APPENDIX 3

GUIDANCE TO THE ST. CLOUD, ST. PAUL, AND MINNEAPOLIS SOURCE WATER PROTECTION TEAMS ON THE DELINEATION OF SOURCE WATER PROTECTION AREAS

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UPPER MISSISSIPPIPI RIVER SOURCE WATER PROTECTION PROJECT

NOVEMBER 10, 2004

BACKGROUND

This document has been prepared to provide guidance to the St. Cloud, St. Paul, and Minneapolis Source Water Protection Teams for use in delineating Source Water Protection Areas for their respective water utilities. This guidance is based on the work of two groups: 1) A source water protection delineation panel (convened in 2004) of technical experts from the Minnesota Department of Natural Resources (MDNR), the Minnesota Pollution Control Agency (MPCA), and the Minnesota Department of Health (MDH) and 2) a source water subcommittee (convened in 2002) on public water suppliers relying on rivers and streams. Both of these groups prepared reports and recommendations. This guidance document is based on the work and deliberations of these two groups.

This guidance relates to the data requirements necessary to support the delineation of the four source water protection areas for water suppliers relying on surface waters. For each surface water-based system, these areas include: 1) “Priority Area A”; 2) “Priority Area B”; 3) the “Drinking Water Supply Management Area”, and 4) the “Source Water Protection Watershed.”

Priority Area A 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. Priority Area A also addresses those potential sources of contamination that could pose an immediate health concern to water users.

Priority Area B is defined as the area where the impacts to drinking water from point and nonpoint sources of contamination can be minimized by preventive management. Priority Area B also addresses those potential sources of contamination that could cause long-term or frequent health effects to water users.

The Drinking Water Supply Management Area (DWSMA) is a delineated area encompassing Priority Areas A and B. The DWSMA boundaries are geographic features such as road, railroads, Public Land Survey lines, property or fence lines, public utility service lines, or water features. The DWSMA delineation must conform to the Priority Area A and B delineations as much as possible.

The Source Water Protection Area Watershed is the entire drainage basin for the source water, up to the state boundaries.

This advice and guidance will also provide the technical foundation by which local units of government, Minnesota state agencies, and the U.S. Environmental Protection Agency can review and endorse delineated source water protection areas for surface water suppliers.

The development of source water protection plans needs to address 1) the types of data that are necessary to delineate source water protection areas, 2) the level of detail necessary to support this delineation, and 3) the level of technical information that should be provided to the source water protection teams to support the delineation of source water protection areas. These technical issues are described in the following discussion. Following this discussion, advice is offered as to how these data elements could be applied by the source water protection teams in the delineation of source water protection areas for St. Cloud, St. Paul, and Minneapolis.

TECHNICAL DISCUSSION OF THE DATA ELEMENTS

The data elements that are most significant to delineating source water protection (swp) areas are geology, soils, land use, surface water quality and quantity, ground water quality and quantity, and precipitation (as it relates to hydrology). All components of the environment are interrelated, and these data elements must be evaluated relative to one another and with respect to contaminant source locations and land use factors. Plans for future land use within delineated priority areas also have to be considered.

All of these factors also have to be considered within a “time of travel” context, particularly in the delineation of Priority Area A. In their respective source water assessments, St. Cloud, St. Paul, and Minneapolis each adopted an 8-hour time of travel in delineating the source water assessment equivalent of Priority Area A. This 8-hour period was selected because each water supplier determined that 8 hours was needed to maximize their finished water storage capacity and close their water intake. Time of travel is the central delineation component for Priority Area A. However, this 8-hour time of travel assumption should be reevaluated by the suppliers and their respective source water protection teams as part of the delineation process by comparing high, medium, and low flow scenarios.

Geology/Ground Water

In most cases, ground water quality will not likely be a major factor in delineating source water protection areas. Ground water quality will influence the quality of river water where ground water discharges to the river, and in most cases, local ground water quality will likely be better than nearby river water quality. Generally, ground water discharges to the surface water.

The corridor along the Mississippi River between the Twin Cities and Brainerd lacks comprehensive geologic studies. In addition, this corridor is characterized by unconfined drift aquifers, often shallow aquifers in sandy soils. Ground water in such an environment holds the potential to be more directly connected to surface water, such as the Mississippi River and its tributaries. There is a particular need for detailed geologic information in view of the rapid population growth and land use changes taking place within this corridor.

Since ground water quality can vary dramatically both horizontally and vertically, it would not be prudent to extrapolate data over even relatively small distances. If the ground water in the alluvial shallow aquifers adjacent to source water protection areas is contaminated, it suggests that the particular aquifer is sensitive to pollution. Many such alluvial aquifers exist within seven miles of the Mississippi River in this part of Minnesota. If that aquifer contributes or could potentially contribute significant amounts of water to the surface water body, then indirectly, the surface water body would be also very sensitive to pollution via subsurface pathways. Therefore, it would be wise to incorporate the land above the aquifer into the delineated area.

There are many sources of ground water data in Minnesota, but the data are not easily accessible. There is not a state-wide standard for collecting data so that data collected by state agencies, counties, and local government units are compatible and can be used within a geographic information system (GIS). For example, the Minnesota Department of Agriculture has conducted many nitrate clinics that are helpful in identifying water quality problems, but the wells that were sampled are not identified in a manner in which trends for that well can be recorded.

Whenever available, it is helpful to look at all existing ground water parameters together for a given area; this makes it easier to spot spurious data. The following website may provide useful ground water data for use by source water protection teams: www.moea.state.mn.us/sc/resources/groundwater_Directory.pdf.
Unfortunately, some ground water studies in Minnesota have considered only one parameter. If there are inaccuracies in the data pertaining to that one parameter, those inaccuracies can often be more easily detected by looking at multiple parameters.

There is a particular need for detailed geologic information in view of the rapid population growth and land use changes taking place within this corridor. This corridor is characterized by unconfined drift aquifers, often shallow aquifers in sandy soils. Ground water in such an environment holds the potential to be 1) influenced by anthropogenic activities and 2) directly connected to surface water, such as the Mississippi River and its tributaries.

Geology is important in terms of interaction between ground water and surface water. It is important to note that aquifer boundaries do not match the boundaries of overlying surface watersheds. There is considerable information available about the geology along parts of the corridor along the Mississippi River between the Twin Cities and Brainerd, but the area lacks comprehensive geologic studies. Information from well logs is available for the entire area, but only some of the counties have complete geologic atlases or are included in current ground water models.

Relatively limited data are available in the Brainerd-Twin Cities corridor as to specific locations where surface waters are recharged by or discharge to ground water. However, there are certain locations within this area where modeling has identified the presence of such ground water/surface water connections. This information can be made available to the source water protection teams as it is available and pertinent.

Soils

Important soils characteristics include adsorption/absorption capacity, infiltration and permeability rates, and distribution pattern of soils on a landscape. Soils vary over a region, due to variability in parent material, topography, vegetation, climate, and time. Consequently, soils in the St. Cloud area are not necessarily the same as those formed in the Twin Cities area. Current county soil surveys reflect these differences in soil properties. There are "detailed" soil surveys for all counties in the project area. This information is generally at a mapping scale that can be useful for broad-based planning. When looking at parcels less than 2 or 3 acres, more specific onsite soils investigations should be considered; in most instances, however, source water protection teams would not be working at this level of detail.

The project area contains two soil broad sequences: sandy, coarse-textured outwash and loamy clay till. Generally, because of their higher permeability and infiltration rates, sandy soils have lower runoff rates and typically less organic matter. Loamy soils are generally less permeable, which may result in higher runoff rates, but typically contain more organic matter, which is useful for attenuation of some contaminants through microbial action.

Soil surveys typically describe soil properties within 5 or 6 feet of the surface. Even though soils may be looked at as a thin veneer on the land surface, the information still provides an excellent planning tool. The upper portion of a soil typically is where many of the most important properties of soil reside. The scale of mapping also needs to be taken into consideration, depending on the usage.

In the case of coarse-textured soils, land use is an important factor. If the land is being shifted from agriculture to housing that is serviced by municipal sewers, perhaps soil properties are not as important. If homes are in unsewered areas, ISTS regulations need to be applied aggressively. Soils that are irrigated for crop production within a source water area are problematic. The coarse-textured soils typically have high permeability and infiltration rates, thereby allowing water to pass quickly through the soil profile. Management of nitrogen fertilizer application rates is critical in matching expected crop yields with "no net loss of nitrogen" due to leaching to ground water. Understanding where coarse-textured soils may overlie unconfined drift aquifers could aid in delineating Priority A and B Areas. These soils typically require greater levels of management for nitrogen and/or manure applications when used for agriculture. Additionally, spill response may be different in sandy areas as opposed to loamy or clayey areas.

Surface Water

Surface water quality may indicate areas which have consistently shown a persistent impairment or may show where increased human activity has increased a contaminant load, such as turbidity. If such areas fall within or near a source water protection area, they could indicate that future problems may arise as activity increases. The MPCA currently evaluates surface water quality in the context of the Clean Water Act goals of

"fishable and swimmable," but not for drinking water use. The agency is currently investigating how such drinking water evaluation might be accomplished.
Within the composite St. Cloud/St. Paul/Minneapolis Source Water Assessment Area are 40 stream reaches and 32 lakes listed on the MPCA'S "2004 Impaired Waters List." An issue to be addressed is the implication for drinking water suppliers of assigning a drinking water impairment to source water. A reach of impaired water may extend beyond the delineated source water protection areas. Investigations of possible sources of contamination associated with the impairment may therefore fall outside the delineated source water protection area.

Surface water quality assessments take into account the data collected during the previous ten years; since assessments occur every two years, they may not show any trends, because overlapping data are used. However, a waterbody that has been assessed as impaired may undergo additional monitoring, which may indicate a trend or pattern of contamination. Surface water assessments try to capture the background or constant pollution, rather than contamination related to a single episode, such as a spill.

Generally, surface water quality data are reliable, as long as the sample analysis is conducted by approved labs. Surface water quality data collected in one portion of a watershed may reflect water quality throughout, but is not a guarantee. It may also reflect surface water quality in another watershed having similar geologic properties and land use, but this also is not a guarantee.

Land Use

In the context of source water protection, land use impacts have to be evaluated in conjunction with knowledge of the surrounding natural environment. The MPCA has a statewide susceptibility map, and county susceptibility maps exist for the St. Cloud area and Ramsey, Anoka, and Hennepin Counties. The MDH has developed nitrate probability maps for several counties in the upper Mississippi Basin (e.g., Wright, Benton, Sherburne, Stearns, Todd, and Morrison Counties). The data coverage of these maps is inconsistent; some focus on near-surface soils, some for bedrock, and map scales vary. Land use data are used to varying degrees among communities. In rapidly growing areas, such as the St. Cloud-Twin Cities corridor, planning at a regional scale becomes necessary.
With regard to land use, it is not necessarily a particular land use, but the specific practices associated with that land use, that can result in significant impacts on source water. For example, feedlots can influence source water to varying degrees, depending on how those feedlots are managed. Manure management practices vary among feedlots; manure stored on frozen ground can runoff quickly during a rapid snowmelt or heavy spring rain event, ending up in a river. This illustrates the importance of individual responsibility on the part of land owners and land managers in source water protection.

Stormwater drainage and agricultural tiling systems are examples of how land use changes can dramatically affect not only contaminant transport, but also time of travel. Both can dramatically reduce time of travel from a contaminant release point into a source water. Rivers therefore can become more "flashy" than they were before these drainage systems were in place. As future development takes place, the boundaries of Priority Area A will likely expand. Land use trends (such as changing agriculture from small farms to larger production agriculture) or growth from rural to urban (where runoff patterns change) may be important to consider in delineating the areas.

Land use data vary significantly from area to area, and the data are generally as reliable as the source and the date of its generation or a particular use. Uncertainties in land use data generally relate to the age of the data and whether significant changes in land use are taking place. It will be important to use land use data that are from the area of concern, and not make too broad a generalization.

Precipitation

Precipitation, or melting snow, may flush the surface of a spilled contaminant and transport it into the watershed. Additionally, a heavy rain event or snowmelt may affect the time of travel of a contaminant in a stream. It would be useful to know the rate at which a water surge associated with an extreme rain or snowmelt event would move through the watershed. The larger the magnitude of a flood event (aerial coverage and intensity), the more magnified the hydrologic impact and catastrophic impacts to infrastructure, such as drinking water wells and systems, sanitary and storm sewers, or damaged petroleum tanks. However, larger floods also would tend to result in greater dilution of some contaminants. Some flash floods cover one or two townships; some cover many counties.

Average annual precipitation varies by approximately four inches within the project area. A more important factor is past flood events and comparing the associated stream flows during those events. Since stream flows determine travel times, as well as contaminant concentrations, access to “real-time” flow data is important.

The quality of precipitation data is typically quite good; flash flood data are also generally quite reliable. Snow pack measurement is studied each spring, working with the Army Corps of Engineers and the National Weather Service for spring flood outlooks. There are limitations on these data, mostly due to how soon the data are available. The sources for sub-daily records (hourly) are much more limited.

Time of Travel

Members of the Technical Panel spent considerable time discussing two delineation options for use by the source water protection teams, both based on time of travel and both including an evaluation of contaminant source locations. One delineation option would follow the approach taken in the source water assessments, delineating Priority Area A areas on the basis of boundaries generally following subwatershed divides, resulting in delineated areas comprised primarily of subwatersheds draining into waters that lie within an 8-hour travel of the water intake. The other delineation option would focus on delineating Priority Area A more strictly on the basis of time of travel of a contaminant once it is in a waterway above an intake. Following the initial delineation based strictly on time of travel, delineated boundaries could be adjusted, probably expanded, in response to land use factors and known or likely contaminant source locations.

The use of the “subwatershed” approach would likely result in the delineation of a relatively larger Priority Area A. The location of contaminant sources is a major factor in the delineation of source water protection areas. Because of the large number of potential contaminant sources within source water protection areas, the “subwatershed” approach could more readily accommodate a geographically widespread distribution of such sources than could the second approach.

The use of the second approach would result in a relatively smaller Priority Area A area, because it would be based more essentially on time of travel. Panel members discussed the fact that many spills within a subwatershed would likely never reach the source water. Additionally, the 8-hour time of travel assumes that the contaminant is in the river or tributary, on its way to the intake. The panel suggested that the source water protection teams discuss the advantages and disadvantages of both delineation options.

Several concerns, however were expressed as to the practicability of this second approach to delineating Priority Area A: 1) The boundaries of a source water protection area delineated using this approach could be relatively more complicated; 2) the boundaries of the delineated areas would require more frequent modification, in response to land use changes, including urban and agricultural drainage patterns;
3) accurate stormwater maps are not consistently available; 4) the intrinsic variability among environmental factors, such as soils and geology, becomes relatively more amplified with the smaller, more precisely defined, strict time of travel approach than the subwatershed approach; and 5) the size of the “buffers” along the main stem and tributaries would have to be determined and would not be consistent within a delineated source water protection area.

The Source Water Subcommittee on Rivers and Streams considered, and rejected, the use of the second methodology to delineating source water protection areas, for many of the reasons noted above. In addition, it will be important that delineated boundaries, and the methodology for delineating the boundaries, be easily understood by the public and local decision-makers.

The use of time of travel factor in delineating source water protection areas, no matter which approach is chosen, is limited by several important qualifications that source water protection teams need to recognize:

1. An 8-hour time of travel assumption for delineation purposes means that once a contaminant is in the water draining to an intake, 8 hours is the <u>maximum</u> time of travel to the intake. Therefore, actual travel time within the delineated area could be considerably less than 8 hours.

2. There is currently no systematic monitoring in the Mississippi River designed to detect contaminants in the river that could threaten public water supplies. Water suppliers routinely monitor at their respective intakes for certain constituents.

3. In the event of an oil or chemical spill, responsible parties are required to employ a notification protocol, including notification of the State Duty Officer and downstream public water suppliers. As a practical matter, there is no guarantee that such notification will take place in a timely manner.

4. It is important that water suppliers have access to existing flow conditions on the Mississippi River and its tributaries, in order to accurately calculate time of travel and the arrival time of a contaminant at their intake.

APPLYING THE DATA ELEMENTS IN DELINEATING SOURCE WATER PROTECTION AREAS

Priority Area A should include the main stem of the Mississippi River and all tributaries, sewers, tile lines, and ditches that discharge directly to the source water within the time of travel distance necessary for a contaminant to reach the water supply intake before additional corrective action could be taken. Time of travel distance for each water supplier will vary according to system design, contaminant characteristics, and the physical attributes of the source water.

Delineation of Priority Area A is based on time of travel and should consider the following criteria:

1. Minor watersheds that drain to waterways above an intake or, as a default, the source water assessment inner emergency response area;
2. Water system characteristics, including finished water storage capacity, backup wells, time required for intake closure, and time required to put specialized treatment measures on-line;
3. Notification time following a spill;
4. Number and types of potential significant contaminant sources, particularly those that have created water quality problems in the past;
5. Existence of major transportation routes (e.g., highways and railways) and pipelines that cross the waterways;
6. Barges, boats, or other potential contaminant sources in direct contact with the source water;
7. The “Priority Contaminants of Concern” (see “Attachment 1) as identified by the St. Cloud, St. Paul, and Minneapolis water suppliers; and
8. The data elements described below;

To the extent that source water protection teams review the inner emergency response area delineated in the source water assessment, this review should be augmented with an examination of nearby surficial aquifers, soils, impaired waters, and potential contaminant sources.

Priority Area B is the area where the impacts to drinking water from point and nonpoint sources of contaminants can be minimized by preventive management.

Delineation of Priority Area B is based on time of travel of, and associated response time to, a potential contaminant threat, and should consider the following criteria:

1. Contaminants or potential contaminant sources that the water supplier feels present a risk to the water supply, including the "Potential Contaminants of Concern" noted above for Priority Area A;
2. Existing water resource management/protection programs that have identified a) areas of concern within the watershed above the intake or
   b) types of potential contamination sources that are of concern for overall water quality;
3. The general types of land uses and contaminant sources believed to exist within the watershed above the intake;
4. Minor watershed boundaries within the watershed; topography; wetlands or other contaminant attenuation features; and hydrology, including lakes, dams, etc.; and
5. The physical and chemical attributes of the source water.

DATA ELEMENTS

Geology/Ground Water

Due to the limited data on hydraulic connections between surface water and ground water, source water protection teams should consider all streams and waterways as gaining from ground water under normal climatic conditions until proven otherwise. Moreover, source water protection teams should probably take a conservative approach to delineation, and extend the source water protection area boundaries to accommodate this uncertainty. This lack of detailed data on interaction between surface water and ground water represents an informational need that should be addressed in the future. The source water protection plan could make the acquisition of additional information part of the future management strategies of the plan.

If an alluvial shallow aquifer contains contaminated ground water, the contamination suggests that the particular aquifer is sensitive to pollution. If that aquifer contributes, or could potentially contribute, significant amounts of water to the source water, then indirectly, the surface water body would be also very sensitive to pollution via subsurface pathways. Therefore, it would be wise to incorporate the land above the aquifer into the delineated area. It would also be important to estimate the ratio of ground water versus surface water entering a river, the quality of the ground water, and the age or susceptibility of that ground water. Source water protection teams should have access to a hydrogeologist to help them address ground water/surface water connections, and how they could influence the delineation of source water protection areas.

In this part of Minnesota, alluvial soils extend from ½ to 7 miles on either side of the Mississippi River. Source water protection teams should review the nitrate probability maps that are available (http://www.health.state.mn.us/divs/eh/water/swp/maps/indes.htm) and any other information, such as the water quality of public water supply wells within a proposed source water protection area to determine if contaminated ground water in nearby shallow alluvial aquifers could pose a threat to the surface water that is the source water for St. Cloud, St. Paul, or Minneapolis. The wellhead team should work with MDH to develop a water quality data base for ground water that is compatible with the County Well Index so that water quality data can be illustrated in a GIS format.

Soils

A key concept in delineating a source water protection area is to evaluate soils data in conjunction with data on geology, ground water, land use, and known contaminant sources and their locations to identify particular areas of concern, and to establish the boundaries of the source water protection area accordingly. In addition, a soils evaluation should take account of upstream hydrology and topography, such as soils permeability and slope gradient.

Delineating coarse-textured soils overlying unconfined drift aquifers that are hydraulically connected to surface waters is an important component in determining a source water protection area boundary. In those areas where loamy soils are adjacent to surface water bodies, runoff (and subsequently topography) would have to be accounted for in delineations. Runoff is a high priority in delineating source water protection areas because of the potential for direct transport of contaminants into the source water.

Surface Water

The MPCA prepares a list of waters (lakes and river reaches) that are determined to be "impaired" by virtue of one or more of an array of constituents. These constituents relate to the Clean Water Act goals of "fishable" or "swimmable"; they do not relate to drinking water standards. However, certain of these constituents, such as Fecal coliform, would be of concern from a drinking water perspective. Therefore, a map and list of impaired waters in the proximity of the area being considered for delineation as Priority Areas A or B would be useful to the source water protection teams. The boundaries of a source water protection area could be expanded in response to knowledge of impaired surface waters, and include waters already designated as impaired. If MPCA begins assessing waters on the basis of drinking water contaminants, it would probably first assess surface waters which are currently used as drinking water sources.

Members of source water protection teams may have knowledge of and access to data on contaminants, contaminant sources, and water quality within or near proposed source water protection areas. This information should be reviewed and used by the teams in the delineation process. The MPCA would like to have such data shared with them.

Time of travel considerations are more related to a single contaminant release episode and how long it will take to flush the system, whereas surface water quality assessments provide a picture of a longer term contamination problem. Inasmuch as flow volumes influence pollutant concentration as well as the travel time of a pollutant, source water protection teams should keep this influence in mind when considering flow levels as they relate to the delineation of source water protection areas.

Land Use

Land use and cultural activities will influence the location of source water protection area boundaries. The more intense the land use, especially in terms of potential contaminants or spills of contaminants, the more likely such uses should be considered for inclusion within the delineated source water protection areas. With respect to spills, the volume and location of potential spill sources, along with travel times and watershed conditions, need to be considered in the delineation of source water protection areas.
Delineation of Priority Area A should take consideration of those land uses and contaminants that are likely to cause immediate health problems in people, while Priority Area B delineation should consider the land uses and associated contaminants that could cause long-term or frequent health problems in people. Delineation of the Source Water Protection Watershed should consider land uses which, in a larger perspective, could have some potential impact on the drinking water intake.

Priority Area A delineation criteria most impacted by land uses will potentially include 1) minor watersheds where watershed boundaries are changed due to man-made changes; 2) upstream hydrology, where dams and Impoundments occur; 3) soils, where land use modifications such as agriculture have altered the surface;
4) knowledge of potential contaminant sources; 5) existence of major transportation routes; and 6) the presence of barges, boats, or other potential contaminant sources.

Priority Area B delineation criteria most impacted by land uses will potentially include 1) tributaries, where land use is of significant potential for contaminants; 2) the immediate watershed, where land use has resulted in extensive modification to the overland flow of water; 3) time of travel, where cultural changes, such as impoundments, agricultural drainage, and impervious surfaces, have modified flows; 4) type of land cover, where it is influenced by land use activity, 5) watersheds, where the character of the watershed is made up of significant potential contaminant sources; 6) hydrology, where it is modified by land uses; 7) land use, with respect to potential contaminants; 8) water quality, where it is impacted due to land use or human activity; 9) potential sources of contamination; and 10) soils.

For delineation purposes, the land use assessment should be integrated with the consideration of the other data elements; it is important that no single land use type be disproportionately weighted in delineating source water protection areas. This is because land use practices and strategies determine impacts, not the general category of land use. For example, two different animal feedlot operations can have different levels of impacts, depending on the practices associated with each.

In the case of a river impoundment, the river upstream of the dam is not a typical river flowage. This may tend to attenuate contaminant levels through settling, dispersion, dilution, aeration, dissipation, and slowing transport time. In the case of non-point contaminant sources, it is likely that the impoundment will provide considerable attenuation. If the contaminant of concern is a spill on a bridge just upstream of the impoundment, the bridge should be included in the delineated protection area. If the contaminant of concern is feedlot slurry in a storage facility, it is probably important to determine the proximity of the facility to the intake, the number of such facilities in the area, and the volumes of slurry being stored.

If public transportation facilities, such as roads, railroads, pipelines, and airports are located such that spills could be conveyed rapidly to the source water, they should be considered for inclusion in the protection area. Consideration should be made of the man-made storm water conveyances, agricultural tiling, and public ditches that drain into the source water above the water supply intake.

Precipitation

There are no distinct trends favoring heavier precipitation from one part of the watershed to the other that would change the delineation. There is no evidence that heavy rain events are any more or any less likely in St. Cloud than in the Twin Cities.
The MDNR can provide water suppliers with a thirty-year precipitation average for their area, and a map of rain gauging station locations. Precipitation averages should be linked to stream flow, which could show past flooding. The delineation of source water protection areas could take into account the effects of wide-range flooding due to heavy precipitation events.

Delineation Technical Panel Roster

Pete Boulay, Minnesota Department of Natural Resources (Climatology)
Terry Bovee, Minnesota Department of Health (Soils)
Jan Falteisek, Minnesota Department of Natural Resources (Ground water quantity)
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David Brostrom, Upper Mississippi River Source Water Protection Project Coordinator, provided staff support to the Technical Panel.

Source Water Subcommittee on Rivers and Streams Roster

David Brostrom, Upper Mississippi River Source Water Protection Project Coordinator
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Chuck Regan, Minnesota Pollution Control Agency
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ATTACHMENT 1

UPPER MISSISSIPPI RIVER SOURCE WATER PROTECTION PROJECT
PRIORITY CONTAMINANTS OF CONCERN
ST. CLOUD, ST. PAUL, MINNEAPOLIS

May 15, 2003

Source water protection efforts for St. Cloud, St. Paul, and Minneapolis will include an inventory of potential contaminant sources within their respective source water assessment areas. These assessment areas have been combined into a single "composite" source water assessment area for this project. The large number of Safe Drinking Water Act contaminants, the large size of the composite source water protection area for St. Cloud, St. Paul, and Minneapolis, and the number and widespread distribution of potential contaminant sources within this area make it impractical to inventory all potential contaminants of concern and their sources. It is therefore necessary to prioritize potential contaminants that are of concern to the water suppliers, in order to formulate and implement a pilot-scale project by which a more comprehensive methodology can be developed to inventory potential contaminants and sources on a large scale.

The St. Cloud, St. Paul, and Minneapolis water suppliers have each identified contaminants that are present in their source water that are of priority concern to them for various reasons, such as 1) high levels of certain contaminants in raw water, 2) limitations of treatment measures and technology,
3) contaminant concentrations contributing to creation of disinfection byproducts, 4) lack of monitoring data, and 5) lack of knowledge regarding contaminants, sources, or health effects.

The contaminants listed in EPA's National Primary Drinking Water Standards are of concern to all public water suppliers. Of these listed contaminants, and in addition to them, the following contaminants have been identified by St. Cloud, St. Paul, and Minneapolis as being priority contaminants of concern.

Priority Contaminants for St. Cloud, St. Paul, and Minneapolis

1. **TSS, Sediment, and Suspended organics**, which indicates erosion and are commonly associated with bacteria, organisms, and metals and which are precursors to THM's
2. **Cryptosporidium**, a parasite present in the Mississippi River and is difficult to remove or can pass through water treatment, and other biological and microbiological organisms (Fecal Coliform, Giardia, viruses)
3. **Phosphorus**, which promotes growth of vegetation and can disrupt treatment processes
4. **Nitrates and Ammonia**, which can disrupt disinfection processes
5. **SDWA Chemicals**: 406 Herbicides; 407 BNA's; 408 Cabamates; 409 Glyphosate; 410 Dalapon (classes of chemicals monitored for but not detected in Vadnais Lake)
6. **Pesticides/Herbicides**
7. **Organic solvents** (VOC's, MTBE, TCE)
8. **Petroleum products**
9. **Endocrine-disrupting chemicals**
10. **Radioactive materials**