as described in this guidance document or the plan may be included in a County Water Plan. The County must agree to include the source water protection plan in the County Water Plan. The elements of a source water protection plan would need to be included in the County Water Plan. The procedures required, such as notification of local units of government and review by state agencies outlined in the State’s water planning statutes and rules, would be considered as meeting the procedural standards for source water protection plans for transient noncommunity public water supply systems. Any source water protection plan for a transient system that is included in a County Water Plan would be approved/endorsed by the Board of Water and Soil Resources as part of the approval process of the local water plan.

## General Content of an SWP Plan

The following listing provides an overview of SWP plan content. Subsequent chapters present more detailed descriptions of how elements of the plan are to be developed and the procedures and criteria MDH will use for review and approval. An SWP Plan will consist of two parts.

*Part 1 must contain the following elements:*

- **Assessment of the data elements used in the plan** - The plan must assess present and future implications of the data elements for the use of the intake, the quality and quantity of water supplying the intake, and land and water uses.
- **Delineation of the SWPA, including Priority A and B Designations, the DWSMA and the SWPW** - The plan must have a map showing each boundary of the Priority A and B Designations, the DWSMA, and the SWPW.
- **Description of the source water setting** - The plan must describe the type of setting (river, lake, mine pit) and whether there is a likelihood that the geologic setting and geomorphology of the area will insulate the surface water from contamination.

*Part 2 must contain the following elements:*

- **Data elements, including inventory of potential contamination sources and land uses** - The plan must contain the data elements or summaries of the data elements, including the inventory of potential contaminant sources and land uses located within the SWPA that were identified in the Scoping 2 Notice. If the plan contains a summary, the plan must identify where the actual inventories are kept and describe how one may review the inventories.
- **Impact of changes on public water supply intake** - The plan must identify and describe any known future changes to the physical environment, land use, and surface and groundwater that may impact the water serving the intake.
- **Issues, problems, and opportunities** - The plan must identify issues related to the surface water serving the intake and the source water protection areas.
- **SWP goals** - The plan must state goals for present and future water use and land use to provide a framework for determining plan objectives and related actions.
- **SWP objectives and a plan of action** - The plan must have measurable objectives and a plan of action for the improvement of source water and source water protection areas.
- **Approach(es) used to evaluate the progress of the plan of action** - The plan must identify a strategy for evaluating the progress of the plan of action and a strategy for evaluating the impact of a contaminant release on the surface water supplying the intake.
- **Contingency planning to address water supply interruption** - The plan must have a contingency strategy that addresses disruptions of the water supply caused by contamination or mechanical failures of the public water supply system.

## Data Reporting Guidelines

The data and maps collected for an SWP plan must meet the following reporting standards so data are meaningful and consistent.

Locational data collected must:

- Include one geographic indicator (map coordinate system) for point information;
- Identify property parcels with an identification number assigned by the county auditor;

- Include state identifiers, such as the unique number of a well or a number assigned by a state agency responsible for a potential source of contamination; and
- Be recorded and reported on forms and software provided by MDH or other software when the public water supplier provides a data dictionary and an electronic cross-reference table.

Newly-created maps:

- Must be presented at 1 to 24,000 scale (1 inch equals 2000 feet) or greater detail. The seven-and-one-half minute topographic maps prepared by the U.S. Geological Survey are at a scale of 1 to 24,000;
- Must be presented in an electronic format (such as a coverage for a geographic information system) or drafted on a stable base material;
- Must be presented at a consistent map scale; and
- May be combined on multiple maps or map overlays.

Laboratory methods used to analyze water samples must be at least as precise as those used by the MDH Laboratory. Other laboratories may be used.

A geographic reference coordinate system used to define a geographic reference point must describe:

- The units of measurement used;
- The applicable zone;
- The applicable reference datum; and
- The map projection method used.

## CHAPTER 4

### Getting Started and Involving the Public

To develop an SWP plan that meets this guidance, there are a number of initial steps that must be followed by the public water supplier.

#### Identify an SWP Plan Manager

The first step that a public water supplier must take to ensure the success of the development and implementation of an SWP plan is to identify a person to coordinate plan development and implementation. The plan manager should be someone who is already closely associated with and knowledgeable about the public water system, e.g., the system water operator, water system owner, public works supervisor, or city governmental official. This person will serve as the principal contact for MDH regarding the preparation and submittal of an SWP plan. The principal duties of this position may include:

- Coordinating the technical, policy, and educational aspects of SWP plan development and implementation;
- Serving as liaison with MDH and local units of government;
- Writing the SWP plan;
- Scheduling and conducting meetings;
- Chairing the SWP team; and
- Overseeing data management and reporting.

#### Appoint an SWP Team

The next step the public water supplier must take is appointment of an SWP team because it is critical to the success of the development and implementation of an SWP plan. Staff of local units of government, such as cities, townships, counties, and soil and water conservation districts, must be looked to for assistance. An important benefit of SWP planning is the development of a cooperative effort between the public water supplier and local staff to ensure a broad examination of SWP-related issues.

State, and some federal agencies, can assist with data needs and interpretation. Public water suppliers could reduce the costs of SWP planning by drawing on staff resources from agencies and the public to provide valuable expertise. Often, their participation will be at minimal or no cost to the public water supplier. The development of an SWP plan for a water system involves assembling information from numerous sources and using that information to make decisions pertaining to land use in the DWSMA. For this reason, it is beneficial to include a wide variety of people with various experiences and knowledge to participate on a local SWP planning team. The principal duties of the team may include:

- Assembling information about the water system;
- Providing information and input related to the boundaries of the DWSMA;
- Locating contaminant sources within the DWSMA;
- Developing goals, objectives, and management strategies for contaminants of concern; and
- Providing local control and ownership of the SWP plan.

The SWP team could include:

- System water operator\*
- Public utilities director\*
- City administrator or clerk\*
- Council member\*
- Local business representative
- Citizens within the DWSMA
- Local educator
- County water planning staff
- Planning and Zoning Administrator
- Landowner representatives (farmers, loggers, etc.)
- Watershed and/or Soil and Water Conservation Staff
- State agency staff
- Minnesota Rural Water Association staff
- Others as appropriate for the area

\* Suggestions followed by an asterisk are appropriate for water systems owned and operated by a local unit of government.

### **Develop a Public Participation Process**

Involving all interested parties in the SWP planning process is critical to its success. No group which could be significantly affected by SWP planning should be denied an opportunity to participate or at least comment. Public water suppliers must ensure there is a process for public participation during the development and implementation of an SWP plan. Also, the public water supplier must conduct a public information meeting concerning the approved Part 1 of the plan (described on page 13).

The scope and extent of public participation will be left to the discretion of the public water supplier. It is a better strategy to actively involve members of the public at the beginning of the SWP planning process rather than waiting until the public hearing, which must be held once the plan is ready for submittal to MDH. Problems, conflicts, and opportunities of interest to the public must be identified early in the process so that they are addressed as much as possible. This helps ensure that decisions are based on shared information and perceptions, and helps educate the public about water-related issues and options available to protect their drinking water supply. At a minimum, advertisement in the local newspapers of the intent to develop the SWP plan is a good idea. City newsletters and websites may be used by community public water suppliers as additional sources of public notice.

**Include Local Units of Government** - The public water supplier may use many methods to enlist the participation and involvement by local governments. However, informational meetings with local governments and opportunities for them to comment must occur at several times during SWP plan development and review. At a minimum this must include:

- Notifying local governments within the DWSMA of the intent to develop an SWP plan;
- Meeting with local governments at least once during SWP plan development;
- Submitting a copy of the approved Part 1 of the SWP plan to local governments; and
- Local government review of Part 2 of the SWP plan before submittal to MDH.

The SWP plan manager would be well advised to have frequent informal contacts as well with key representatives from affected local governments. This way, any issues that arise can be dealt with during plan development in a collaborative manner and the SWP manager may also avoid needless conflict and frustration with affected local governments at the end of the SWP planning process.

The role of affected local government is that of an advisor to the water supplier. They also are key partners in future implementation, so their participation is critical to the eventual success of the plan.

**Notification of State and Federal Agencies** - State and federal agencies can be very useful to the public water supplier in the development of the SWP plan, and their involvement on the SWP team must be solicited by the SWP manager based on the issues likely to arise in the plan. However, it is probable that there are agencies whose involvement will be limited. The public water supplier must notify MDH of their intention to develop and implement an SWP plan. MDH will be responsible for notifying pertinent state and federal agencies of the public water supplier's intent to develop and implement an SWP Plan.

## CHAPTER 5

### Part 1 - Delineations and Analysis of the Sensitivity and Susceptibility

This chapter presents Minnesota's guidance for: 1) delineating the SWPA, including the Priority A and B Designations, the associated DWSMA, and SWPW; and 2) conducting the analysis of the sensitivity and susceptibility of those areas. The approach outlined in this chapter is based on the recommendations of two sub-workgroups that were requested by the Ad Hoc Workgroup to address delineation criteria. The sub-workgroups members and their reports can be found in Appendix IV. The elements of Part 1 of an SWP plan must be completed and approved by MDH before Part 2 of the SWP plan is prepared.

#### Criteria for Delineating Priority A and B Designations of the Source Water Protection Areas

The SWPA provides the focus for implementing a strategy to protect a public water supply intake from contamination. There are distinct source waters in Minnesota that are used for drinking water: rivers, streams, lakes and mine pits. The diversity of each of these sources also must be taken into account. A number of factors must be considered when delineating the source water protection areas to ensure that the delineation actually reflects water movement to the intake. It is the recommendation of the Ad Hoc Workgroup that the appropriate criteria listed in the menu below must be used to identify the two priority designations of the source water protection areas.

**PRIORITY A DESIGNATION** - The menu of criteria includes, but is not limited to:

- Time of travel;
- Minor watersheds that drain to the waterway above an intake;
- Upstream hydrology;
- Topography;
- Topographic divide;
- Soils;
- Intake depth and length;
- Public water supply system;
- High, medium and low flows;
- How long the system can supply its daily demand while the intake is shut off;
- How quickly specialized treatment can be put on-line;
- Time needed for an observer/responder to notify the water utility of a spill;
- Knowledge of potential contaminant sources;
- Existence of major transportation routes;
- Barges, boats, or other potential contaminant sources in direct contact with the waterway, and
- Direct connection between mine pits.

The Priority A Designation must include the main stem of the river used as the water supply source, as well as all tributaries, sewer, tile lines, and ditches that discharge directly to the water within the time of travel distance necessary for a contaminant to reach the water supply intake before additional corrective actions could be taken. Time of travel distance for each utility will vary according to system, design, contaminant characteristics, and the physical attributes of the source water.

**PRIORITY B DESIGNATION** - The menu of criteria includes, but is not limited to:

- Groundwater flows, including groundwater divides;
- Depth of the lake or volume of water;
- Intake depth and length;
- Eco-region context;
- Type of lake - inland, Lake Superior, mine pit;
- Tributary influences;
- Immediate “lakeshed” or “pitshed;”
- Watershed-to-lake area ratio;
- Current direction;
- Flow rate;
- Time of travel;
- Residence time;
- High, medium and low flows;
- Geology surrounding the water body;
- Topography surrounding the water body;
- Type of land cover surrounding the water body;
- Soils;
- Watersheds;
- Hydrology, including changes in hydrology;
- Knowledge of the land use, including shoreland classification;
- Knowledge of potential sources of contamination;
- Water quality information about the source water, such as total suspend solids, fecal coliform bacteria, dissolved oxygen, phosphorus.

It is important to understand that any Priority A Designation is within the Priority B Designation for the purpose of achieving the stated goals of source water protection planning mentioned in Chapter 1.

Based on the sub-workgroups’ recommendation, the Ad Hoc Workgroup supports convening another workgroup to determine how to calculate time of travel and criteria specific to each type of water source used.

### **Criteria for Delineating the Drinking Water Supply Management Area (DWSMA)**

The DWSMA is the surface and subsurface area surrounding a public water supply intake, including the source water protection areas, that must be managed. The boundaries of the DWSMA are geographic features such as: 1) right of ways for highways, streets, roads, and railroads; 2) section, half-section, quarter-quarter section or other fractional section lines of the United States Public Land Survey; 3) property or fence lines; 4) public utility service lines; and 5) water features, such as a stream/river bank and the lakeshore. The DWSMA must follow the Priority A and B Designations as closely as possible.

**The purpose of the DWSMA is to provide a more understandable geographic reference of where contaminant source controls are needed to protect the public intake than can be achieved using only the boundaries of the SWPA. It is much easier for the general public to see a road than where a calculated line crosses a property parcel.**

## **Criteria for Delineating the Source Water Protection Watershed**

The SWPW provides information about the geographic location of the SWPA and DWSMA. What is an appropriate watershed will vary based on a number of criteria. The menu of criteria includes, but is not limited to:

- Type and size of public water supply;
- Type and size of the source water body;
- Volume of water drawn;
- Upstream area;
- DNR minor watershed boundaries with local adjustment/groundtruthing;
- Local flow direction and volume;
- Currents;
- Tributary influences;
- Residence time;
- Knowledge of the land use, including shoreland classification; and
- Knowledge of potential sources of contamination;

## **Analyzing the Sensitivity and Susceptibility of the Source Water to Contamination**

In determining the sensitivity of a source water, the intrinsic physical properties of the geologic setting or the landscape within the watershed must be considered. Factors influencing the sensitivity of a surface water include volume of water, seasonal changes in flow rates, topography, hydrology, geology, vegetation, soil types. These factors help attenuate contaminants and affect their movement to the public water supply intake. For example, a larger volume of water in a source water and the rate at which it flows can help attenuate or dilute contaminants before they enter a public water supply intake.

Susceptibility is defined as the likelihood that a contaminant will enter a public water supply at a level which may result in an adverse human health impact. The susceptibility of all surface water is determined to be high because there are no practical means of preventing all potential contaminant releases into the surface water. However, a susceptibility determination for a specific public water supply system must be included in the plan, based on comparing the sensitivity of the surface water intake to the presence of a potential source of contamination which may release a contaminant of concern. This secondary analysis allows for a differentiation between each surface-water based public water supply system.

## **Scoping 1 Meeting Regarding Delineation and Analysis of the Sensitivity and Susceptibility (Part 1)**

Because the level of effort needed to determine the delineations and sensitivity analysis will vary from supplier to supplier and source water to source water, a Source Water Protection Unit staff member will convene a panel of surface water professionals to meet with the public water supplier to determine the delineation criteria, data elements and information needed to: 1) delineate the SWPA, including Priority A and B Designations, the DWSMA and SWPW; and 2) analyze the sensitivity and susceptibility. The panel of surface water professionals will, at a minimum, consist of a representative from the DNR, MPCA, BWSR, MGS, and USGS. Another topic to be discussed may include what delineation method(s) would be most appropriate given data availability and the type of water supply

that is being used. The types of existing data elements which a panel may suggest are categorized as: 1) the physical environment; 2) land use; 3) water quantity; and 4) water quality. Appendix V contains a complete listing of data elements. MDH will assist the public water supplier with collecting this data, which is on-file with state and federal agencies. MDH will formally notify the public water supplier in writing of the results of the Scoping 1 meeting within 30 days of the meeting.

### **Submitting Part 1 to MDH for EQB Approval**

The following items must be in Part 1 that is submitted to MDH for review:

1) Documentation of the delineated SWPA, including the Priority A and B Designations, must accompany a map showing the boundaries of these areas. The following information is needed for review:

- Description of the setting, i.e. lake, river, mine pit;
- Delineation criteria used;
- Description of the delineation method used, including assumptions, and the supporting documentation for the assumptions;
- Description of all parameters, other than the delineation criteria;
- Description of the delineation results, including:
  - a) results of model calibrations; and
  - b) a narrative describing the uncertainties relating to the accuracy of the calculated SWPA boundaries;
- Data collected and used, including the source of the data (data provided to the public water supplier by MDH need not be submitted); and
- Copy of the calculations performed; when a computer model is used, the electronic data input and solution files.

2) Documentation of the boundaries of the DWSMA, that must follow Priority A and B Designations as closely as possible, is required to be included.

3) Documentation of the delineated SWPW must accompany a map showing the boundaries of the SWPW. The maps of the delineated SWPA, DWSMA and SWPW will need to be legible but do not have to be professionally drafted. However, the maps must conform to the statements described in Chapter 3.

4) Sensitivity and susceptibility analyses need to be included.

5) Documentation of the sensitivity and susceptibility of the source water will need to:

- Identify the method used;
- Contain the data elements collected and used; and
- Contain the maps, diagrams, reports, studies, and tables used to prepare the sensitivity and susceptibility analysis.

**Notification of review results** will be communicated by MDH to the public water supplier within 60 days after EQB approval. Once the delineation of the SWPA, the DWSMA, and the analysis of sensitivity and susceptibility are approved, the public water supplier can begin Part 2 of the SWP plan. If the EQB does not approve a part of the submittal, the public water supplier will receive written notification that identifies the deficiency and the reasons for disapproval. The public water supplier will need to re-submit the corrected portion of Part 1 of the SWP plan before moving on to Part 2.

### **Submitting Part 1 to Units of Government**

The public water supplier or MDH will need to submit a copy of the approved Part 1 to appropriate local, state and federal units of government, or provide a notice defining how to obtain a copy within 30 days of EQB approval. The MDH and public water supply will need to coordinate this effort.

### **Public Meeting Regarding Part 1 Approval by EQB**

Within 60 days of notification that EQB has approved Part 1 of the plan, the public water supplier must hold at least one information meeting for the general public. The purposes for the meeting are to: 1) make affected land owners aware that their property is within the DWSMA, 2) provide the public with information regarding the level of protection needed for the public water supply intake, 3) inform the general public about the intent to develop management strategies, 4) solicit comments regarding potential contaminant sources or conflicting land uses which may impact the public water supply intake, and 5) solicit participants who may assist the public water supplier with preparing and implementing Part 2 of the SWP plan.

## CHAPTER 6

### **Part 2 - Preparing a Plan of Action to Manage Potential Contaminant Sources**

This chapter presents Minnesota's guidance for conducting an inventory and managing pertinent potential contaminant sources within the approved DWSMA. These elements for Part 2 of an SWP plan must be started after the delineations and analysis discussed in Chapter 5 have been approved.

#### **Scoping 2 Meeting Regarding Contaminant Source Inventory and Management (Part 2)**

MDH will hold a Scoping 2 meeting with the public water supplier to identify data elements that Part 2 of an SWP plan must contain and address. In the development of Part 2 of the SWP plan, the public water supplier must collect and consider existing information which describes: 1) the physical environment; 2) land use; 3) water quantity; and 4) water quality. Appendix V contains a complete listing of data elements. MDH will assist the public water supplier with collecting the data on-file at state and federal agencies. MDH will formally notify the public water supplier in writing of the results of the Scoping 2 meeting within 30 days of the meeting.

In addition to the delineation of the DWSMA and its sensitivity described in Part 1, there are a number of elements in Part 2 of the SWP plan that guide the selection of management strategies. These include the following.

#### **Conducting a Potential Contaminant Source Inventory**

The identification of potential contaminant sources (Appendix VI is a list of potential contaminant sources) within the DWSMA is a fundamental element of SWP. It is needed to assign meaningful priorities to source management measures and to effectively monitor implementation of the SWP plan. A source inventory is an ongoing process. Initially, present and historical land uses need to be inventoried.

The focus of the inventory within the Priority A Designation will be point sources of potential contaminants. Both point and non-point sources must be inventoried in the Priority B Designation. While it is not necessary to conduct an inventory within the SWPW, a section about the type of land use and associated non-point sources is to be included in the SWP plan and will be based on existing data.

A contaminant source inventory must address all land parcels within the DWSMA and land-use information will need to be reported using the reporting standards in Chapter 3. This is needed to 1) provide consistency in reporting land use on a statewide basis, 2) use legal definitions of potential contaminant sources, and 3) reflect interagency standards for identifying and reporting potential contaminant sources.

The sensitivity and susceptibility of the source water and the DWSMA will be used to determine the extent of the management strategies for the inventoried source. All potential sources and land and water uses within the DWSMA must be inventoried. MDH will provide guidance and training, such as workshops, for conducting source inventories within a DWSMA.

### **Identifying Contaminants of Concern**

The identification of contaminants of concern is another fundamental element of SWP. This identification must be based on the inventory, the public water supplier's opinion and the contaminants listed in the Federal Safe Drinking Water Act. A complete listing of the regulated contaminants can be found in Appendix VII. This identification will also be used to determine the extent of management strategies for the inventoried source.

### **Identifying the Impact of Expected Changes to Land and Water Resources on the Public Water Supply**

Part 2 of the SWP plan must list and describe expected changes to the physical environment, land use, surface water and groundwater that may impact the source water serving the public water supply intake. This is needed to determine whether new potential sources of contamination may be introduced in the future and to identify future actions for addressing these anticipated contamination sources. Examples of expected changes include: 1) rapid growth of a community, 2) construction of a large feedlot, 3) drilling a new well, 4) the establishment or the expansion of a public drinking water system, and/or 5) the establishment or expansion of a wastewater system. Strategies selected to manage potential sources of contamination must be explicit and logical in relationship to the identified changes.

### **Identifying the Issues, Problems, and Opportunities**

Part 2 of the SWP plan will need to identify water use and land use issues, problems, and opportunities related to the source water serving the public water supply intake and the DWSMA. This is needed to define the nature and magnitude of contaminant source management issues in the DWSMA. Identifying the issues, problems, and opportunities will enable the public water supplier to: 1) take advantage of opportunities that may be available to make effective use of existing resources, 2) set meaningful priorities for source management, and 3) solicit support for implementing specific source management strategies. This will guide a public water supplier toward developing meaningful goals, objective priorities, and an effective plan of action.

The water quantity and quality data collected will need to be used in conjunction with the contaminant source inventory to assess the impacts that land use is having, or may have, on the source water used by the public water supply intake. Potential impacts will need to be referenced to 1) existing or proposed land-use changes in the DWSMA, and 2) the influence that existing land-use control programs have on water and related land resources. Also, the public water supplier must consider the administrative, technical, and financial aspects for the improvement of existing strategies or the implementation of any new management strategies.

### **Establishing SWP Goals**

Part 2 of an SWP plan will need to establish goals for present and future water and land use that will provide a framework for determining plan objectives and a related plan of action. Examples of goals include the desired quality of the source water serving the public water supply, the role that the public water supplier intends to assume in ensuring that problems and opportunities are addressed, and the type of land use and management the public water supplier wishes to encourage in the DWSMA.

## Objectives and Plan of Action

The core of an SWP plan is the identification and implementation of effective contaminant source management strategies that will protect a public water supply intake from potential contamination. These management strategies may range from nonregulatory activities, such as public education, to regulatory activities, such as the adoption of ordinances. Management of point sources of contamination will be the focus of the Priority A Designation. Management of the Priority B Designation must focus on both point and non-point sources of contamination. A source water protection plan may need to identify management strategies for non-point sources of contamination located in the SWPW if it is determined to be appropriate at the Scoping 2 meeting and is based on information in Part 1.

There are hundreds of activities that could be implemented as management strategies, but Part 2 of the SWP plan must use management strategies which most effectively address local land and water uses, as well as resource needs. Together, the Minnesota Department of Agriculture, the Minnesota Pollution Control Agency, and MDH have created guidance documents outlining management strategies that can be used by a public water supplier. A listing of these documents is found in Appendix VIII. MDH, in conjunction with other state agencies, will hold a workshop on management strategies periodically and schedule it to accommodate public water suppliers who are preparing this part of an SWP plan.

Another important part of an SWP plan is the prioritization of management strategies. A number of factors will need to be considered when management strategies are selected and prioritized. Such factors include:

- Knowledge of contamination of a public water supply intake;
- Types and quantities of the potential contamination sources;
- Location of the potential contaminant source in relation to the intake;
- Capability of the source water to attenuate or dilute a contaminant;
- Capability of the geologic material in the source water protection area to absorb a contaminant;
- Existence and effectiveness of existing official controls;
- Time required to obtain cooperation; and
- Administrative, legal, technical, and financial resources needed.

It is likely that not all of the action steps proposed in Part 2 of the SWP plan could be implemented immediately following plan approval by the EQB. Factors which may affect the rate at which action steps can be implemented include: resource limitations, negotiations with property owners and state and local agencies, and needed changes to state and local legal authority to manage potential contaminant sources. The potential for the release of contaminants near the public water supply intake must be addressed foremost because little time may be available to react effectively. The plan of action must specify the response measures that will be used to address contaminant releases that are, at a minimum, within an 8-hour time of travel from the public water supply intake.

The management of potential contaminant sources will likely involve participation by state agencies and other local agencies. When describing priorities, the SWP plan must identify the entity responsible for implementing each action step. When local and state agencies are involved, the plan will need to document whether cooperation by these agencies has been arranged.

The plan of action in the SWP plan will be required to:

- Address the problems and opportunities identified in the plan;
- Identify and prioritize the management strategies that will be used;
- Identify proposed changes in intake construction, maintenance, and use; and
- Identify who is responsible to implement each management strategy selected.

### **Identifying a Strategy to Evaluate the Effectiveness of Management Strategies**

The public water supplier will need to identify in Part 2 of the SWP plan a strategy to evaluate the effectiveness of the selected management strategies. This evaluation must be conducted annually, or when a plan is amended. The evaluation strategy will need to encompass the entire DWSMA, be based on the health risk the contaminant presents to the intake, and specify the approach used.

Evaluation approaches which can be used are:

- Sampling the quality of the source water;
- Documenting inventory controls of potential contaminants;
- Documenting the implementation of management strategies; or
- Use of existing monitoring data.

This evaluation will be used to focus the selection of management strategies in subsequent amendments of the SWP plan and must be submitted to MDH annually.

### **Preparing the Contingency Strategy for an Alternate Water Supply**

The SWP plan must have a contingency strategy to address the disruption of the water supply due to mechanical failure or contamination if they are to be State approved/endorsed. A contingency plan is needed to ensure a timely and effective response to any interruption of the public water supply. The public water supplier must prepare a description of the water supply system, its capacity, and the anticipated water use and demand of its users. Potential sources of water supply disruption must be identified, and alternative short- and long-term measures for restoring the water supply must be discussed. The contingency plan must present the logistical support that will be utilized to address water supply interruptions, as well as specific emergency response procedures. Finally, mitigative measures that can be used to reduce the vulnerability of the present water supply system must be identified.

The strategy selected by the public water supplier will vary from supplier to supplier, based on the situation. The Minnesota Department of Natural Resources (DNR) requires public water suppliers serving more than 1000 people to submit Emergency and Conservation Plans. Water Emergency and Conservation plans which have been approved by the DNR under provisions of Minnesota Statute 186 and Minnesota Rules, part 6115.0770, will be considered equivalent to an approved SWP contingency plan.

## CHAPTER 7

### **Review and Endorsement/Approval of Part 2 of the SWP Plan**

This chapter presents the review and endorsement/approval of Part 2 of the SWP plan. Part 2 of the SWP plan must be submitted to local units of government, as noted in the next paragraph, for review. Also, public water suppliers that are public utilities or governmental units must hold a public hearing before Part 2 of the SWP plan is submitted to MDH. Nongovernmental public water suppliers must hold a public information meeting. The SWP plan must be reviewed and endorsed/approved by EQB before the public water supplier can proceed with implementation.

#### **Submitting Part 2 of the SWP Plan to Local Units of Government**

Before Part 2 of the SWP plan is submitted to MDH, the public water supplier must submit a copy of Part 2 of the SWP plan to local units of government that are wholly or partially within the SWPA, or provide a notice defining how to obtain a copy of Part 2. Local units of government will be allowed 60 days to review and comment on Part 2 of the plan. The public water supplier must address any comments received from local units of government. Local units of government are defined as, but are not limited to: public water suppliers, townships, counties, watershed districts, watershed management organizations, natural resource conservation services, regional development commissions, and municipalities.

#### **Holding a Public Hearing/Public Information Meeting Regarding Part 2 of the SWP Plan**

A public utility or governmental public water supplier is to hold a public hearing on Part 2 of the SWP plan after the 60-day local government review and before Part 2 of the SWP plan is submitted to MDH. For communities, this hearing could be held at a regularly scheduled city council meeting. A non-governmental public water supplier is to hold a public information meeting on Part 2 of the SWP plan after the 60-day local government review and before Part 2 of the SWP plan is submitted to MDH. The purposes for the public hearing/public information meeting are to 1) make land owners aware of proposed management strategies that affect their property, 2) provide the public with information regarding the level of protection needed for the public water supply intake, and 3) solicit comments regarding potential contaminant sources or conflicting land uses which may impact the public water supply intake.

#### **Submitting Part 2 of the SWP Plan to MDH for State Agency Review**

The public water supplier must submit seven copies of the following to MDH:

- Part 2 of the SWP plan,
- All written comments received on Part 2 of the plan and the public water supplier's response to the comments received, and
- A summary of changes made to Part 2 of the plan as a result of the local review process.

MDH will forward copies of the plan submittal to the following agencies for comment:

- Minnesota Department of Agriculture,
- Minnesota Planning,
- Minnesota Department of Natural Resources,

- Minnesota Pollution Control Agency,
- Minnesota Board of Water and Soil Resources, and
- Other agencies EQB or MDH believe could assist with review.

These agencies will have 60 days in which to submit comments to MDH regarding whether any portion of the proposed Part 2 of the SWP plan is contrary to state or federal law or if it does not satisfy the review criteria.

MDH and the other identified agencies must use the following principles as the basis for plan review:

- **Compliance with the State’s program description** - Part 2 of the SWP plan must be in compliance with the content and procedures described in this guidance document.
- **Sound management of water resources - Includes evaluating whether management controls specified in Part 2 of the plan have significant effects on groundwater or surface water up- or downgradient from the source. Source management options must be based on sound data and technical analysis and the interactions between surface water and groundwater must be considered. Also, the effects of short- and long-term variations in precipitation must be evaluated for their impacts on source management.**
- **Effective health and environmental protection** - Includes preventing potential water and related land resource problems which may impact the public intake, identifying anticipated and appropriate improvements in the quality of the environment within the source water protection areas, and promoting public health and safety.
- **Efficient management of potential contaminant sources** - Includes estimating the cost of implementing Part 2 of the SWP plan. Also, the management approach must identify 1) mechanisms for funding plan implementation, 2) how coordination will be achieved with participating state and local agencies, 3) the approaches that were used to identify potential contaminant source management problems and opportunities to correct them, and 4) how water conservation practices will be used to support SWP goals.

### **Submitting Part 2 of the SWP Plan to EQB For State Endorsement/Approval**

After the 60-day review done by state agencies, MDH must forward, within 30 days, a copy of Part 2 of the SWP plan to EQB for endorsement/approval, along with a recommendation regarding the endorsement/approval of the plan. EQB will have 60 days after receipt of Part 2 of the plan from MDH to act upon the plan.

**Notification of State Review Results** - The EQB will communicate the results of the State’s review to the public water supplier within 90 days after MDH has submitted Part 2 to EQB. Once Part 2 of the SWP plan has been approved/endorsed by EQB, the public water supplier can proceed with implementing the SWP plan. If the EQB does not endorse/approve the plan, the public water supplier will receive written notification that identifies the deficiency and the reasons for the lack of endorsement/disapproval. The public water supplier will need to resubmit the revised Part 2 of the SWP plan to MDH within 120 days. The State must follow the same principles for plan review as when Part 2 of the SWP plan was first submitted.

### **Submitting the Approved Part 2 to Units of Government**

The public water supplier or MDH will need to submit a copy of the approved Part 2 to appropriate local, state and federal units of government, or provide a notice defining how to obtain a copy within 30 days of EQB approval. The MDH and public water supply will need to coordinate this effort.

## **CHAPTER 8**

### **Implementing an SWP Plan**

Upon notification from EQB that the SWP plan has been approved, the public water supplier may proceed with implementation. This must begin within 60 days of approval notification and the public water supplier must notify local units of government within the DWSMA of the SWP plan adoption or future plan amendments. MDH will continue to work with the public water supplier on potential contaminant source control issues and coordinating involvement by state and local agencies with plan implementation. Issues and problems identified with implementing SWP plans will be forwarded to the Minnesota Environmental Quality Board by the Minnesota Department of Health.

## **CHAPTER 9**

### **Updating an SWP Plan**

Source water protection is an ongoing process and SWP plans need to be periodically reviewed and updated. Land and water use within the source water protection areas are likely to change over time and the SWP plan must be modified to reflect these changes. Public water suppliers will need to review and update their SWP plans 1) every ten years to ensure that their plans reflect current conditions within the source water protection areas; 2) when a new intake is added to a public water supply system and it is located beyond the boundaries of an approved source water protection area. The date the plan was originally approved by the EQB will be used to reference the ten-year period. The plan must be amended using the same procedures utilized in the original plan. To ensure continuous coverage of an SWP plan, the amendment process is to begin two years prior to the end of the ten-year review time period.

## **APPENDIX I**

### **MEMBERSHIP OF THE SOURCE WATER PROTECTION PLAN DEVELOPMENT FOR SURFACE WATER SYSTEMS ADVISORY AD HOC WORKGROUP**

Marilyn Bayerl  
Minnesota Lakes Association

Bernie Bullert  
American Water Works Association

Shelly Becklund  
Minnesota Association of Soil and Water Conservation Districts

Christopher Elvrum  
Metropolitan Council

Karen Evens  
Minnesota County Water Plan Coordinators

Richard Harju  
Minnesota League of Cities

Robyn Hoerr  
Minnesota Rural Water Association

Jim Japs  
Minnesota Department of Natural Resources

Bruce Kerfoot  
Transient Noncommunity Water Systems

Joe Martin  
Minnesota Farm Bureau Federation

Brent Mather  
Minnesota Department of Public Safety

Eric Mohring  
Minnesota Board of Water and Soil Resources

Charles Regan  
Minnesota Pollution Control Agency

Craig Sallstrom  
Minnesota Crop Production Retailers

Gretchen Sabel/ John Wells  
Minnesota Planning

Dan Stoddard  
Minnesota Department of Agriculture

Jane VanHunnik  
Upper Mississippi Headwaters Board

Dave Weirens  
Association of Minnesota Counties

John Wells  
Minnesota Planning

Mark Wettlaufer  
Minnesota Rural Water Association

Marie Zellar  
Clean Water Action Alliance

## APPENDIX II

### SURFACE WATER COMMUNITY PUBLIC WATER SUPPLIES

COMMUNITY NAME	WATER SOURCE
Aurora	St. James Pit
Beaver Bay	Lake Superior
Biwabik	Canton Pit
Chisholm	Fraser-Humphrey Pit
Duluth	Lake Superior
East Grand Forks	Red Lake River
Ely	Burntside Lake
Eleveth	St. Mary's Lake
Fairmont	Budd Lake
Fergus Falls	Wright Lake (Ottertail River)
Grand Marais	Lake Superior
Hoyt Lakes	Colby Lake
International Falls	Rainy River
Mankato	Minnesota/Blue Earth Rivers
McKinley	Corsica Pit
Minneapolis	Mississippi River
Moorhead	Red River of the North
St. Cloud	Mississippi River
St. Paul	Mississippi River/Vadnais Lakes Chain
Silver Bay	Lake Superior
Thief River Falls	Red Lake River
Two Harbors	Lake Superior
Virginia	Mesabi Mountain Pit

**APPENDIX III**

**STATE AGENCY PROGRAM SUPPORT FOR SOURCE WATER PROTECTION  
PROGRAM IMPLEMENTATION**

## **List of State Agency Programs Supporting Source Water Protection Program Implementation**

### **Board of Water and Soil Resources**

- Well Sealing Cost-Share
- Abandoned Well Inventory
- State Groundwater Cost-Share
- Local Water Planning
  - Comprehensive Local Water Planning
  - Metro Groundwater Planning
- Reinvest in Minnesota
- Wetland Conservation

### **Land Management Information Center**

- Groundwater Clearing-House

### **Metropolitan Council**

- Groundwater Modeling

### **Minnesota Department of Agriculture**

- Agricultural Chemicals Spills Response
- Agricultural Chemical Response and Reimbursement Account
- Nitrogen Fertilizer Management Plan
- Pesticide Management Plan
- Chemigation Permits
- Bulk Pesticide Storage
- Lawn and Turf Management

### **Minnesota Department of Health**

- Health Risk Limits
- Source Water Protection
- Public Water Supply
- Well Management
- Well Disclosure

### **Minnesota Department of Natural Resources**

- Aquatic Plant Management
- Floodplain Management
- Underground Gas Storage
- Regional Aquifer Studies
- Well Inventory
- Observation Wells

## **List of State Agency Programs Supporting Source Water Protection Program Implementation**

Page 2

### **Minnesota Department of Natural Resources - Continued**

- Geologic Sensitivity Mapping
- Shoreland Management
- County Geologic Atlas
- Mining
- Forestry
- Lake Hydrology
- Stream Hydrology
- Surface Water Technical Analysis
- Flood Damage Reduction Grant
- Mississippi River Critical Area
- Mississippi National River and Recreation Area Program
- Fisheries
- Project WET
- Wild and Scenic Rivers
- Endangered Species
- Water Appropriations

### **Minnesota Geological Survey**

- Regional Assessments

### **Minnesota Pollution Control Agency**

- Solid Waste Disposal
- Superfund and Site Assessment
- Waste Tire Management
- Underground Disposal Control
- Property Transfer Technical Assistance
- Potential Source of Groundwater Contamination Inventory
- Spills Response
- Hazardous Waste Management
- Pollution Prevention
- Underground Storage Tanks
- Leaking Underground Storage Tank
- Individual Sewage Treatment Systems
- State Disposal System Permits
- National Pollutant Discharge Elimination System Permit
- Clean Water Partnership

## **List of State Agency Programs Supporting Source Water Protection Program Implementation**

Page 3

### **Minnesota Pollution Control Agency - Continued**

- Sewage Sludge Management
- Feedlots
- Nonpoint Source Pollution Management
- Basin Planning and Management
- Total Maximum Daily Load
- Coastal Nonpoint Pollution
- Stormwater
- Wetland and Dredging

### **U.S. Geological Survey**

- Federal-State Cooperative Groundwater Program

### **Natural Resource Conservation Service**

- Conservation Reserve Program
- Environmental Quality Incentives Program
- Forestry Incentive Program
- Grazing Lands Conservation Program
- Resource Conservation and Development
- Soils
- Watersheds
- Wetlands Reserve Program
- Wildlife Habitat Incentive Program

### **Minnesota Planning/Environmental Quality Board**

- Community-Based Planning
- Land Use Planning and Zoning
- Environmental Review

## **APPENDIX IV**

### **DELINEATION SUB-WORKGROUP MEMBERS**

#### Delineation for Rivers and Streams

Dave Ford - Department of Natural Resources  
Chuck Regan - Pollution Control Agency  
Jim Stark - U.S. Geological Survey  
Chris Elvrum - Metropolitan Council  
Dave Brostrom - Private Consultant and River Defense Network  
Rich Pomerleau - Army Corps of Engineers  
Sheila Grow - Department of Health Hydrologist  
Mike Howe - Department of Health Planner

#### Delineation for Lakes

Amy Loiselle - Department of Natural Resources  
Joseph Magner - Pollution Control Agency  
Mark Tomasek - Pollution Control Agency  
Dave Ford - Department of Natural Resources  
Jim Walsh - Department of Health Hydrogeologist

#### Delineation for Mine Pits

Dave Brostrom - Private Consultant and River Defense Network  
Perry Jones - U.S. Geological Survey  
John Adams - Department of Natural Resources  
Robert Leibfried - Department of Natural Resources  
Joe Maki - Department of Natural Resources  
Arlo Knoll - Department of Natural Resources  
Jim Walsh - Department of Health Hydrogeologist

## **Recommendations for Delineating Source Water Protection Areas for Public Water Supplies Relying on Rivers and Streams**

Minnesota Department of Health  
September 17, 2002

The Source Water Subcommittee for delineating source water protection areas has developed a three-tiered approach for defining areas of protection for public water supplies that rely on rivers and streams for source water. Because surface water is inherently vulnerable to contamination, this approach is designed to protect drinking water while providing the eight different public water supply systems that rely on rivers and streams the flexibility to address various physical settings. The delineation criteria proposed below can be used by individual water utilities to fit their specific needs. The subcommittee recommends that another work group be convened to determine how to calculate time of travel.

**(1) Inner emergency management area:** The inner emergency management area is defined as the area in which the public water supply utility would have little or no time to respond to a direct discharge of contamination, other than to close the intake. Communication between emergency responders and the water utility will be essential for effective response action in this area. This is the area where a spill is most problematic because it is likely that a public water supply system would not have time to fill their reservoirs or adjust treatment technologies to address the spill.

The inner emergency management area should include the main stem of the river used as the water supply source, as well as all tributaries, sewers, tile lines, and ditches that discharge directly to the water within the time of travel distance necessary for a contaminant to reach the water supply intake before additional corrective actions could be taken. Time of travel distance for each water utility will vary according to system design, contaminant characteristics, and the physical attributes of the source water.

Delineation of the inner emergency management area is based on time of travel and should consider the following criteria:

- boundaries used for existing emergency response plans, minor watersheds that drain to waterways above an intake or, as a default, the source water assessment inner emergency response area;
- upstream hydrology/topography, such as permeability of soils and gradient of slopes;
- type of system (on-stream versus off-stream reservoirs, backup wells, etc.);
- how quickly the intake can be closed;
- how long the system can supply its daily demand while the intake is shut off;
- how quickly specialized treatment can be put on-line;
- time needed for an observer/responder to notify the water utility of the spill;
- number and types of potential significant contaminant sources, particularly those that have created water quality problems in the past;
- existence of major transportation routes (e.g., highways and railways) or pipelines that cross the waterways; and
- barges, boats, or other potential contaminant sources in direct contact with the waterways.

## **Recommendations for Delineating Source Water Protection Areas for Public Water Supplies Relying on Rivers and Streams**

### **Page 2**

**(2) Outer source water management area:** The outer source water management area is defined as the area where the impacts to drinking water from point and nonpoint sources of contamination can be minimized by preventive management. The guidance criteria for this protection area includes the guidance for defining assessment areas (Minnesota's Source Water Assessment Program, Minnesota Department of Health, February 5, 1999, page 20).

Delineation of the outer source water management area is based on time of travel to respond to a potential contaminant threat and should consider the following criteria:

- contaminants or potential contamination sources that the public water supplier feels present a risk to the water supply;
- existing water resource management/protection programs that have identified areas of concern within a watershed or types of potential contamination sources that are of concern for overall water quality;
- the general types of land uses and contaminant sources believed to exist within the watershed, including the existence of major transportation routes (e.g., highways and railways) and pipelines;
- minor watershed boundaries within the watershed; topography; man-made and natural drainage patterns; wetlands or other contaminant attenuation features; and hydrology, including lakes, dams, etc.; and
- the physical and chemical attributes of the source water being used.

**(3) Watershed above intake:** The third tier of protection for public water supplies relying on rivers or streams would be the entire watershed beyond the outer source water management area above the intake(s) for the water utility.

## **Recommendations for Delineating Source Water Protection Areas for Public Water Supplies Relying on Rivers and Streams**

**Page 3**

### **Land Management Suggestions**

- Management practices designed to minimize and prevent contamination from point and nonpoint sources within the outer source water management area also are applicable to the inner emergency management area.
- Governing units and programs within the watershed basin should be coordinated to prevent degradation of the source water.
- The inner emergency management area may be divided into two parts to prioritize protection strategies: (1) highly vulnerable areas within waterways and within a buffer along the waterways and (2) areas that drain directly to the highly vulnerable areas. Existing state shoreland zoning regulations can be used to define the minimum highly vulnerable buffer tracts along the waterways (e.g., rivers, streams, tributaries, storm sewers, tile lines, and ditches) since landowners already are required to conform to setback restrictions established in the state shoreland zoning law. It is anticipated that the boundaries of the buffer areas will change as land use changes. It will be important to govern land use changes within the highly vulnerable buffered section of the inner emergency management area, such as newly sewered developments, to minimize and manage impacts to the source water. An example of a management option for an area that could be included in the buffered area may involve only lending money for installing tile lines when a map of the existing and proposed tiled area is provided.
- Potential contaminant source inventory.
- Inner emergency management area: Existing information on potential contaminant sources should be evaluated for the entire the inner emergency management area. In addition, the locations of the potential contaminant sources should be field verified and documented on a map for the highly vulnerable buffer area.
- Outer source water management area: The potential contaminant source inventory mainly can be conducted by searching available data bases. Only the locations of critical areas of potential point and nonpoint contaminant sources need to be field verified.
- Watershed basin: Point source and nonpoint sources of contamination within this area should be evaluated for their possible impact on water quality at the intake. Only critical areas of major activities need to be managed.

### **Recommendation**

- Another work group should be convened to determine how to calculate time of travel.

### **Glossary of Terms**

**State shoreland regulations:** land use restricted in areas 1000 feet from a lake and 300 feet from a stream.

**Significant contaminant sources:** whatever sources the treatment plant cannot routinely treat.

## Recommendations for Delineation of Source Water Protection Areas for Public Water Supplies Relying on Lakes

Minnesota Department of Health  
September 17, 2002

The Source Water Subcommittee for delineating source water protection areas has developed a three-tiered approach for defining areas of protection for public water supplies that rely on lakes for source water. Because surface water is inherently vulnerable to contamination, this approach is designed to protect drinking water while providing those public water supply systems that rely on lakes the flexibility to address various physical settings. The delineation criteria proposed below can be used by individual water suppliers to fit their specific needs.

**(1) Inner emergency management area:** The inner emergency management area is defined as the area in which the public water supplier would have little or no time to respond to a direct discharge of contamination, other than to close the intake. Communication between emergency responders and the water operator will be essential for effective response action in this area. This is the area where a spill is most problematic because it is likely that a public water supply system would not have time to fill their reservoirs or adjust treatment technologies to address the spill.

The inner emergency management area should be based on the volume of water that would likely be pumped in the time needed for the water supplier to respond to an emergency that threatens the water quality at the intake. In the case of an intake that is situated in relatively still water away from known or predictable currents, this volume of water will take the form of a fixed radius around the intake. The following formula, which calculates the radius of a cylinder, may be useful for this purpose:

$$r = \sqrt{\frac{Q}{(L)(\pi)}}$$

where r is the radius around the intake in feet, Q is the volume of water pumped over the emergency response time needed for a particular water supplier in ft<sup>3</sup>, and L is the minimum depth of the intake below the surface of the lake in feet.

For example, if a water supplier pumps 500,000 gallons per day (66,845 ft<sup>3</sup>), requires an emergency response time of 1 day and has an intake that is located 15 feet below the lowest known lake level, then their inner zone radius would be:

$$r = \sqrt{\frac{66,845 \text{ ft}^3}{(15)(\pi)}} = 38 \text{ ft}$$

In the event that the intake is situated in an area where lake currents are relatively consistent and predictable, then this radius should be made elongate in the up-current direction. The extent of this elongated capture zone is dependent on the average rate of flow in the current. The radius should be extended up-current to the emergency response time required by the water supplier.

## **Recommendations for Delineation of Source Water Protection Areas for Public Water Supplies Relying on Lakes**

### **Page 2**

For example, if a water supplier required 1 day for an emergency response time and the lake current past the intake was estimated at 1000 feet per day, then the inner emergency response area would consist of the calculated radius around the intake, plus an extension of that radius out to a distance of 1000 feet in the up-current direction.

In the event that the radius or its extension intercepts the lakeshore, then a land surface area should be added to the radius around the intake. The boundaries of this additional land surface area should reflect the potential for surface runoff to reach the lake within the emergency response time specified by the water supplier, minus the time of travel from the lakeshore to the intake.

In the event that the radius around the intake intersects man-made drainage features, such as storm-water drains, then the entire storm-water drainage area must be included in the inner emergency response zone unless a storm-water management plan is in place to show that 1) certain portions of that area are physically excluded from draining to the intake area, 2) the storm-water is sufficiently treated so as not to present a threat to the water supplier or 3) an evaluation has been conducted to show that the time of travel to the surface water intake exceeds the emergency response time.

In the event that the radius or its extension intercepts a river or stream, then that river or stream should be included in the inner emergency response zone up to a point where the time of travel on the stream falls within the emergency response requirements of the water supplier. The delineation of this component of the inner emergency response zone should be consistent with that recommended by the Technical Subcommittee for Delineating Source Water Protection Areas for Public Water Suppliers Relying on Rivers and Streams. This approach is outlined below in italics.

*The inner emergency management area should include the main stem of the river used as the water supply source, as well as all tributaries, sewers, tile lines, and ditches that discharge directly to the water within the time of travel distance necessary for a contaminant to reach the water supply intake before additional corrective actions could be taken. Time of travel distance for each water utility will vary according to system design, contaminant characteristics, and the physical attributes of the source water.*

*Delineation of the inner emergency management area is based on time of travel and should consider the following criteria:*

- *boundaries used for existing emergency response plans, minor watersheds that drain to waterways above an intake or, as a default, the source water assessment inner emergency response area;*
- *upstream hydrology/topography, such as permeability of soils and gradient of slopes;*
- *type of system (on-stream versus off-stream reservoirs, backup wells, etc.);*
- *how quickly the intake can be closed;*

## Recommendations for Delineation of Source Water Protection Areas for Public Water Supplies Relying on Lakes

### Page 3

- *how long the system can supply its daily demand while the intake is shut off;*
- *how quickly specialized treatment can be put on-line;*
- *time needed for an observer responder to notify the water utility of the spill;*
- *number and types of potential significant contaminant sources, particularly those that have created water quality problems in the past;*
- *existence of major transportation routes (e.g., highways and railways) or pipelines that cross the waterways; and*
- *barges, boats, or other potential contaminant sources in direct contact with the waterways.*

**(2) Outer source water management area:** The outer source water management area is defined as the area where the impacts to drinking water from point and nonpoint sources of contamination can be minimized by preventive management. The guidance criteria for this protection area includes the guidance for defining assessment areas (Minnesota's Source Water Assessment Program, Minnesota Department of Health, February 5, 1999, page 20). This guidance is identical to that suggested by the Technical Subcommittee for Delineating Source Water Protection Areas for Public Water Suppliers Relying on Rivers and Streams.

Delineation of the outer source water management area is based on time of travel to respond to a potential contaminant threat and should consider the following criteria:

- contaminants or potential contamination sources that the public water supplier feels present a risk to the water supply;
- existing water resource management/protection programs that have identified areas of concern within a watershed or types of potential contamination sources that are of concern for overall water quality;
- the general types of land uses and contaminant sources believed to exist within the watershed, including the existence of major transportation routes (e.g., highways and railways) and pipelines;
- minor watershed boundaries within the watershed; topography; man-made and natural drainage patterns; wetlands or other contaminant attenuation features; and hydrology, including lakes, dams, etc.; and
- the physical and chemical attributes of the source water being used.

**3) Watershed above intake:** The third tier of protection for public water supplies relying on lakes would be the entire watershed beyond the outer source water management area above the intake(s) for the water supplier.

## **Recommendations for Delineation of Source Water Protection Areas for Public Water Supplies Relying on Mine Pits**

Minnesota Department of Health  
September 20, 2002

The Source Water Subcommittee for delineating source water protection areas has developed a two-tiered approach for defining areas of protection for public water supplies that rely on mine pits for source water. Because surface water is inherently vulnerable to contamination, this approach is designed to protect drinking water while providing those public water supply systems that rely on mine pits the flexibility to address various physical settings. The delineation criteria proposed below can be used by individual water suppliers to fit their specific needs.

**(1) Inner emergency management area:** The inner emergency management area for mine pits should reflect those areas capable of recharging the mine pit over a relatively short period of time; such inflows could pose a risk to the water supply if they were to contain contaminants. This is the area where a spill is most problematic because it is likely that a public water supply system would not have time to fill their reservoirs or adjust treatment technologies to address the spill. Because previously existing natural surface water drainage features, such as rivers and streams, have been diverted away from mine pits, short time of travel inflows are primarily restricted to precipitation-derived runoff from the immediate area of the pit rim or from other mine pits to which it is physically connected. For that reason, the inner emergency management area should be based on the topographic divide around the rim of the source water mine pit, plus those of adjacent mine pits that show evidence of direct physical connection. Direct physical connection can take the form of natural features, such as zones of intense fracturing or faulting, or man-made features, such as mine shafts, drifts or adits, or drainage conduits such as culverts or pipes. The topographic divide that is delineated must account for man-made features such as waste rock stockpiles and culverts. These features are not always represented accurately on existing topographic maps, particularly in areas that are being actively mined. As a result, the topographic divide must be verified based on physical inspection of the pit rim area rather than be derived solely from existing uncorrected topographic maps or digital elevation models.

**(2) Outer source water management area:** The outer source water management area is defined as the area where the impacts to drinking water from point and nonpoint sources of contamination can be minimized by preventive management. Because natural surface water drainage features have been diverted away from mine pits, this outer management area should reflect groundwater contribution to the source water mine pit. These groundwater inflows can represent a substantial portion of the water budget of a mine pit, particularly in the case of a pit that is rapidly filling. The outer source water management area should be delineated based on the groundwater divide in either the Biwabik Iron Formation or the glacial drift, whichever is broader, that surrounds the mine pit being used as a public water supply, plus any other pits to which the source water pit has a direct physical connection. The groundwater divides should be determined using static water level data from wells, natural ore mine pits and lakes.

**APPENDIX V**

**LIST OF DATA ELEMENTS**

## **LIST OF DATA ELEMENTS**

### **Physical Environment**

#### Precipitation

- Existing map or list of local precipitation gauging stations; and
- Existing table showing the average monthly and annual precipitation in inches for the preceding five years.

#### Geology

- Existing geologic map and a description of the geology, including aquifers, confining layers, recharge areas, discharge areas, sensitive areas as defined in Minnesota Statutes, section 103H.005, subdivision 13, and groundwater flow characteristics;
- Existing records of the geologic materials penetrated by wells, borings, exploration test holes, or excavations, including those submitted to the department;
- Existing borehole geophysical records from wells, borings, and exploration test holes; and
- Existing surface geophysical studies.

#### Soil

- Existing maps of the soils and a description of soil infiltration characteristics; and
- Existing description or an existing map of known eroding lands that are causing sedimentation problems.

#### Water Resources

- Existing map of the boundaries and flow directions of major watershed units and minor watershed units;
- Existing map and a list of public waters as defined in Minnesota Statutes, section 103G.005, subdivision 15, and public drainage ditches;
- Existing shoreland classifications of the public waters listed under subitem (2), pursuant to part 6120.3000 and Minnesota Statutes, sections 103F.201 to 103F.221;
- Existing map of wetlands regulated under Chapter 8420 and Minnesota Statutes, sections 103G.221 to 103G.2373; and
- Existing map showing those areas delineated as floodplain by existing local ordinances.

### **Land Use**

#### Land Use

- Existing map of parcel boundaries;
- Existing map of political boundaries;
- Existing map of public land surveys including township, range, and section;
- Map and an inventory of the current and historical agricultural, residential, commercial, industrial, recreational, and institutional land uses and potential contaminant sources;
- Existing comprehensive land-use map; and
- Existing zoning map.

#### Public Utility Services

- Existing map of transportation routes or corridors;
- Existing map of storm sewers, sanitary sewers, and public water supply systems;
- Existing map of the gas and oil pipelines used by gas and oil suppliers;
- Existing map or list of public drainage systems.

## List of Data Elements

Page 2

### Water Quantity

#### Surface Water

- Description of high, mean, and low flows on streams;
- List of lakes where the state has established ordinary high water marks;
- List of permitted withdrawals from lakes and streams, including source, use, and amounts withdrawn;
- List of lakes and streams for which state protected levels or flows have been established; and
- Description of known water-use conflicts, including those caused by groundwater pumping.

#### Groundwater

- List of wells covered by state appropriation permits, including amounts of water appropriated, type of use, and aquifer source;
- Description of known well interference problems and water use conflicts; and
- List of state environmental bore holes, including unique well number, aquifer measured, years of record, and average monthly levels.

### Water Quality

#### Surface Water

- Map or list of the state water quality management classification for each stream and lake; and
- Summary of lake and stream water quality monitoring data, including:
  - bacteriological contamination indicators;
  - inorganic chemicals;
  - organic chemicals;
  - sedimentation;
  - dissolved oxygen; and
  - excessive growth or deficiency of aquatic plants.

#### Groundwater

- Summary of water quality data, including:
  - bacteriological contamination indicators;
  - inorganic chemicals; and
  - organic chemicals;
- List of water chemistry and isotopic data from wells, springs, or other groundwater sampling points;
- Report of groundwater tracer studies;
- Site study and well water analysis of known areas of groundwater contamination;
- Property audit identifying contamination; and
- Report to the Minnesota Department of Agriculture and the Minnesota Pollution Control Agency of contaminant spills and releases.

## **APPENDIX VI**

### **LIST OF POTENTIAL SOURCES OF CONTAMINATION**

## POTENTIAL SOURCES OF CONTAMINATION

These definitions were taken from state statute or rule whenever possible. When regulatory (official) definitions were not available, they were developed in cooperation with the agency which has administrative authority over a specific potential contamination source. The list of codes is cross referenced to the Standard Industrial Codes (SIC) in use at the federal level. The SIC number was taken from the Standard Industrial Classification Manual (1987), U.S. OMB.

### Key to Definition Type:

- \* = Regulatory definition exists.
- o = Ad hoc definition used.

Definition Type	PCSI Code	Activity	SIC Group Number
<b>Agricultural</b>			
*	AA_	Aqua Farming	0273
o	AC_	Continuous Crop	01
*	AF_	Feedlot	021, 024, 025
o	AI_	Irrigated Crop	01
*	AL_	Livestock	02
o	ALO	Logging	2411
*	AM_	Manure Storage	02
*	AP_	Pasture	02
*	AS_	Seasonal Stockpiling of Fertilizer	01
o	AX_	Chemical Mixing	287
o	AHS	Historical Use	
<b>Bulk Storage/Material Stockpiling</b>			
o	BCG	Compressed Gasses	1389, 5984, 4925 5169, 2813
o	BCL	Coal	299, 5052, 491
o	BFR	Fertilizer	5191
*	BPS	Pesticide	516
*	BPT	Petroleum Products	517
o	BSE	Seasonal Storage	
o	BSS	Salt Storage	
o	BSY	Salvage Yard (Hardware - Lumber)	7389, 179

**Potential Sources of Contamination - Page 2**

<b>Definition Type</b>	<b>PCSI Code</b>	<b>Activity</b>	<b>SIC Group Number</b>
*	BTI	Tires	5014, 301
o	BTW	Treated Wood	2491, 5211
o	BUD	Unidentified Drum	
o	BVC	Volatile Organic Chemicals	5169
*	BWA	Hazardous Waste	
<b>Commercial</b>			
o	CAI	Airport	45
o	CAR	Agricultural Chemical Retail	525, 526
o	CAW	Agricultural Chemical Warehouse	5191
o	CBO	Boatyard/	44
		Boatworks	37
o	CCE	Cemetery	6553
o	CCP	Cement Products	32
o	CDC	Dry Cleaning	7216
o	CEX	Exterminator	7342
o	CFP	Food Processing	20
o	CFR	Furniture Refinishing	764
o	CHA	Hardware	5251
o	CHM	Hotel/Motel	70
o	CIS	Implement Sales	5083
o	CLD	Laundromat	7215
o	CLO	Logging Contractor	2411
o	CLS	Lawn Services/Snow Plowing	73
o	CLU	Lumberyard	5031 and 52
*	CMO	Mortuary	726
o	CMP	Medical/Dental/Chiropractic/Veterinary Practice (Health Services)	80
o	CMS	Metal Scrap and Salvage	5093
o	CMW	Metal Working/Machine Shop	34
o	COF	Office	
o	CPA	Painting/Renovating	172

**Potential Sources of Contamination - Page 3**

<b>Definition Type</b>	<b>PCSI Code</b>	<b>Activity</b>	<b>SIC Group Number</b>
o	CPD	Petroleum Product Distributor	517
o	CPH	Photographic Services	7384
o	CPR	Printing	27, 7334
*	CRF	Restaurant/Food Service	58
o	CSL	Slaughtering	201
o	CSS	Service Station	554, 753
o	CTX	Taxidermy	7699
o	CTY	Trainyard	40
o	CVP	Vehicle Storage/Parking	7521, 4226
*	CVS	Vehicle Sales	551 and 552
o	CVJ	Vehicle Junk Yard	5093, 5015
o	CWA	Warehouse	422

**General**

*	GC_	Cesspool	
*	GDI	Diesel Fuel Storage	
o	GDR	Drainage Well	
o	GDS	Storm Water	
o	GDT	Agricultural Drain	
*	GDW	Dry Well	
o	GE_	Equipment/Vehicle Washing	
*	GF_	Fuel Oil Storage	
o	GFP	Fuel Pumps	
*	GG_	Gasoline Storage	
o	GH_	Community Water Supply Connection	
*	GKG	Kerosene/Jet Fuel	
o	GL_	Lawn >1 Acre	
o	GP_	Propane Fuel	
o	GR_	Equipment/Vehicle Repair	
o	GS_	Sewer Connection	
*	GT_	Septic Tank	

Potential Sources of Contamination - Page 4

Definition Type	PCSI Code	Activity	SIC Group Number
*	GW_	Water Well(s)	
*	GWO	Waste Oil	
<b>Industrial</b>			
*	IAS	Asphalt Production	29
o	ICG	Coal Gasification Plant	2813
o	ICM	Chemical Manufacturing	28
o	ICS	Cleaning Supply Manufacturing	284
o	IEG	Electrical Power Generation	49
o	IEM	Electrical Products Manufacturing	36 (Noncomputer) 357 (Computer)
o	IET	Electrical Power Transmission	49
o	IFM	Furniture Manufacturing	25
o	IFW	Foundry/Metal Working	34
o	ILU	Lumber Mill	24
o	IMP	Metal Plating	347
*	IMQ	Mining/Quarrying	14 (Nonmetallic) 10 (Metallic)
o	ING	Natural Gas Storage, Distribution	492
o	IPA	Paint Manufacturing	28
o	IPM	Paper Mill	26
*	IPP	Petroleum Pipeline	46
*	IPR	Petroleum Refining/Processing	2911
o	IWT	Wood Treating	2491
<b>Miscellaneous</b>			
o	MAB	Animal Burial	
o	MCF	Catastrophic Fire	
o	MHD	Homestead Dump	
o	MSE	Soil Erosion	
*	MSH	Sinkhole	

Potential Sources of Contamination - Page 5

Definition Type	PCSI Code	Activity	SIC Group Number
<b>Institutional</b>			
o	NCH	Church	8661
o	NFS	Fire Station	9224
o	NGO	Government/Court Offices	9 and 921
o	NHC	Hospital/Clinic	806
o	NLI	Library	82
o	NMI	Military Installation	9711
o	NMU	Museum/Gallery	8412
o	NPC	Prison/Correctional Facility	9223
o	NPL	State/Federal Land	
o	NPO	Post Office	43
o	NPS	Public Safety (Police, etc.)	9229
o	NSC	School	82
<b>Recreational</b>			
o	RAP	Amusement Park	7996
o	RCG	Campground	7033
o	RFG	Fair Grounds	075
o	RGC	Golf Course	799
o	RPA	Park/Playground	
o	RRC	Racing Track/Casino	7948 and 7999
o	RRE	Resort	799
o	RSF	Sports Facility	7941, 799
o	RSR	Shooting Range/Game Farm	971
o	RZO	Zoo/Arboretum	8422

Potential Sources of Contamination - Page 6

Definition Type	PCSI Code	Activity	SIC Group Number
<b>Waste Management</b>			
o	WAD	Ash Disposal	4953
*	WAF	Landfarm	
o	WAG	Lagoon	
*	WCF	Composting Facility	2875
*	WIN	Incinerator	4953
o	WLF	Landfill	4953
*	WLA	Permitted - Active	
*	WLD	Demolition Debris	
o	WLI	Permitted - Closed	
*	WLO	Open Dump	
o	WLP	Promiscuous Dump	
*	WRF	Recycling Facility	4953
*	WSD	Sludge Disposal	4953
o	WSP	Spill	
*	WST	Septage Storage/Disposal	
*	WSW	Storm Water Retention Pond	
o	WTP	Tailings Impoundment/Mine Tailings	
*	WTS	Transfer Station	4953
o	WU_	Superfund Site	
o	WUC	CERCLIS Site	
*	WUF	Federal (NPL)	
*	WUS	State (PLP)	
*	WWP	Waste Processing/Treatment Facility	4953
o	WWS	Waste Water Seepage Pond	

**APPENDIX VII**

**LIST OF CONTAMINANTS REGULATED BY THE SAFE DRINKING  
WATER ACT**



# National Primary Drinking Water Standards

Contaminant	MCLG <sup>1</sup> (mg/L) <sup>2</sup>	MCL or TT <sup>1</sup> (mg/L) <sup>2</sup>	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water
<b>MICROORGANISMS</b>				
<i>Cryptosporidium</i>	zero	TT <sup>3</sup>	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and fecal animal waste
<i>Giardia lamblia</i>	zero	TT <sup>3</sup>	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste
Heterotrophic plate count (HPC)	n/a	TT <sup>3</sup>	HPC has no health effects; it is an analytic method used to measure the variety of bacteria that are common in water. The lower the concentration of bacteria in drinking water, the better maintained the water system is.	HPC measures a range of bacteria that are naturally present in the environment
<i>Legionella</i>	zero	TT <sup>3</sup>	Legionnaire's Disease, a type of pneumonia	Found naturally in water; multiplies in heating systems
Total Coliforms (including fecal coliform and <i>E. coli</i> )	zero	5.0% <sup>4</sup>	Not a health threat in itself; it is used to indicate whether other potentially harmful bacteria may be present <sup>5</sup>	Coliforms are naturally present in the environment; as well as feces; fecal coliforms and <i>E. coli</i> only come from human and animal fecal waste.
Turbidity	n/a	TT <sup>3</sup>	Turbidity is a measure of the cloudiness of water. It is used to indicate water quality and filtration effectiveness (e.g., whether disease-causing organisms are present). Higher turbidity levels are often associated with higher levels of disease-causing microorganisms such as viruses, parasites and some bacteria. These organisms can cause symptoms such as nausea, cramps, diarrhea, and associated headaches.	Soil runoff
Viruses (enteric)	zero	TT <sup>3</sup>	Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste
<b>DISINFECTION BYPRODUCTS</b>				
Bromate	zero	0.010	Increased risk of cancer	Byproduct of drinking water disinfection
Chlorite	0.8	1.0	Anemia; infants & young children: nervous system effects	Byproduct of drinking water disinfection
Haloacetic acids (HAA5)	n/a <sup>6</sup>	0.060	Increased risk of cancer	Byproduct of drinking water disinfection
Total Trihalomethanes (TTHMs)	none <sup>7</sup> n/a <sup>6</sup>	0.10 0.080	Liver, kidney or central nervous system problems; increased risk of cancer	Byproduct of drinking water disinfection
<b>DISINFECTANTS</b>	MRDL <sup>1</sup> (mg/L) <sup>2</sup>	MRDL <sup>1</sup> (mg/L) <sup>2</sup>		

Contaminant	MCLG <sup>1</sup> (mg/L) <sup>2</sup>	MCL or TT <sup>1</sup> (mg/L) <sup>2</sup>	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water
Chloramines (as Cl <sub>2</sub> )	MRDLG=4	MRDL=4.0 <sup>1</sup>	Eye/nose irritation; stomach discomfort, anemia	Water additive used to control microbes
Chlorine (as Cl <sub>2</sub> )	MRDLG=4	MRDL=4.0 <sup>1</sup>	Eye/nose irritation; stomach discomfort	Water additive used to control microbes
Chlorine dioxide (as ClO <sub>2</sub> )	MRDLG=0.8 <sup>1</sup>	MRDL=0.8 <sup>1</sup>	Anemia; infants & young children: nervous system effects	Water additive used to control microbes
<b>INORGANIC CHEMICALS</b>				
Antimony	0.006	0.006	Increase in blood cholesterol; decrease in blood sugar	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder
Arsenic	0 <sup>7</sup>	0.010 as of 1/23/06	Skin damage or problems with circulatory systems, and may have increased risk of getting cancer	Erosion of natural deposits; runoff from orchards, runoff from glass & electronics production wastes
Asbestos (fibers >10 micrometers)	7 million fibers per Liter (MFL)	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	Allergic dermatitis	Discharge from steel and pulp mills; erosion of natural deposits
Copper	1.3	TT <sup>8</sup> ; Action Level= 1.3	Short term exposure: Gastrointestinal distress Long term exposure: Liver or kidney damage People with Wilson's Disease should consult their personal doctor if the amount of copper in their water exceeds the action level	Corrosion of household plumbing systems; erosion of natural deposits
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	TT <sup>8</sup> ; Action Level= 0.015	Infants and children: Delays in physical or mental development; children could show slight deficits in attention span and learning abilities Adults: Kidney problems; high blood pressure	Corrosion of household plumbing systems; erosion of natural deposits

Contaminant	MCLG <sup>1</sup> (mg/L) <sup>2</sup>	MCL or TT <sup>1</sup> (mg/L) <sup>2</sup>	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water
Mercury (inorganic)	0.002	0.002	Kidney damage	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills and croplands
Nitrate (measured as Nitrogen)	10	10	Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Nitrite (measured as Nitrogen)	1	1	Infants below the age of six months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	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	0.0005	0.002	Hair loss; changes in blood; kidney, intestine, or liver problems	Leaching from ore-processing sites; discharge from electronics, glass, and drug factories
<b>ORGANIC CHEMICALS</b>				
Acrylamide	zero	TT <sup>9</sup>	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 or reproductive problems	Runoff from herbicide used on row crops
Benzene	zero	0.005	Anemia; decrease in blood platelets; increased risk of cancer	Discharge from factories; leaching from gas storage tanks and landfills
Benzo(a)pyrene (PAHs)	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, nervous system, or reproductive system	Leaching of soil fumigant used on rice and alfalfa
Carbon tetrachloride	zero	0.005	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	Discharge 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

Contaminant	MCLG <sup>1</sup> (mg/L) <sup>2</sup>	MCL or TT <sup>1</sup> (mg/L) <sup>2</sup>	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water
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 drug and 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	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	Liver problems	Residue of banned insecticide
Epichlorohydrin	zero	TT <sup>9</sup>	Increased cancer risk, and over a long period of time, stomach problems	Discharge from industrial chemical factories; an impurity of some water treatment chemicals
Ethylbenzene	0.7	0.7	Liver or kidneys problems	Discharge from petroleum refineries
Ethylene dibromide	zero	0.00005	Problems with liver, stomach, reproductive system, or kidneys; 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 heptachlor
Hexachlorobenzene	zero	0.001	Liver or kidney problems; reproductive difficulties; increased risk of cancer	Discharge from metal refineries and agricultural chemical factories
<b>Hexachlorocyclopent adiene</b>	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 cattle, lumber, gardens
Methoxychlor	0.04	0.04	Reproductive difficulties	Runoff/leaching from insecticide used on fruits, vegetables, alfalfa, livestock

Contaminant	MCLG <sup>1</sup> (mg/L) <sup>2</sup>	MCL or TT <sup>1</sup> (mg/L) <sup>2</sup>	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water
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 cancer risk	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, or circulatory system problems	Discharge from rubber and plastic factories; leaching from landfills
Tetrachloroethylene	zero	0.005	Liver problems; increased risk of cancer	Discharge from factories and dry cleaners
Toluene	1	1	Nervous system, kidney, or liver problems	Discharge from petroleum factories
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 metal degreasing sites and other factories
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
<b>RADIONUCLIDES</b>				
Alpha particles	none <sup>7</sup>	15 picocuries per Liter (pCi/L)	Increased risk of cancer	Erosion of natural deposits of certain minerals that are radioactive and may emit a form of radiation known as alpha radiation
Beta particles and photon emitters	none <sup>7</sup>	4 millirems per year (mrem/yr)	Increased risk of cancer	Decay of natural and man-made deposits of certain minerals that are radioactive and may emit forms of radiation known as photons and beta radiation
Radium 226 and Radium 228 (combined)	none <sup>7</sup>	5 pCi/L	Increased risk of cancer	Erosion of natural deposits

Contaminant	MCLG <sup>1</sup> (mg/L) <sup>2</sup>	MCL or TT <sup>1</sup> (mg/L) <sup>2</sup>	Potential health effects from exposure above the MCL	Common sources of contaminant in drinking water
Uranium	zero	30 ug/L as of 12/08/03	Increased risk of cancer, kidney toxicity	Erosion of natural deposits

## NOTES

### 1 - Definitions

- Maximum Contaminant Level Goal (MCLG) - The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.
- Maximum Contaminant Level (MCL) - The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.
- Maximum Residual Disinfectant Level Goal (MRDLG) - The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
- Maximum Residual Disinfectant Level (MRDL) - The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
- Treatment Technique (TT) - A required process intended to reduce the level of a contaminant in drinking water.

2 - Units are in milligrams per liter (mg/L) unless otherwise noted. Milligrams per liter are equivalent to parts per million (ppm).

3 - EPA's surface water treatment rules require systems using surface water or ground water under the direct influence of surface water to (1) disinfect their water, and (2) filter their water or meet criteria for avoiding filtration so that the following contaminants are controlled at the following levels:

- *Cryptosporidium* (as of 1/1/02 for systems serving >10,000 and 1/14/05 for systems serving <10,000) 99% removal.
- *Giardia lamblia*: 99.9% removal/inactivation
- Viruses: 99.99% removal/inactivation
- *Legionella*: No limit, but EPA believes that if *Giardia* and viruses are removed/inactivated, *Legionella* will also be controlled.
- Turbidity: At no time can turbidity (cloudiness of water) go above 5 nephelometric 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 in any month. As of January 1, 2002, turbidity may never exceed 1 NTU, and must not exceed 0.3 NTU in 95% of daily samples in any month.
- HPC: No more than 500 bacterial colonies per milliliter
- Long Term 1 Enhanced Surface Water Treatment (Effective Date: January 14, 2005): Surface water systems or (GWUDI) systems serving fewer than 10,000 people must comply with the applicable Long Term 1 Enhanced Surface Water Treatment Rule provisions (e.g. turbidity standards, individual filter monitoring, *Cryptosporidium* removal requirements, updated watershed control requirements for unfiltered systems).
- Filter Backwash Recycling: The Filter Backwash Recycling Rule requires systems that recycle to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or at an alternate location approved by the state.

4 - 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 per month.) Every sample that has total coliform must be analyzed for either fecal coliforms or *E. coli* if two consecutive TC-positive samples, and one is also positive for *E. coli* fecal coliforms, system has an acute MCL violation.

5 - Fecal coliform and *E. coli* are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Disease-causing microbes (pathogens) in these wastes can cause diarrhea, cramps, nausea, headaches, or other symptoms. These pathogens may pose a special health risk for infants, young children, and people with severely compromised immune systems.

6 - Although there is no collective MCLG for this contaminant group, there are individual MCLGs for some of the individual contaminants:

- Haloacetic acids: dichloroacetic acid (zero); trichloroacetic acid (0.3 mg/L)
- Trihalomethanes: bromodichloromethane (zero); bromoform (zero); dibromochloromethane (0.06 mg/L)

7 - MCLGs were not established before the 1986 Amendments to the Safe Drinking Water Act. The standard for this contaminant was set prior to 1986. Therefore, there is no MCLG for this contaminant.

8 - Lead and copper are regulated by a Treatment Technique that requires systems to control the corrosiveness of their water. If more than 10% of tap water samples exceed the action level, water systems must take additional steps. For copper, the action level is 1.3 mg/L, and for lead is 0.015 mg/L.

9 - Each water system must certify, in writing, to the state that when it uses acrylamide and/or epichlorohydrin to treat water, 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).

Office of Water (4606)

EPA 816-F-02-013

[www.epa.gov/safewater](http://www.epa.gov/safewater)

July 2002

**For More Information:**  
**Call the Safe Drinking Water Hotline, 1-800-426-4791**

## **APPENDIX VIII**

### **LIST OF GUIDANCE DOCUMENTS OUTLINING MANAGEMENT STRATEGIES**

Management Strategies for Hazardous Waste and Household Hazardous Waste

Management Strategies for Above-Ground and Underground Storage Tanks

Management Strategies for Urban Stormwater

Management Strategies for Wells

Management Strategies for Feedlots and Manure Management

Management Strategies for On-Site Sewage Systems

Management Strategies for Row Crop Farming

Management Strategies for Turf Management

The guidance documents listed can be requested by calling the Minnesota Department of Health, Environmental Health Division, Drinking Water Protection Section, at 651/215-0800. Please tell the receptionist that you are requesting a copy of a guidance document and ask for the exact guidance title. A copy of the guidance can be mailed to you.