

CITY OF AURORA, MINNESOTA

SOURCE WATER ASSESSMENT

PWS ID 1690002

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PART 1

INTRODUCTION

The 1996 Amendments to the federal Safe Drinking Water Act (SDWA) require the Minnesota Department of Health (MDH) to complete source water assessments for public water supply systems.

The requirements of the SDWA addressed herein are intended to provide Aurora drinking water customers with 1) a general description of the area which supplies water to the Aurora water utility, 2) an overview of why this water supply is susceptible to potential contaminants, 3) a description of the contaminants of concern which may impact the users of the public water supply, and 4) to the extent practical, the origins of the contaminants of concern.

The MDH, with the assistance of the Aurora water utility, assembled a source water assessment team to develop this source water assessment. This team included representatives from the Aurora water utility, the city of Aurora, St. Louis County, St. Louis Soil and Water Conservation District, the Minnesota Department of Natural Resources, and the Minnesota Pollution Control Agency.

STATUS OF SOURCE WATER PROTECTION

Although not a requirement of the SDWA, the city of Aurora intends to use this source water assessment as a basis and the framework for the development and implementation of a source water protection plan. Therefore, in conjunction with the MDH and other state and local government agencies, Aurora will work to develop a source water protection strategy.

DESCRIPTION OF THE SOURCE WATER

The city of Aurora obtains its public water supply from the St. James iron ore pit, which is located within the city limits adjacent to the developed portion of town. The city's water treatment facility is located within the city of Aurora. In recent years, Aurora has pumped water from the St. James Pit to control rising water levels in the pit. The water treatment plant has a pumping capacity of approximately 1.15 million gallons per day. Average demand is approximately 200,000 gallons per day. The city has a water storage capacity of 800,000 gallons.

The St. James Pit is located within the upper portion of the St. Louis River watershed, at the top of the Lake Superior drainage basin, approximately four miles south of the Laurentian Divide.

The city of Aurora owns a buffer around the St. James Pit. A public boat access is located on the southeast side of the pit. Plans are currently in the discussion phase regarding the establishment of a campground on the east side of the St. James Pit.

The cities of Aurora and Biwabik have discussed, and have undertaken preliminary planning and design work for, a connection of their water systems. There are currently no plans to construct such a connection.

SOURCE WATER SENSITIVITY

In determining the sensitivity of a source water, the intrinsic physical properties of the geologic setting or landscape within the watershed must be considered. Other factors influencing the sensitivity of a surface water body include topography, hydrology, geology, vegetation, and the distribution of various soil types within the subwatersheds of the St. James Pit. The water in the St. James Pit also reflects a significant groundwater contribution from the surrounding surficial drift aquifer and the Biwabik Iron Formation Aquifer. The large volume of water in the St. James Pit (a 380-foot depth) helps to attenuate contaminant concentration and also affects the movement of contaminants to the public water supply intake. The closer the source of contamination is to the intake, the greater the impact on the quality of the water used by Aurora. The further the source of contamination is from the intake, the more likely that the influence of such contamination on the public water supply will be attenuated through dilution.

Although new mining activities in the vicinity of the St. James Pit are not currently anticipated in the foreseeable future, any such activities could significantly influence the water level in the St. James Pit.

SOURCE WATER ASSESSMENT AREA

The source water assessment area for Aurora contains an inner emergency response area and an outer source water management area. The inner emergency response area is designed to help the city address contaminant releases which present an immediate (acute) health concern to water users. This geographic area is defined by the amount of notification time the city needs to close the surface intake and a "buffer" to accommodate unanticipated delays in notification and shut down.

The outer source water management area is designed to enable protection of water users from long-term (chronic) health effects related to low levels of chemical contamination or the periodic presence of contaminants at low levels in the surface water used by the city. This area is intended to enable protection of users from contaminants that may 1) be usually found at treatable levels in the source water and 2) occasionally present an acute health concern under certain conditions, such as periods of high runoff or storm events. The establishment of this area also recognizes the potential for future development that may influence the source water.

The inner emergency response area for Aurora is shown in Figure 1. This area is the surface watershed surrounding the St. James Pit that drains directly into the pit. The surface watershed surrounding the St. James Pit was delineated by the Minnesota Department of Natural Resources (DNR). This drainage area has been influenced by past mining activities in and around the St. James and Miller-Mohawk Pits. The boundary of the inner emergency response area is adjacent to or within approximately a quarter-mile of the south, east, and north sides of the St. James Pit; the boundary extends approximately one-half mile west of the St. James Pit, and includes the Miller-Mohawk Pit. In addition to the area of direct surface drainage into the St. James Pit, the inner emergency response area also includes a portion of Aurora north of the highway through town that drains into the St. James Pit via the city's stormwater system.

Figure 1 also shows the outer source water management area for Aurora. This area reflects the groundwater divide around the St. James Pit that has been estimated on the basis of currently available data on 1) surface topography, 2) the configuration of the Biwabik Iron Formation in the area, 3) water levels in surrounding lakes and flooded mine pits, and 4) water levels in surrounding wells. This estimate was produced by MDH staff. The outer source water management area boundary is within approximately a quarter-mile of the St. James Pit to the south, extends approximately one mile west of the pit, then north approximately four miles to the Laurentian Divide. The outer source water management area follows this divide east approximately four miles, then south and west around the former LTV taconite mine, and then generally south to a point approximately two-thirds of a mile southeast of the St. James Pit. A portion of the southern boundary of the outer source water management area is coincident with the inner emergency response area boundary. This area includes land that has been significantly disturbed by past iron ore and taconite mining activities.

The source water assessment area for a surface water supply in Minnesota typically includes a third area – the entire watershed upstream of the water supply. Because the St. James Pit is located so closely to the top of the watershed (the Laurentian Divide), the inner emergency response area and outer source water management area encompass the entire upstream watershed of the St. James Pit. Therefore, the source water assessment area for Aurora is comprised only of the inner emergency response area and outer source water management area.

Delineation of a source water assessment area for a mine pit is problematic, due to the uncertainties associated with the complicated surface water and groundwater hydrology, as well as the interaction between the two systems on the Mesabi Iron Range. Water in mine pits on the Mesabi Range originates from three sources: 1) surface drainage and precipitation into pits; 2) groundwater from surficial drift aquifers; and 3) groundwater from the bedrock aquifer. Groundwater movement can contribute water to, or drain water from, pits and this pattern can change in response to changing water levels in pits. In addition, changes in mining activities on land surrounding pits that serve as

public water supplies can drastically influence water levels in pits. Surface water supplies are components of dynamic hydrologic systems, and mine pits are particularly sensitive to hydrologic changes. Finally, underground mines and related structures that were developed during early mining conducted on the Mesabi Iron Range created the potential for underground hydraulic connections among open pit mines. These underground mines and structures are, for the most part, unmapped and their locations unknown. For these reasons a source water assessment should be viewed as reflective of conditions and knowledge at a certain point in time, and changing conditions or the acquisition of new data will require corresponding modifications to a source water assessment.

PART II

POTENTIAL CONTAMINANTS OF CONCERN

The contaminants of concern are the contaminants regulated under the federal SDWA that are listed in the "National Primary Drinking Water Standards." They are divided into organic chemicals, inorganic chemicals, radionuclides, disinfection byproducts, and microorganisms. A listing can be found at: <http://www.epa.gov/safewater>. Of greatest concern to the Aurora water supply are those contaminants associated with stormwater runoff into the St. James Pit, contaminants from recreational use near and in the St. James Pit, possible release of small quantities of raw untreated sewage, and contaminants that may be associated with past mining activities in the vicinity of the St. James Pit.

SOURCES OF CONTAMINANTS

Both point and nonpoint pollution sources are present in the source water assessment area for Aurora. Specific concerns relative to the Aurora water supply are 1) the three stormwater outfalls that discharge into the St. James Pit (which convey stormwater runoff from a portion of Aurora), 2) contaminants associated with boat use in the St. James Pit and the potential campground adjacent to the pit, 3) the sewer line from two houses on the bank of the pit and the associated lift station, and 4) unknown contaminants from past mining activities in the vicinity of the St. James Pit.

To the extent practical, Table 1 below contains a listing of potential sources of contamination located in the inner emergency response area and the outer source water management area. The potential sources of contamination listed in the table represent data collected from a number of state and federal data bases. Due to the number of data sets involved in preparing this table, some duplication is possible. Many of the data files do not contain accurate locational information for potential contaminant sources. Editing the data sets for possible duplication and locational accuracy was not possible to perform as part of the preparation of this source water assessment.

**TABLE 1
INVENTORY OF POTENTIAL CONTAMINATION SOURCES**

POTENTIAL CONTAMINATE	COUNT
Dumps	2
Gravel Pit	1
Hazardous Waste Generators	2
Leaking Underground Storage Tanks	2
Registered Storage Tank	1
Voluntary Investigative Clean-Up	1

Since the St. James Pit is located at the top of the St. Louis River Basin and the Lake Superior watershed, most of the available information describing the basin and watershed does not apply to the watershed upstream of Aurora's water supply.

Table 2 contains a description of land uses within the inner emergency response area and outer source water management area for Aurora.

**TABLE 2
LAND USES WITHIN THE AURORA INNER EMERGENCY RESPONSE AREA
AND OUTER SOURCE WATER MANAGEMENT AREA**

DESCRIPTION	OUTER	INNER
Open Water	32.247	108.529
Low Intensity Residential	12.677	0.890
High Intensity Residential	3.336	0.000
Commercial/Industrial/Transportation	36.695	12.232
Bare Rock/Sand/Clay	8.006	0.000
Quarries/Strip Mines/Gravel Pits	3200.262	12.677
Barren Transitional	6.672	0.000
Deciduous Forest	2047.812	49.594
Evergreen Forest	169.465	4.893
Mixed Forest	360.280	15.345
Shrubland	8.229	0.000
Grasslands/Herbaceous	50.039	1.334
Pasture/Hay	43.367	5.115
Row Crops	48.482	22.462
Urban/Recreational Grasses	8.673	0.222
Woody Wetlands	116.757	0.222
Emergent Herbaceous Wetlands	13.344	0.000
TOTAL ACRES	6166.343	233.515

RESULTS OF MONITORING THE SOURCE WATER

Source water monitoring results can be found in the various programs conducted in the Lake Superior Basin. These programs include the Minnesota Pollution Control Agency's water quality programs, Minnesota Department of Natural Resources fisheries and water monitoring, county water planning, the MDH Fish Consumption Advisory Handbook, and Clean Water Partnership diagnostic studies. The St. James Pit has not been addressed by any of these monitoring programs. The following websites provide access to information produced by various monitoring programs:

The Minnesota Pollution Control Agency: <http://www.mPCA.state.mn.us>

The U.S. Environmental Protection Agency: <http://www.epa.gov/storet>

The Minnesota Pollution Control Agency's Lake Superior Basin Information Document contains a general description of water quality in the upper portion of the St. Louis River watershed area.

Most water quality monitoring programs are conducted for purposes other than drinking water protection. A greater emphasis on drinking water standards in the future would be beneficial to public water suppliers. Results of monitoring have verified the presence of many potential contaminants in the source water, all of which have been adequately treated by the water treatment plant. The public water supplier also conducts a monitoring program for raw and finished water.

SUSCEPTIBILITY OF THE SOURCE WATER TO CONTAMINATION

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 determination of susceptibility by the Environmental Protection Agency is on a scale of low, medium, and high. The susceptibility of any surface water source, such as the water in the St. James Pit, is determined to be high because there are no practical means of preventing all potential contaminant releases into surface waters. The federal SDWA recognizes the susceptibility of surface waters and requires filtration to remove pathogens and particulate contaminants. The susceptibility of the Aurora surface water intake to contamination is classified as high.

While it has been determined that Aurora's source water is highly susceptible to contaminants found in its source water, historically the city's water plant has effectively treated this source water to meet or exceed safe drinking water standards. However, water suppliers are being increasingly challenged to comply with new and changing standards and to respond to changing land uses and conditions within their source water assessment areas.

USING THIS ASSESSMENT

Protecting the drinking water source is a wise and relatively inexpensive investment in Aurora's future. The overall intent of this assessment is to provide background information for the community to use in developing a local Drinking Water Protection Program. The assessment benefits the community by providing the following:

- **A basis for focusing limited resources within Aurora to protect the drinking water source.**
The source water assessment provides the community with information regarding activities within the source water assessment area that may directly affect its water supply.
- **A basis for informed decision-making regarding land use within Aurora.**
The assessment provides the community with information regarding the source of its drinking water and the contaminant threats to the quality of that source. Knowledge of the character and location of the resource allows planning authorities to make informed decisions regarding land uses within the source water assessment area that are compatible with protecting drinking water resources.
- **A basis for informed source water planning efforts for the source water assessment area for Aurora.**

Aurora
Inner Emergency Response Area
Outer Source Water Management Area

Surf
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