

**WELLHEAD PROTECTION PLAN
FOR THE**

City of Pequot Lakes

Moderately Vulnerable Setting

May, 2013

Forward

This document presents the amended wellhead protection (WHP) plan for the City of Pequot Lakes that will help provide for an adequate and safe drinking water supply for community residents. It contains the following components:

- Assessment of the data elements used to prepare the plan;
- Delineation of the wellhead protection area;
- Delineation of the drinking water supply management area;
- Assessments of well and drinking water supply management area vulnerability;
- Impact of land and water use changes on the public water supply well(s) used by the water supplier;
- Issues, problems, and opportunities affecting the well(s), well water, and the drinking water supply management area;
- Wellhead protection goals for this plan;
- Objectives and plan of action for achieving the wellhead protection goals;
- Evaluation program for assessing the effectiveness of this plan; and
- Contingency strategy to address an interruption of the water supply.

Water Supply Wells Included in This Plan

Unique Number	Well Name or Number	Use/Status ¹
241514	Well # 3	P
626480	Well # 4	P

¹P = Primary Water Supply Well, E = Emergency Backup Well, S = Seasonal Well

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Pequot Lakes Drinking Water Supply Management Area (DWSMA) MN-00615 - Moderate Vulnerability

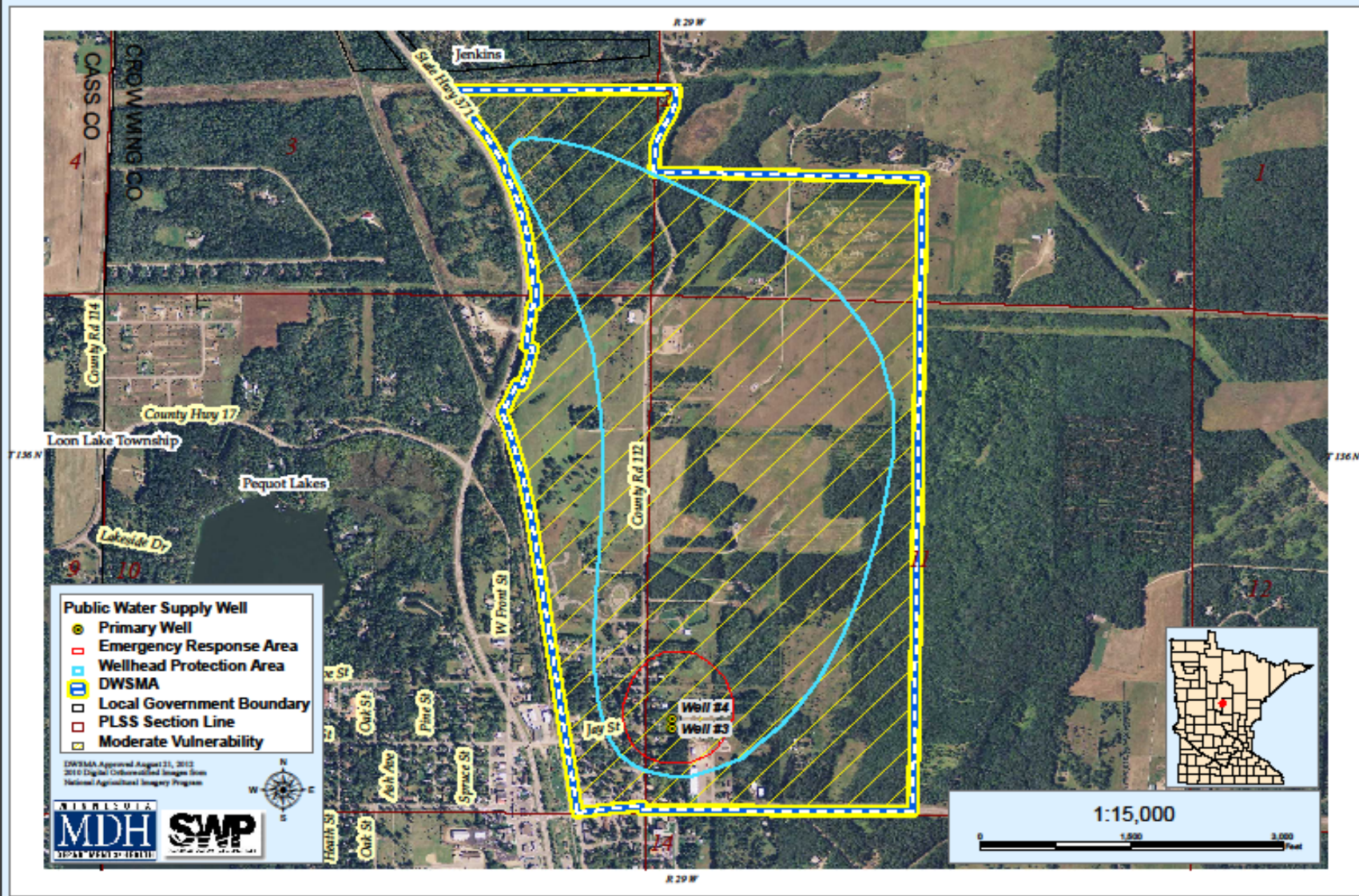


Figure 1

Chapter 1 - Introduction

1.1 Background

The wellhead protection (WHP) plan for the City of Pequot Lakes is being amended in cooperation with the Minnesota Department of Health (MDH). The second part of the city's original WHP Plan was approved by MDH July, 15, 2003. The State WHP Rule requires community water suppliers to amend their plan every 10 years (starting in year 8) so that the plan remains current and reflects any changes to the public water supply system, land use, contaminant issues, etc. that may have occurred during the time the original WHP plan was in place. WHP plans are amended to keep up with new challenges and opportunities to protect the public water supply wells and aquifer used by the city.

This plan contains specific actions that the city will take to fulfill WHP requirements that are specified under Minnesota Rules, part 4720.5510 to 4720.5590. Also, the support that Minnesota state agencies, federal agencies, Crow Wing County, and others will provide is presented to identify their roles in protecting the city's drinking water supply. The plan is effective for 10 years after the approval date specified by MDH and the city is responsible for implementing the WHP plan of action, as described in Table 9 of this report. Furthermore, the city will evaluate the status of plan implementation at least every two-and-one-half years to identify whether its WHP plan is being implemented on schedule.

1.2 Plan Appendices

Much of the technical information that was used to prepare this plan is contained in the appendices but is summarized in the main body of this plan. In particular:

- Appendix I contains the first part of the plan, consisting of the delineation of the wellhead protection area (WHPA), the drinking water supply management area (DWSMA), and the vulnerability assessments for the public water supply well(s) and the DWSMA. This part of the plan is summarized in Chapter 3.
- Appendix II contains the inventory of potential contamination sources. This inventory is discussed in Chapter 4 in terms of assigning risk to the city's water supply and is also discussed in Chapter 6, relating to issues, problems or opportunities.
- Appendix III contains the contingency strategy to provide for an alternate water supply if there is a disruption caused by contamination or mechanical failure. This information is discussed in Chapter 11.

1.3 Plan Development Milestones:

Scoping Two Meeting Held (4720.5340, Subp. 1)	October 9, 2012
Scoping Two Letter Dated (4720.5340, Subp. 2)	November 7, 2012
WHP Management Plan Submitted to Local Units of Government (LGU's) (4720.5340, Subp. 1)	March 7, 2013
WHP Management Plan Review Received from LGU's (4720.5350, Subp. 2)	May 7, 2013

Management Plan Review Comments Considered (4720.5350, Subp. 3)	May 7, 2013
Public Hearing Conducted (4720.5350, Subp. 4)	May 7, 2013
WHP Management Plan Submitted to MDH (4720.5360, Subp. 1)	May 9, 2013
Final WHP Plan Review & Notice (4720. 5360, Subp. 4)	August 9, 2013

Chapter 2 - Identification and Assessment of the Data Elements Used to Prepare the Plan

The data elements that are included in this plan were used to delineate the WHPA and the DWSMA and to assess DWSMA and well vulnerability and document the need for the WHP measures that will be implemented to help protect the city's water supply from potential sources of contamination. The city met with representatives from MDH on two occasions to discuss data elements that are specified in Minnesota Rules, part 4720.5400, for preparing a WHP plan.

The first scoping meeting, held on September 20, 2011 addressed the data elements that were needed to support the delineation of the WHPA, the DWSMA, and the well(s) and DWSMA vulnerability assessments. The second scoping meeting, held on October 9, 2012 discussed the data elements required to identify potential risks to the public water supply and develop effective management strategies to protect the public water supply in relation to well and DWSMA vulnerability. The results of each meeting were communicated to the city by MDH through a formal scoping decision notice. Not all of the data elements listed in the WHP rule had to be addressed in the WHP plan because of the moderately vulnerable nature of the city's source of drinking water.

The following table presents the data element assessment results relative to the overall impact that each data element has on the four items listed.

Table 1 is the assessment of the present and future implications of the data elements on the four planning activities. The data elements that are marked high (H) are considered to have a direct implication or impact on the activity. Data elements that have an indirect or marginal impact on an activity are shown as moderate (M). A data element that has little if any impact is shown as low (L). The source of the data is shown under "Data Source." The "Availability of Data" is "Yes" if planning needs are met and "No" if they are not.

Table 1 - Assessment Results for the Data Elements

Data Element	Present and Future Implications				Data Source
	Use of the Well (s)	Delineation Criteria	Quality and Quantity of Well Water	Land and Groundwater use in DWSMA	
Precipitation					MN Climatology Office
Geology					
Maps and geologic descriptions	M	H	H	H	MGS, DNR, USGS, Consultant Reports
Subsurface data	M	H	H	H	MGS, MDH, MPCA, DNR, MDA
Borehole geophysics	H	H	H	H	MGS, Consultant Reports
Surface geophysics	L	L	L	L	DNR, MPCA, Consultant Reports
Maps and soil descriptions					NRCS
Eroding lands					NRCS
Soils					
Maps and soil descriptions					
Eroding lands					
Water Resources					
Watershed units					DNR, USGS
List of public waters					DNR
Shoreland classifications					DNR
Wetlands map					LMIC
Floodplain map					FEMA
Land Use					
Parcel boundaries map	L	H	L	H	County
Political boundaries map	L	H	L	L	County Metro Council
PLS map	L	H	L	L	City, MGEO
Land use map and inventory	H	L	H	H	Sanborn Fire Maps, Historical Society, City Records, County
Comprehensive land use map	M	L	H	H	City, County
Zoning map	M	L	H	H	City, County
Public Utility Services					
Transportation routes and corridors	L	N/A	M	H	
Storm/sanitary sewers and PWS system map	M	L	M	M	City
Oil and gas pipelines map	L	N/A	M	M	LMIC
Public drainage systems map or list	L	L	L	L	County, LMIC
Records of well construction, maintenance, and use	H	H	H	M	City, CWI, MDH files
Surface Water Quantity					
Stream flow data	L	L	L	L	DNR, USGS, Metro Council
Ordinary high water mark data					DNR
Permitted withdrawals					DNR
Protected levels/flows					DNR

Data Element	Present and Future Implications				Data Source
	Use of the Well (s)	Delineation Criteria	Quality and Quantity of Well Water	Land and Groundwater use in DWSMA	
Water use conflicts					DNR
Groundwater Quantity					
Permitted withdrawals	H	H	H	H	DNR
Groundwater use conflicts	M	M	H	H	DNR
Water levels	H	H	H	M	DNR, MPCA, MDA, MDH, City
Surface Water Quality					
Stream and lake water quality management classification					DNR
Monitoring data summary					MPCA, SWCD, WSD/WMO
Groundwater Quality					
Monitoring data	H	H	H	H	MPCA, MDH
Isotopic data	M	H	M	M	MDH
Tracer studies	M	M	M	M	Not Available (<i>default description</i>)
Contamination site data	M	L	M	M	MPCA, MDA
Property audit data from contamination sites	M	L	M	M	City, MPCA
MPCA and MDA spills/release reports	M	L	M	M	City, MPCA

Chapter 3 - Delineation of the Wellhead Protection Area, Drinking Water Supply Management Area and Vulnerability Assessments

A detailed description of the process used for 1) delineating the WHPA and the DWSMA, and 2) preparing the vulnerability assessments of the city water supply well(s) and DWSMA is presented in the first part of the WHP Plan (See Appendix I). The City of Pequot Lakes requested that MDH do this work and it was performed by Gail Haglund, a licensed geoscientist by the State of Minnesota.

3.1 WHPA and DWSMA Delineation

Figure 1 shows the boundaries of the WHPA and the DWSMA. The WHPA was delineated using computer simulations of groundwater movement to generate the underground capture zones for city Wells 3 (Unique No. 241514) and 4 (Unique No. 626480).

The DWSMA boundaries were designated using the following criteria:

- Center-lines of highways, streets, roads;
- Public Land Survey coordinates;
- Property lines / parcel boundaries; and
- Political boundaries.

3.2 Well Vulnerability Assessment

Well construction information and water quality data obtained for each well used by the City of Pequot Lakes is considered and evaluated in the assessment of well vulnerability. The city wells are considered vulnerable in part because of differences found in the well drillers logs for wells 3 and 4 (the drillers log for well 4 describes the till material as having a larger component of sand than the log for well 3) and previous tritium results for well 4 indicating that the aquifer contains a measureable component of post 1953 water or more recent recharge.

3.3 DWSMA Vulnerability Assessment

The moderate vulnerability assigned to the DWSMA (Figure 1) was determined using geologic, soils, and groundwater chemistry information. Existing well logs indicate the aquifer is covered by a layer of clay rich till varying in thickness from < 10 feet to more than 50 feet. Similarly, the tritium detected in well 4 indicates there is a component of young water recharging the city wells so a moderate vulnerability was assigned to the DWSMA. (See Appendix 1 for the Part I Wellhead Protection Report for further information on the vulnerability assessment for the City of Pequot Lakes wells and aquifer.)

Chapter 4 - Establishing Priorities and Assigning Risk to Potential Contamination Sources

The types of potential contamination sources that may exist within the DWSMA were derived from the information collected to satisfy the data element requirements (Chapter 2). The impact assigned to each data element as part of the assessment process (Table 1) was used to assess the types of potential contamination sources that may present a risk to the city's drinking water supply. The moderate vulnerability assessment for the DWSMA indicates that generally only wells, other types of boreholes, or activities that remove confining material that may allow contaminants to reach the aquifer such as buried tanks or certain types of Environmental Protection Agency Class V Wells are likely to impact the city wells and aquifer. To further safe guard the public water supply used by the City of Pequot Lakes, large above ground tanks, former spills and potentially large contaminant release sources such as pipelines were also considered in completing the potential contaminant source inventory.

4.1 Contaminants of Concern

None of the human-caused contaminants regulated under the federal Safe Drinking Water Act have been detected at levels indicating that the well itself serves to draw contaminants into the aquifer as a result of pumping. This generally indicates that most of the recharge the aquifer receives is over a long period of time and not immediately impacted by land uses.

4.2 Inventory Results and Risk Assessment

A map and description of the locations of potential contamination sources is presented in Appendix II. A summary of the results for the IWMZ is listed in Table 2 and Table 3 presents these results for the remainder of the DWSMA. The status of former city wells and borings were considered based upon research and information provided by MDH. The report generated for the City of Pequot Lakes showed that former city wells 1 and 2 have been properly sealed based upon well sealing records on file at the department. No other unused unsealed city wells or borings were identified by MDH. (See Exhibit 1) The WHP Team also considered other significant potential contaminant threats such as gas or oil pipelines. None of these types of potential contaminant threats were identified in the DWSMA.

The priority assigned to each type of potential contamination source addresses 1) the number inventoried, 2) its proximity to a city well, 3) the capability of local geologic conditions to absorb a contaminant, 4) the effectiveness of existing regulatory controls, 5) the time required for the City of Pequot Lakes to obtain cooperation from governmental agencies that regulate it, and 6) the administrative, legal, technical, and financial resources needed. A **high (H)** risk potential implies that the potential source type has the greatest likelihood to negatively impact the city's water supply and should receive highest priority for management. A **low (L)** risk potential implies that a lower priority for implementing management measures is assigned.

Table 2 - Potential Contamination Sources and Assigned Risk for the IWMZ

Source Type	Total	Level of Risk
Water Treatment Backwash Basin / Discharge	1	L

Table 3 - Potential Contamination Sources and Assigned Risk for the Rest of the DWSMA

Potential Source Type	Total Number	Number Within Emergency Response Area and Level of Risk		Number Within Remainder of the DWSMA and Level of Risk	
Domestic Wells (active)	17	0	-	17	M to L
Unused, Unsealed Well	0	0	-	0	M
Sealed Wells	3	2	-	1	-
Well (unknown status)	1	0		1	M to H
Underground Storage Tanks	1	1	M to H	0	-
Above Ground Tanks	0	0	-	0	-

Chapter 5 - Impact of Land & Water Use Changes on the Public Water Supply Well(s)

The city estimates that the following changes to the physical environment, land use, surface water, and groundwater may occur over the 10-year period that the WHP plan is in effect (Table 4). 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 sources. Land and water use changes may introduce new contamination sources or result in changes to groundwater use and quality. The anticipated changes may occur within the jurisdictional authority of the city, although some may not. Table 4 describes the anticipated changes to the physical environment, land use, and surface water or groundwater in relationship to the 1) influence that existing governmental land and water programs and regulations may have on the anticipated change, and 2) administrative, technical, and financial considerations of the City of Pequot Lakes and property owners within the DWSMA.

Table 4 - Expected Land and Water Use Changes

Expected Change (Physical Environment, Land Use, Surface Water, Groundwater)	Impact of the Expected Change On the Source Water Aquifer	Influence of Existing Government Programs and Regulations on the Expected Change	Administrative, Technical, and Financial Considerations Due to the Expected Change
Physical Environment: No major changes in the Pequot Lakes DWSMA are anticipated at this time.	Does not apply	Does not apply	Does not apply
Land Use: 1. MNDOT to realign Hwy. 371 east of city wells through DWSMA in 2018. (See Figure # 2) 2. Some new residential dwellings may be constructed.	1. Proactive planning and awareness by PWS among MNDOT staff is being done to try and prevent impacts on the aquifer. 2. New wells could be constructed into the aquifer	1. Use of existing framework for spill prevention, response and construction practices to minimize groundwater impacts 2. Hook-up requirement to the City Water System depending on location.	1. Reminding and alerting MNDOT staff of WHP area and concerns prior to and during construction. 2. Educating private well owners they are in DWSMA and / or carrying out hook-up requirements as needed.
Surface Water:	N/A	N/A	N/A
Groundwater: A new irrigation or high capacity well could be installed in the DWSMA.	The well may alter existing groundwater flow pattern and change the WHPA and DWSMA boundary.	An appropriations permit is required by the DNR for high capacity water users. The City, DNR & MDH will work together to evaluate potential impacts on the city well & aquifer should this occur.	The City will need to monitor for changes in land use and wells in the DWSMA and alert DNR / MDH of potential changes that may impact the city water supply.

Chapter 6 - Issues, Problems, and Opportunities

6.1 Identification of Issues, Problems and Opportunities

The City of Pequot Lakes has identified water and land use issues and problems and opportunities related to 1) the aquifer used by the city water supply wells, 2) the quality of the well water, or 3) land or water use within the DWSMA. The city assessed input from public meetings and written comments it received, the data elements identified by MDH during the scoping meetings, and the status and adequacy of the city's official controls and plans on land and water uses, in addition to those of local, state, and federal government programs. The results of this effort are presented in the following table, which defines the nature and magnitude of contaminant source management issues in the city's DWSMA. Identifying issues, problems and opportunities, including resource needs, enables the city 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.

6.2 Comments Received

There have been several occasions for local governments, state agencies, and the general public to identify issues and comment on the city's WHP plan. At the beginning of the planning process, local units of government were notified that the city was going to develop its WHP plan and were given the opportunity to identify issues and comment. A public information meeting was held to review the results of the delineation of the wellhead protection area, DWSMA, and the vulnerability assessments. The meetings of the city's wellhead protection team were open to the public. Also, a public hearing was held before the completed WHP plan was sent to MDH for state agency review and approval. At this time, no comments have been received on the Pequot Lakes WHP Plan.

Table 5 - Issues, Problems, and Opportunities

Issue Identified	Impacted Feature	Problem Associated with the Identified Issue	Opportunity Associated with the Identified Issue	Adequacy of Existing Controls to Address the Issue
There may be unused, unsealed wells in the Pequot Lakes DWSMA.	The aquifer and city wells could potentially be impacted.	Any unused, unsealed wells may potentially impact the aquifer and city water supply.	City educates the public about the dangers of unused, unsealed wells. Funding may be available to assist with well sealing	The MDH is responsible for enforcing the State well code and well sealing. MDH can assist the city as needed.
MN State Highway 371 will be re-routed through the east side of the Pequot Lakes DWSMA.	The aquifer and city wells could potentially be impacted.	Excavation and movement of soils protecting the aquifer. There is the potential for petroleum spills or a contaminant release associated with new road construction.	Early in the planning process the City informed MNDOT about the DWSMA and WHP concerns such as storm water, spill prevention and clean- up to minimize impacts. The city will continue reminding MNDOT of these issues and others.	The city has an extractive use overlay district. No extractive uses (i.e. sand and gravel mining for road construction) are allowed in the DWSMA.
The potential exists for new commercial development along a new realigned State Highway 371 in the DWSMA.	The aquifer and city wells could potentially be impacted.	More potential contaminants such as tanks, etc. would be located in the DWSMA.	Planning staff have identified this issue & are educating the planning commission on ways to minimize impacts through local controls.	The City has up to date local controls & maps reflecting WHP. Existing Ag, RR zoning districts presently minimize impacts in the DWSMA.

Continued, Table 5- Issues, Problems, and Opportunities

Issue Identified	Impacted Feature	Problem Associated with the Identified Issue	Opportunity Associated with the Identified Issue	Adequacy of Existing Controls to Address the Issue
There is one underground storage tank for an oil recycling drop off station south of the city wells.	The aquifer and city wells could potentially be impacted.	Accidental spills or dumping in and around the used oil recycling drop off site.	Site and area is closely monitored by city utility staff. Site is kept clean and spills are cleaned up.	Drop off site is on impervious surface to allow better clean up and monitoring so spill material does not enter ground.

Chapter 7 - Existing Authority and Support Provided by Local, State, and Federal Governments

In addition to its own controls, the City of Pequot Lakes will rely upon partnerships formed with local units of government, state agencies, and federal agencies with regulatory controls or resource management programs in place to help implement its WHP plan. The level of support that a local, state, and federal agency can provide depends on its legal authority, as well as the resources available to local governments.

7.1 Existing Controls and Programs of the City of Pequot Lakes

Table 6 shows the legal controls and/or programs that the city has identified to support the management of potential contamination sources within the DWSMA.

Table 6 - Controls and Programs of the City of Pequot Lakes

Type of Control	Program Description
City of Pequot Lakes: Land Use Control Ordinance and Building Permits	Protects the Health, Safety and General Welfare of the community through good planning. Reduces conflicts between different land uses and provides an opportunity to establish standards and guidelines to offset potential risk posed by a land use and / or improper construction practices.
City of Pequot Lakes: Hook up requirements to the water supply system and cross connection program	Increases the use and support of city infrastructure. Reduces the risk that poor management of wells will become a pathway for contaminants and the pumping of other wells will impact contaminant movement to the city wells.

The entire Pequot Lakes DWSMA is within the City of Pequot Lakes. The City of Pequot Lakes Zoning Map is found on page 27, Figure 3. Presently, the City of Pequot Lakes is in the process of updating their comprehensive plan and map so no comprehensive plan map is available at this time. However, the city has drafted language about WHP and vulnerability of their groundwater supply to include in their comprehensive plan to make sure WHP issues and DWSMA Map continue to be considered in land use decisions. The City also wishes to further explore and evaluate the use of their Comprehensive Plan and Zoning Ordinance to provide better protection of the city wells and aquifer as part of plan implementation strategies.

7.2 Local Government Controls and Programs

The following departments or programs within Crow Wing County may be able to assist the city with issues relating to potential contamination sources that 1) have been inventoried or 2) may result from changes in land and water use within the DWSMA:

Table 7 - Local Agency Controls and Programs

Government Unit	Name of Control/Program	Program Description
Crow Wing County (Land Services: Environmental Services)	Water Management Plan Solid Waste / Household Hazardous Waste, Recycling	Protects the health, safety & welfare in the unincorporated and township areas of the county through local controls. Crow Wing County Land Services administers a number of other environment and land related services. The Environmental Services division administers the county water plan which supports local drinking water and wellhead protection implementation efforts. Environmental Services also provides solid waste and household hazardous waste programs throughout the county.
Crow Wing County Soil & Water Conservation District (SWCD)	State Cost Share Program	Promotes and implements many of the activities in the county water plan to protect and improve water resources. Administers State Cost Share funds provided for private landowner implementation for certain water quality related practices (Example: Well Sealing Cost Share for private wells)

7.3 State Agency and Federal Agency Support

MDH will serve as the contact for enlisting the support of other state agencies on a case-by-case basis regarding technical or regulatory support that may be applied to the management of potential contamination sources. Participation by other state agencies and the federal government is based on legal authority granted to them and resource availability. Furthermore, MDH 1) administers state regulations that affect specific potential sources of contamination and 2) can provide technical assistance to property owners to comply with these regulations.

The following table identifies the specific regulatory programs or technical assistance that state and federal agencies may provide to the City of Pequot Lakes to support implementation of the WHP plan. It is likely that other opportunities for assistance may be available over the 10-year period that the plan is in effect due to changes in legal authority or increases in funding granted to state and federal agencies. Therefore, the table references opportunities available when the city's WHP plan was first approved by MDH.

Table 8 - State and Federal Agency Controls and Programs

Government Unit	Type of Program	Program Description
MDH	State Well Code (Minnesota Rules, Chapter 4725)	MDH has authority over the construction of new wells and the sealing of wells. MDH staff in the Well Management Program offer technical assistance for enforcing well construction codes, maintaining setback distances for certain contamination sources, and well sealing.
MDH	Wellhead Protection (WHP)	MDH has staff that will help the city identify technical or financial support that other governmental agencies can provide to assist with managing potential contamination sources.
DNR	Water appropriation permitting (Minnesota Rules, Chapter 6115)	DNR can require that anyone requesting an increase in existing permitted appropriations, or to pump groundwater, must address concerns regarding the impacts to drinking water if these concerns are included in a WHP plan.
MPCA	Tank Compliance & Assistance Program	Establishes tank permit requirements, installation standards, monitoring, reporting and mitigation of spills and releases from above ground storage tanks (AST) and underground storage tanks (UST).
Environmental Protection Agency (EPA)	40 Code of the Federal Regulations 144 Subpart G	Automatic closure of the Class V automotive waste disposal wells in a WHPA, inventory of Class V Wells.

7.4 Support Provided by Nonprofit Organizations

The Minnesota Rural Water Association can provide a wide variety of technical support ranging from helping to develop / update wellhead protection (WHP) plans, locate and secure funding for implementation and provide on-site technical assistance for the implementation of this plan.

The Minnesota League of Cities can provide technical and legal advice for city administration, developing ordinances and local plans.

Chapter 8 - Goals

Goals define the overall purpose for the WHP plan, as well as the end points for implementing objectives and their corresponding actions. The WHP team identified the following goals after considering the impacts that changing land and water uses have presented to drinking water quality over time and future changes that need to be addressed to protect the community's drinking water:

- Maintain and protect the good quality of water produced from the City of Pequot Lakes wells and prevent contamination of the aquifer.
- Maintain a safe and adequate drinking water supply for community residents to protect their health, and
- Insure the security of the water system and minimize disruptions to the system.

Chapter 9 - Objectives and Plan of Action

Objectives provide the focus for ensuring that the goals of the WHP plan are met and that priority is given to specific actions that support multiple outcomes of plan implementation.

Both the objectives and the wellhead protection measures (actions) that support them are based on assessing 1) the data elements (Chapter 2), 2) the potential contaminant source inventory (Chapter 4), 3) the impacts that changes in land and water use present (Chapter 5) and 4) issues, problems, and opportunities referenced to administrative, financial, and technical considerations (Chapter 6).

9.1 Objectives

The following objectives have been identified to support the goals of the WHP plan for the City of Pequot Lakes:

1. Continue to create awareness and appreciation for the City of Pequot Lakes water supply and efforts needed to protect and maintain the system among city residents, council and landowners in the DWSMA.
2. Continue to educate city residents, city council and landowners in the DWSMA about what WHP is and activities in the WHP Plan that protect the quality of drinking water and city water supply.
3. Promote proper management of private wells (sealing of wells not in use, good management of wells in use, etc.)
4. Continue to monitor for any contaminants or changes in land use within the Inner Well Management Zone (200' radius) around the city well.
5. Keep the emergency / contingency plan up to date.
6. Implement and update as needed local controls that help protect the city well, aquifer and also support the water supply system.
7. Participate in WHP Meetings with local resource staff (Crow Wing County, SWCD, MDH, MRWA) to keep current on WHP issues and discuss plan implementation activities identified.
8. Track and report WHP implementation efforts to the City Council and MDH.

9.2 WHP Measures and Action Plan

Based upon the factors, the WHP team has identified WHP measures that will be implemented by the city over the 10-year period that its WHP plan is in effect. The objective that each measure supports is noted as well as the lead party and any cooperators, the anticipated cost for implementing the measure and the year or years in which it will be implemented.

The following categories are used to further clarify the focus that each WHP measure provides, in addition to helping organize the measures listed in the action plan:

- WHP Education
- Well Management
 - Municipal Well Management Activities
 - Private Wells
 - Class V Wells & High Capacity Wells
- Tank & Spill Management Strategies
- Water Supply Planning and Land Use
 - Highway 371 Realignment
 - Land Use Planning
- Data Collection
- WHP Coordination and Reporting

9.3 Establishing Priorities

WHP measures reflect the administrative, financial, and technical requirements needed to address the risk to water quality or quantity presented by each type of potential contamination source. Not all of these measures can be implemented at the same time, so the WHP team assigned a priority to each. A number of factors must be considered when WHP action items are selected and prioritized (part 4720.5250, subpart 3):

- Contamination of the public water supply wells by substances that exceed federal drinking water standards.
- Quantifiable levels of contamination resulting from human activity.
- The location of potential contaminant sources relative to the wells.
- The number of each potential contaminant source identified and the nature of the potential contaminant associated with each source.
- The capability of the geologic material to absorb a contaminant.
- The effectiveness of existing controls.
- The time needed to acquire cooperation from other agencies and cooperators.
- The resources needed, i.e., staff, money, time, legal, and technical resources.

The City of Pequot Lakes assigned priority rank for the WHP Measures included in this plan. The following series of tables by category list each measure that will be implemented over the 10 year period that the city's WHP plan is in effect including the priority assigned to each measure.

A. WHP EDUCATION:

14

B. WELL MANAGEMENT

Implementation Action Items														
<u>Action #</u>	<u>Description</u>	<u>Priority</u>	Responsible Party ® & Cooperators ©	Cost	Implementation Time Frame									
					2013	2014	2015	2016	2017	2018	2019	2020	2021	Update Plan
<u>Municipal Well Management</u> : Inner Zone Management Activities (200’ radius of public water supply wells)														
1	The WHP Manager will monitor for new potential contaminant sources and setback requirements within the IMMZ (200’) of the City wells. If new contaminant sources are identified, MDH Planner or Community Engineer will be contacted for steps that can be taken to protect the well.	Very High	WHP Mgr.® MDH Staff ©	Staff Time	X	X	X	X	X	X	X	X	X	X
2	The WHP Manager will assist MDH in updating the IWMZ survey form for the city well every 3-5 years.	High	City Staff ® MDH	Staff Time				X				X		
<u>Private Well Management</u>														
3	Educate the public about the importance of sealing unused wells through a city newsletter or local paper. Maintain information about the importance of sealing unused wells on the city website and contact information. Work collaboratively with the County Water Planner and SWCD to promote well sealing as funds are available.	High	WHP Mgr.,® County Water Planner, SWCD©	Staff Time			X				X			
4	Provide information on the proper management and sealing of wells to landowners with wells in the DWSMA and why this is important. Keep MDH private well mgmt. information on file at city hall and post on city website.	High	WHP Mgr., ® MDH, MRWA, SWCD ©	Staff Time		X								

WELL MANAGEMENT, cont'd

Implementation Action Items														
<u>Action #</u>	<u>Description</u>	<u>Priority</u>	Responsible Party ® & Cooperators ©	Cost	Implementation Time Frame									
					2013	2014	2015	2016	2017	2018	2019	2020	2021	Update Plan
<u>Class V Wells:</u>														
5	<u>Step 1:</u> Identify any potential automotive Class V wells in the DWSMA. <u>Step 2:</u> If a Class V Well is identified, work with MDH Planner to provide the property owner with management or permitting options.	High	WHP Mgr. ® MDH ©	Staff Time	This measure describes the importance of identifying a “<u>Class V Well</u>” and steps to take if one is identified.									
<u>High Capacity Wells:</u>														
6	<u>Step. 1:</u> Identify any new high capacity well that is proposed for construction in or within one mile of the DWSMA. <u>Step 2:</u> <i>If a high capacity well is identified:</i> contact MDH Hydrologist to evaluate the effect that proposed pumping may have on the boundaries of the delineated WHP area, and work with MDH Hydrologist, DNR and high capacity well owner to minimize potential impacts that pumping may have on water quantity or quality of the public water supply.	Very High	WHP Mgr. ® MDH, DNR ©	Staff Time	This measure describes the importance of identifying a “<u>High Capacity Well</u>” in or within 1 mile of the DWSMA, and steps to take if one is identified.									

C. TANK & SPILL MANAGEMENT STRATEGIES

Implementation Action Items														
<u>Action #</u>	<u>Description</u>	<u>Priority</u>	Responsible Party ® & Cooperators ©	Cost	Implementation Time Frame									
					2013	2014	2015	2016	2017	2018	2019	2020	2021	Update Plan
<u>Tanks:</u>														
1	Remind City & Utility Staff about the importance of monitoring the Used Oil Recycling Station area for leaks, spills or material dumped in the area that may enter the ground. Emphasize the importance of cleaning up any identified spilled material.	Very High	WHP Mgr.® City Utility Staff ©	Staff Time	X	X	X	X	X	X	X	X	X	
2	Inform any new tank owners in the DWSMA about WHP and provide them information explaining that their facility is in the recharge area of the city wells. Remind them of the importance of tank monitoring, clean up and reporting of any leaks or spills to protect the city water supply.	High	WHP Mgr. ® MRWA, MDH ©	Staff Time	This measure can be used if any new tanks are installed in the DWSMA.									
3	If former underground storage tanks (UST’s) or fuel oil tanks are discovered or discontinued from service, inform property owners of the importance of proper removal & clean-up to protect groundwater. Recommend they contact MPCA UST Staff at: (800) 657-3864 for information on proper removal and clean up.	High	WHP Mgr. ® MPCA ©	Staff Time	This measure describes what the PWS can advise in the event of discovering former underground fuel oil tanks in the DWSMA.									
<u>Spills:</u>														
1	Provide a map of the DWSMA and WHP information to the Pequot Lakes Fire Department, First Responders and County Highway Department. Explain the importance of local response to spills or releases in the DWSMA & importance of clean-up to protect ground water.	High	WHP Mgr. ®	Staff Time	X									

D. WATER SUPPLY PLANNING AND LAND USE:

Implementation Action Items														
Action #	Description	Priority	Responsible Party ® & Cooperators ©	Cost	Implementation Time Frame									
					2013	2014	2015	2016	2017	2018	2019	2020	2021	Update Plan
Highway 371 Realignment:														
1	Provide MNDOT staff with amended DWSMA Map. Remind them to consider road run-off and storm water infiltration concerns in the DWSMA as part of road design.	Very High	WHP Mgr.® MDH ©	Staff Time		X								
2	As plans for the road realignment project are completed by MNDOT, request MDH Hydrologist & Planner review for groundwater related concerns or questions.	High	WHP Mgr.® MDH ©	Staff Time				X	As needed when plans are available.					
3	Before construction begins, request mayor send DWSMA map and letter to MNDOT to remind them of the importance of spill prevention, clean up, etc. to protect the city’s drinking water supply. Request fueling and parking of tanker trucks in the DWMSA be minimized and the letter and map be provided to the project contract supervisors.	Very High	WHP Mgr., Mayor ® MDH ©	Staff Time						X	Exact time TBD.			
Planning & Land Use:														
4	Review and update the Emergency / Contingency Plan as needed to ensure it reflects current personnel information and any changes to the water supply system.	High	WHP Mgr. ®				X			X			X	
5	Evaluate how the water supply emergency / contingency plan can be incorporated or a part of overall emergency & planning in the City of Pequot Lakes.	High	WHP Mgr. ®			X								
6	Explore and evaluate developing a water conservation ordinance. Share results of research with planning commission and the city council.	Moderate	WHP Mgr. ® MDH, MRWA ©					X	X					

WATER SUPPLY PLANNING AND LAND USE:, cont'd

Implementation Action Items														
<u>Action #</u>	<u>Description</u>	<u>Priority</u>	Responsible Party ® & Cooperators ©	Cost	Implementation Time Frame									
					2013	2014	2015	2016	2017	2018	2019	2020	2021	Update Plan
7	Update the city comprehensive plan to include the new Pequot Lakes DWSMA map.	High	WHP Mgr. ® Council, MDH ©	Staff Time					X					
8	Consider existing land uses, future changes and zoning districts in the DWSMA. Present information to the planning commission and consider risks to determine if changes are needed to the comprehensive plan and local zoning controls to better protect the city wells and aquifer. Give special consideration to protecting the one year time of travel area near the PWS wells & potential changes that may result from the Highway 371 realignment in the DWSMA.	High	WHP Mgr., ® Planning Commission, MDH, MRWA ©	Staff Time				X	X					
9	If changes are identified from # 5 above, incorporate changes into the comprehensive plan and / or local controls.	High	WHP Mgr., ® Planning Commission, Council				X	X						
10	Evaluate and update (as needed) city cross connection control ordinance and requirements for backflow prevention. Evaluate properties that may have a private well and be hooked to the city water supply system.	High	WHP Mgr. ® MRWA, MDH ©	Staff Time		X								
11	Continue to attend planning commission and city council meetings to advocate planning that encourages the use of the municipal water system and reduces the risk of potential contaminants identified in this plan.	High	WHP Mgr. ®	Staff Time	X	X	X	X	X	X	X	X	X	

E. DATA COLLECTION

Implementation Action Items														
<u>Action #</u>	<u>Description</u>	<u>Priority</u>	Responsible Party ® & Cooperators ©	Cost	Implementation Time Frame									
					2013	2014	2015	2016	2017	2018	2019	2020	2021	Update Plan
1	Assist MDH Hydrologist in the collection of water samples from each well for the analysis of tritium and other general chemistry parameters to confirm well and aquifer vulnerability.	High	City Utility Staff or WHP Mgr. ® MDH ©	Staff Time					X					
2	Annually update the list of wells and their status (in use, unused, etc.) in the DWSMA. This can be tracked through the issuance of building permits or when an existing property is hooked to the city water supply system.	High	WHP Mgr. ®	Staff Time	X	X	X	X	X	X	X	X	X	X
3	Work with MDH Hydrologist to determine the risk potential spills pose to the aquifer and city wells. Evaluate these risks particularly in the area of the Highway 371 re-alignment.	High	WHP Mgr. ® MDH ©				X							

F. WELLHEAD PROTECTION COORDINATION & REPORTING:

Implementation Action Items														
<u>Action #</u>	<u>Description</u>	<u>Priority</u>	Responsible Party ® & Cooperators ©	Cost	Implementation Time Frame									
					2013	2014	2015	2016	2017	2018	2019	2020	2021	Update Plan
1	Maintain a “WHP Folder” that contains documentation of WHP activities you have completed and date it was done.	High	WHP Mgr. ®	Staff Time	X	X	X	X	X	X	X	X	X	X
2	Do an annual review of Measures in the WHP Plan and identify measures to be completed in the upcoming year. Assess resources needed for completion of upcoming activities.	High	WHP Mgr. ®	Staff Time	X	X	X	X	X	X	X	X	X	X

WELLHEAD PROTECTION COORDINATION & REPORTING: cont'd

Implementation Action Items														
<u>Action #</u>	<u>Description</u>	<u>Priority</u>	Responsible Party ® & Cooperators ©	Cost	Implementation Time Frame									
					2013	2014	2015	2016	2017	2018	2019	2020	2021	Update Plan
3	At a minimum, hold a semi-annual WHP Team meeting with resource partners to discuss plan implementation accomplishments and activities planned for upcoming year.	High	WHP Mgr. ® MDH, County Water Planner, SWCD ©	Staff Time		X		X		X		X		X
4	Complete and submit an annual year-end report on completed WHP activities to the city council.	High	WHP Mgr. ®	Staff Time	X	X	X	X	X	X	X	X	X	X
5	Complete a WHP Evaluation Report every 2.5 years that evaluates the progress of implementing the WHP Measures identified in this plan and the impact of (any) contaminant release on the aquifer supplying the public water supply wells. Submit report to MDH.	High	WHP Mgr. ® MDH or MRWA Planner ©	Staff Time			X			X			X	

9.4 Commitments From Cooperators

The agencies listed in Table 10 have indicated they will support the City of Pequot Lakes with implementing the WHP measure(s) in which they are identified.

Table 10 - Cooperating Agencies List

Agency	Measure	Actions Agency Will Take
Crow Wing Water Planner	A4, B3, F3	Provide technical assistance for implementing activities
Crow Wing SWCD	B3, B4, F3	Provide technical assistance for implementing activities
MDH / MRWA (Items may be supported by either MDH or MRWA unless noted otherwise)	A1-2, A-6, B1-2, B4 – 6, C2, D1-3, D6-8, D10, E1, E3, F3, F5	Provide technical assistance for implementing activities
DNR	A-6	Support activity
MPCA	B-6	Support activity

Chapter 10 - Evaluation Program

Evaluation is used to support plan implementation and is required under Minnesota Rules, part 4720.5270, prior to amending the city's WHP plan. Plan evaluation is specified under Measure F-3 and provides the mechanism for determining whether WHP action items are achieving the intended result or whether they need to be modified to address changing administrative, technical, or financial resource conditions within the DWSMA. The city has identified the following procedures that it will use to evaluate the success with implementing its WHP plan:

1. An annual briefing to the city council and at a minimum, semi-annually to the WHP Team will provide the basis for documenting whether each action step for that year was implemented.
2. The WHP team will meet at a minimum, semi-annually to assess the status of plan implementation and to identify issues that impact the implementation of action steps throughout the DWSMA;
3. The city will assess the results of each action item that has been taken annually to determine whether the action item has accomplished its purpose or whether modification is needed. Assessment results will be presented in the annual briefing to the city council and WHP Team.
4. The city will prepare a written report every 2.5 years that documents how it has assessed plan implementation and the action items that were carried out. The reports will be sent to MDH every 2.5 years and also available when MDH holds the first scoping meeting with the city to begin amending the WHP plan.

Chapter 11 - Contingency Strategy

The WHP plan includes a contingency strategy that addresses disruption of the water supply caused by either contamination or mechanical failure. The city prepared this strategy using a template provided by MDH and presented in Appendix III of this plan.

Chapter 12 - Glossary of Terms

Data Element. A specific type of information required by the Minnesota Department of Health to prepare a wellhead protection plan.

Drinking Water Supply Management Area (DWSMA). The surface and subsurface areas surrounding a public water supply well, including the wellhead protection area, that must be managed by the entity identified in the wellhead protection plan. (Minnesota Rules, part 4720.5100, subpart 13). This area is delineated using identifiable landmarks that reflect the scientifically calculated wellhead protection area boundaries as closely as possible.

Emergency Response Area (ERA). The part of the wellhead protection area that is defined by a one-year time of travel within the aquifer that is used by the public water supply well (Minnesota Rules part 4720.5250, subpart 3). It is used to set priorities for managing potential contamination sources within the DWSMA.

Emergency Standby Well. A well that is pumped by a public water supply system only during emergencies, such as when an adequate water supply cannot be achieved because one or more primary or seasonal water supply wells cannot be used.

Inner Wellhead Management Zone (IWMZ). The land that is within 200 feet of a public water supply well (Minnesota Rules, part 4720.5100, subpart 19). The City of Pequot Lakes must manage the IWMZ to help protect it from sources of pathogen or chemical contamination that may cause an acute health effect.

Nonpoint Source Contamination. Refers to contamination of the drinking water aquifer that is caused by polluted runoff or pollution sources that cannot be attributed to a specifically defined origin, e.g., runoff from agricultural fields, feedlots, or urban areas.

Point Source Contamination. Refers to contamination of the drinking water aquifer that is attributed to pollution arising from a specifically defined origin, such as discharge from a leaking fuel tank, a solid waste disposal site, or an improperly constructed or sealed well.

Primary Water Supply Well. A well that is regularly pumped by a public water supply system to provide drinking water.

Seasonal Water Supply Well. A well that is only used to provide drinking water during certain times of the year, either when pumping demand cannot be met by the primary water supply well(s) or for a facility, such as a resort, that is closed to the public on a seasonal basis.

Vulnerability. Refers to the likelihood that one or more contaminants of human origin may enter either 1) a water supply well that is used by the City of Pequot Lakes or 2) an aquifer that is a source of public drinking water.

WHP Area (WHPA). The surface and subsurface area surrounding a well or well field that supplies a public water system, through which contaminants are likely to move toward and reach the well or well field (Minnesota Statutes, part 103I.005, subdivision 24).

WHP Plan Goal. An overall outcome of implementing the WHP plan, e.g., providing for a safe and adequate drinking water supply.

WHP Measure. A method adopted and implemented by a City of Pequot Lakes to prevent contamination of a public water supply, and approved by the Minnesota Department of Health under Minnesota Rules, parts 4720.5110 to 4720.5590.

WHP Plan Objective. A capability needed to achieve one or more WHP goals, e.g., implementing WHP measures to address high priority potential contamination sources within 5 years.

Chapter 13 - List of Acronyms

CWI - County Well Index

DNR - Minnesota Department of Natural Resources

EPA - United States Environmental Protection Agency

FSA - Farm Security Administration

MDA - Minnesota Department of Agriculture

MDH - Minnesota Department of Health

MGS - Minnesota Geological Survey

MN DOT - Minnesota Department of Transportation

MN GEO - Minnesota Geospatial Information Office

MPCA - Minnesota Pollution Control Agency

NRCS - Natural Resource Conservation Service

SWCD - Soil and Water Conservation District

UMN - University of Minnesota

USDA - United States Department of Agriculture

USGS - United States Geological Survey

Chapter 14 – References

MN Rural Water Association (MRWA) website:

<http://www.mrwa.com/>

MN Department of Health (MDH) Source Water Protection website

<http://www.health.state.mn.us/divs/eh/water/swp/index.htm>

MN Department of Health (MDH) Drinking Water Protection website:

<http://www.health.state.mn.us/divs/eh/water/>

MN Pollution Control Agency (MPCA) website:

<http://www.pca.state.mn.us/>

MN Department of Natural Resources (MN DNR) Water Management website:

http://www.dnr.state.mn.us/waters/watermgmt_section/index.html

MN Department of Agriculture (MDA) Protecting Our Lands & Waters website:

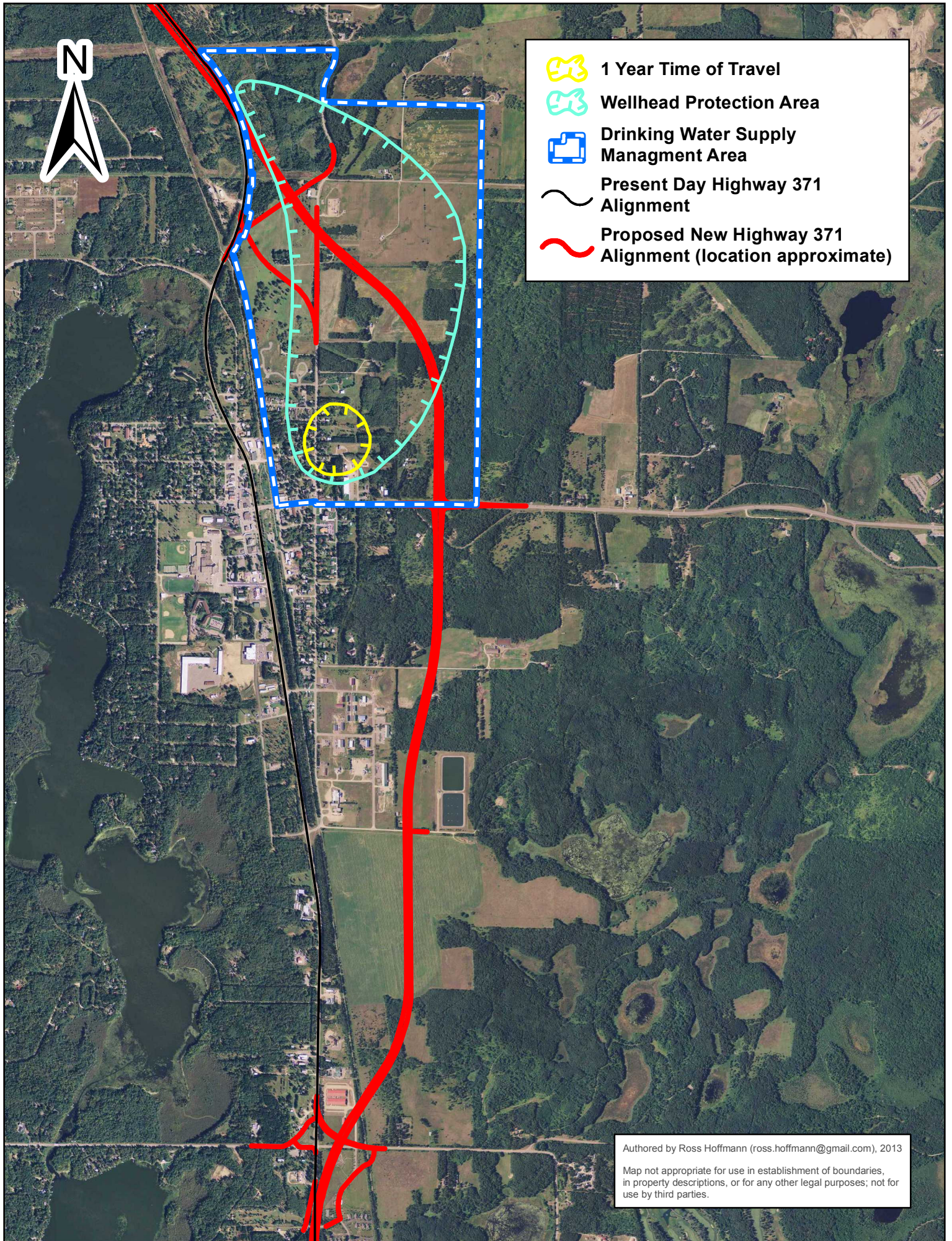
<http://www.mda.state.mn.us/protecting.aspx>

US Environmental Protection Agency (EPA) Source Water protection website:

<http://water.epa.gov/infrastructure/drinkingwater/sourcewater/protection/index.cfm>

Figure 2:

City of Pequot Lakes Highway 371 Realignment Map



-  1 Year Time of Travel
-  Wellhead Protection Area
-  Drinking Water Supply Management Area
-  Present Day Highway 371 Alignment
-  Proposed New Highway 371 Alignment (location approximate)

Authored by Ross Hoffmann (ross.hoffmann@gmail.com), 2013

Map not appropriate for use in establishment of boundaries, in property descriptions, or for any other legal purposes; not for use by third parties.

Figure 3:

City of Pequot Lakes Zoning, Parcel Coverage & Highway 371
Realignment Map

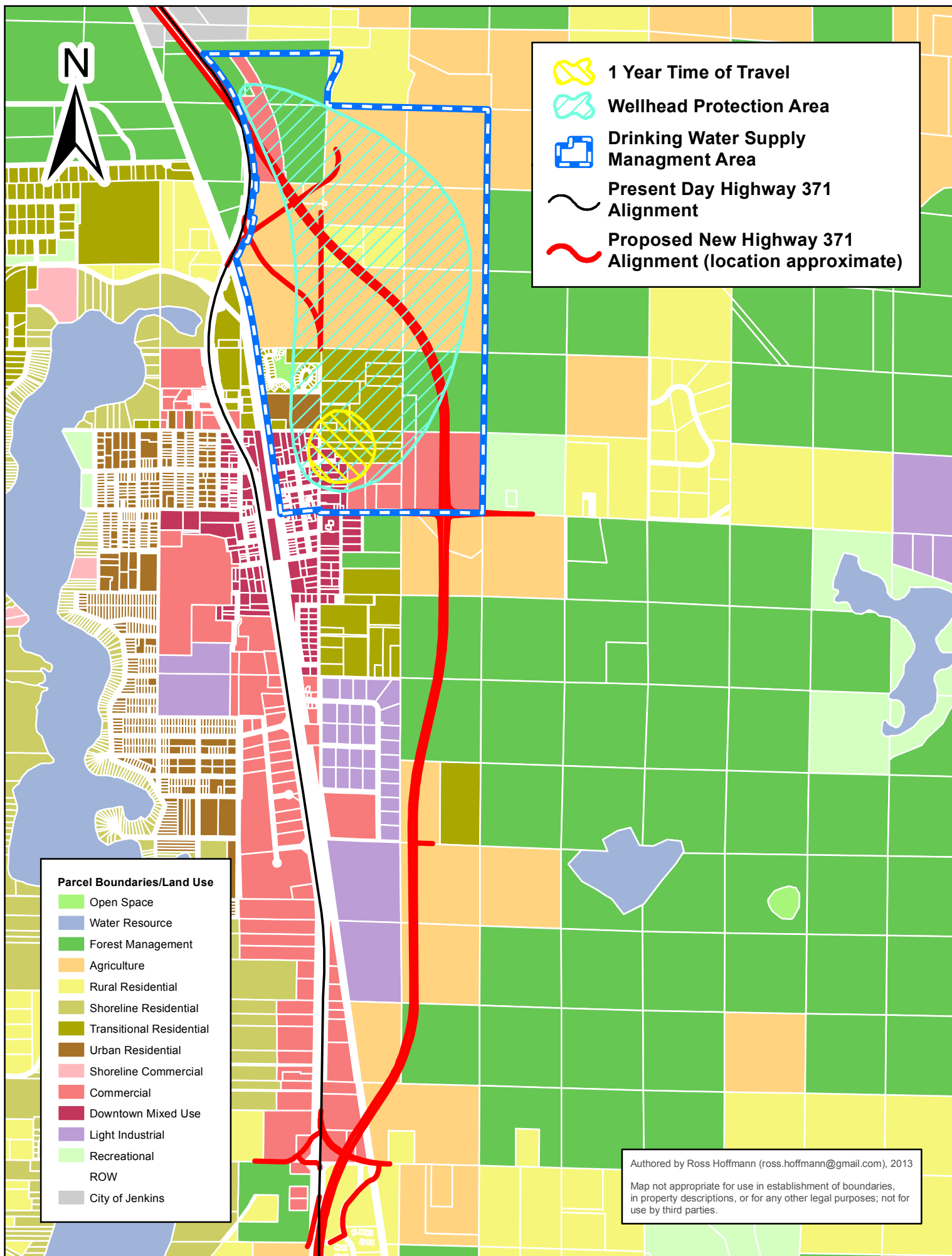
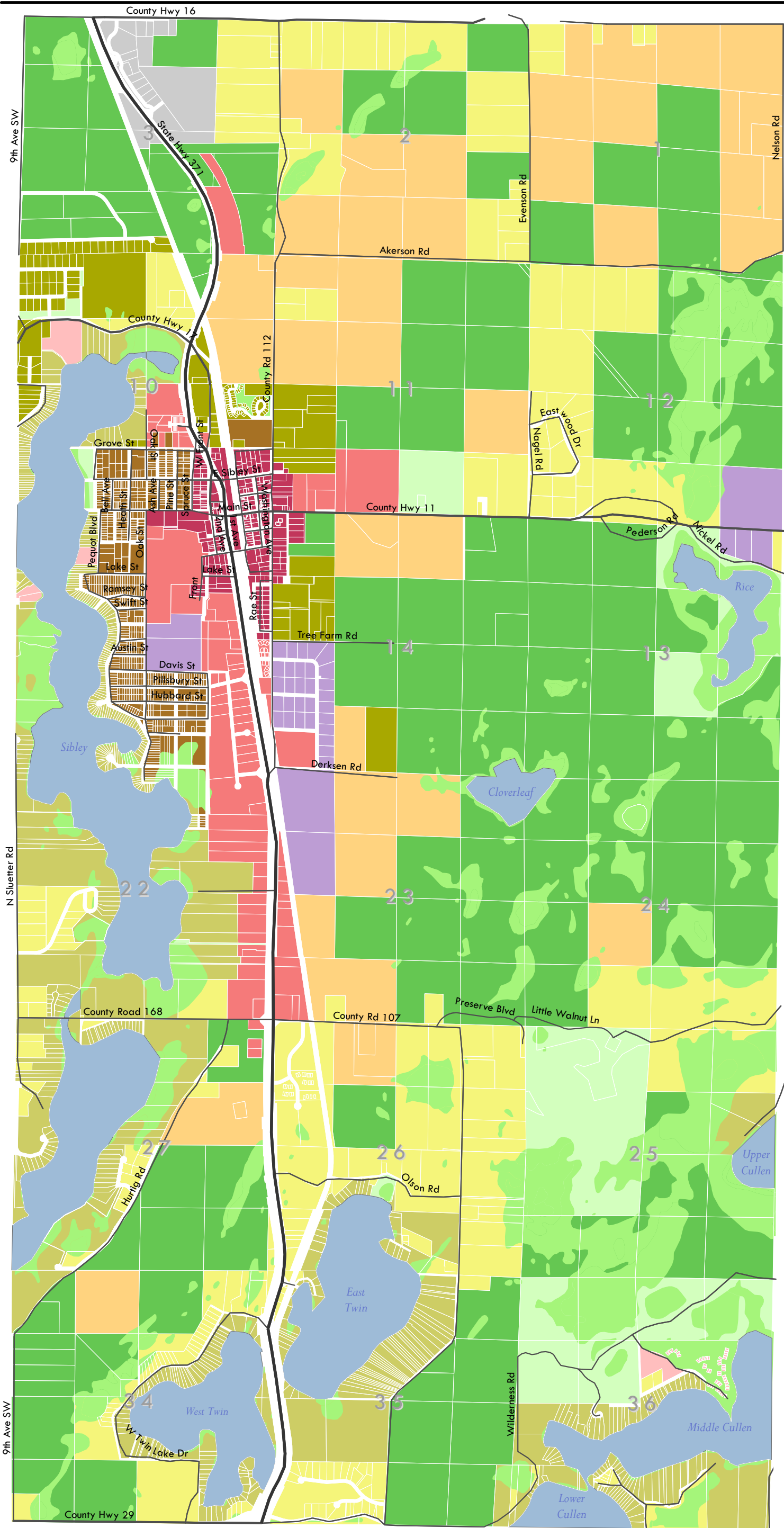


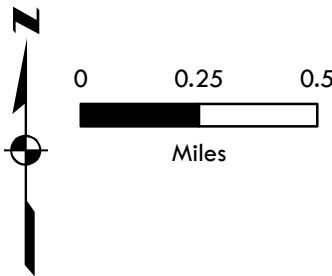
Figure 4:

City of Pequot Lakes Zoning Map



TWP 136, RNG 29

- Zoning Classification**
- Open Space
 - Water Resource
 - Forest Management
 - Agriculture
 - Rural Residential
 - Shoreline Residential
 - Transitional Residential
 - Urban Residential
 - Shoreline Commercial
 - Commercial
 - Downtown Mixed Use
 - Light Industrial
 - Recreational
 - ROW
 - City of Jenkins
 - Section Lines



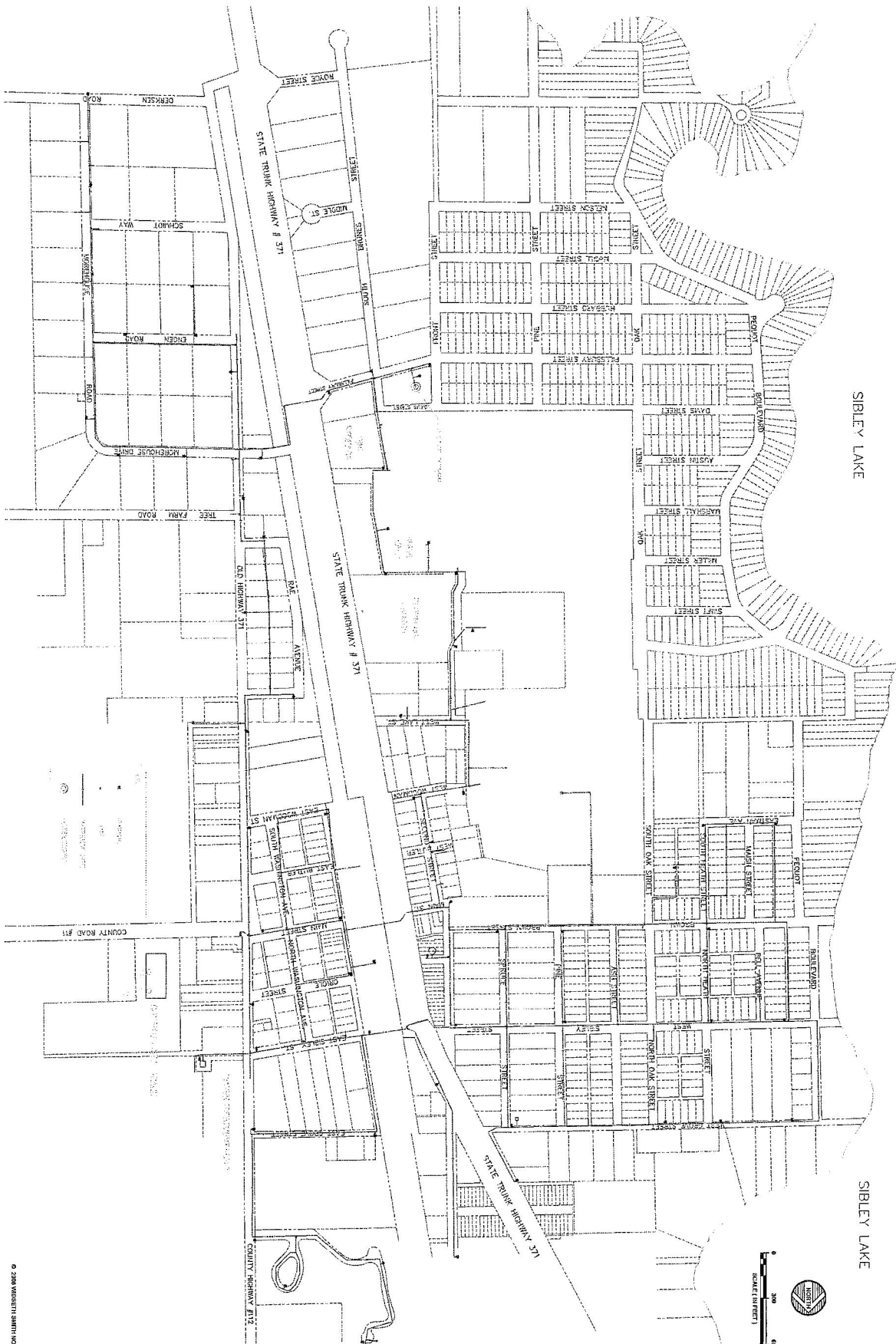
Updated December 2009



Map prepared by
1000 Friends of Minnesota TRC

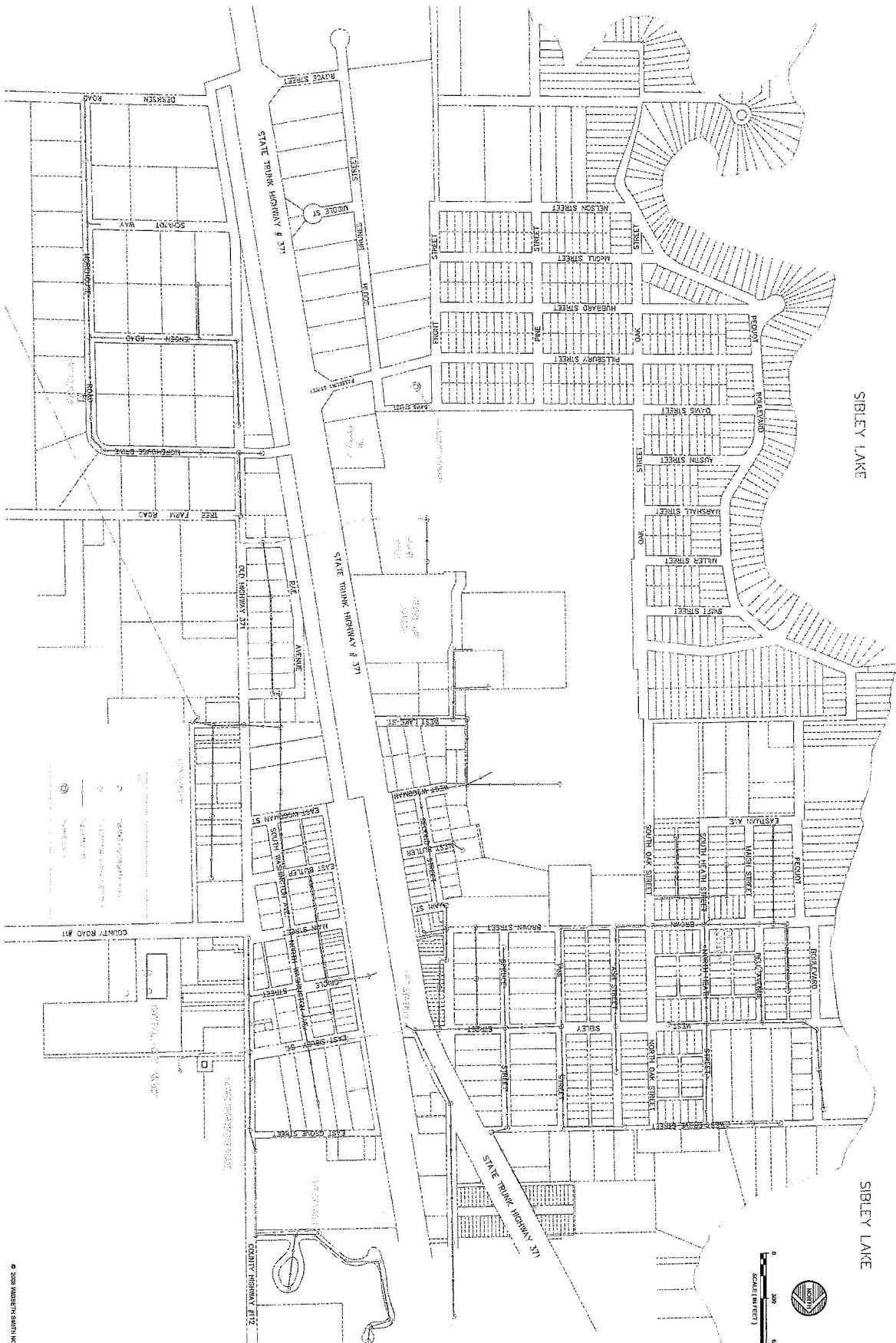
Figure 5:

City of Pequot Lakes Water, Sanitary Sewer and Storm Water Maps



© 2008 WIDSWELL SMITH & ASSOCIATES

SHEET 1 OF 1	UTILITY MAP CITY OF PEQUOT LAKES CROW WING COUNTY, MINNESOTA WATER DISTRIBUTION SYSTEM MAP	DATE: MARCH 2008	DATE	REV	REVISIONS DESCRIPTION	BY	I HEREBY CERTIFY THAT THIS PLAN SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A QUALIFIED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.	 WIDSWELL SMITH & ASSOCIATES ENGINEERS ARCHITECTS LAND SURVEYORS ENVIRONMENTAL SERVICES	ENGINEERS ARCHITECTS LAND SURVEYORS ENVIRONMENTAL SERVICES
		SCALE: AS SHOWN							MICHAEL E. RUDE
		DRAWN BY: WSR							
		CHECKED BY: MSA							
		JOB NUMBER: 013080000 000							



© 2000 WIDSBETH SMITH & NOLLING

SHEET 1 OF 1	SECTION 1	UTILITY MAP	DATE: MARCH 2018	DATE: 7/20/18	REVISION DESCRIPTION	BY	I HEREBY CERTIFY THAT THIS PLAN SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A QUALIFIED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.		ENGINEERS	400 W. 1st St.
		CITY OF PEQUOT LAKES	SCALE: AS SHOWN						ARCHITECTS	Suite 100
		CROW WING COUNTY, MINNESOTA	DRAWN BY: MGR						LAND SURVEYORS	Pequot Lakes, MN 55653
			CHECKED BY: MGR						ENVIRONMENTAL SERVICES	(218) 339-1111
										www.wsn-engineers.com
		SANITARY SEWER COLLECTION SYSTEM MAP	JOB NUMBER: 013080000.000			MICHAEL E. NOLLING	DATE: JULY 10, 2018			

Exhibit 1:

City of Pequot Lakes MDH PWS Well Report



Minnesota Department of Health

Environmental Health in Minnesota

PWSID: 1180019

PWS Name: Pequot Lakes

PWS Type: Community

PWS Status: Active

Public Water Supply Sources: Information from MNDWIS and CWI (sorted by Sample Point ID)

Source Type Codes: GW = Ground water; SW = Surface water; GUI = Ground water under influence

Location Source: MGS = digitized by the MN Geological Survey; * indicates incomplete records

MNDWIS PWS SOURCES IN FLOW														
Source Info						MNDWIS Data					CWI Data			
Sample Point ID	Name	Type	Availability	Status	Well No. (link to Well Log(s))	Location Info (link to Map)	Drill Year	Depth (in feet)	Case Depth (in feet)	Case Diam. (in inches)	Drill Date	Depth Completed (in feet)	Case Depth (in feet)	Case Diam. (in inches)
S03	Well #3	GW	Primary	Active	241514	09/22/2011 (G. Haglund)	1984	143	118	8	00-00-1984	143.00	118.00	8.00
S04	Well #4	GW	Primary	Active	626480	09/22/2011 (G. Haglund)	1999	140	120	10	10-27-1999	140.00	120.00	10.00
MNDWIS PWS SOURCES REMOVED FROM FLOW														
Source Info						MNDWIS Data					CWI Data			
Sample Point ID	Name	Type	Availability	Status	Well No. (link to Well Log(s))	Location Info (link to Map)	Drill Year	Depth (in feet)	Case Depth (in feet)	Case Diam. (in inches)	Drill Date	Depth Completed (in feet)	Case Depth (in feet)	Case Diam. (in inches)
S01	Well #1	GW	Sealed	Inactive	241512	07/30/1999 (T. Johnson)	1961	140	128	12	00-00-1961	140.00	128.00	12.00
S02	Well #2	GW	Sealed	Inactive	241513	07/30/1999 (T. Johnson)	1971	132	117	8	00-00-1971	132.00	117.00	8.00

Unverified Wells

The following tables show information on wells whose existence (or previous existence) has not yet been confirmed.

UNVERIFIED Well Data													
Reference in Record	Name(s)	Unique Well Number	Drilled Depth (ft.)	Completed Depth (ft.)	Depth Cased (ft.)	Casing Diameter (in.)	Year Constructed	Construction Type	Year Out of Service	Sealing Record?	Year Sealed	Location Info	Comments
Databases Searched					Trivia								
County Well Index (1-mile radius); MDH DWP Microfiche; MDH ISuite; Lakesnwoods.com; Biennial Report of the MN State Dairy and Food Commissioner-1907; Minnesota Geological Survey City Well File Folders; MGS Bulletin (27, 31, or 32); MNBrew.com (breweries); MDH DWP MNDWIS; Past and Present MN Railroad Stations; MDH WELLS					PEQUOT LAKES, a city in Sibley Township, sections 10 and 15, platted on March 10, 1900. The city had a Northern Pacific Railroad or Minnesota International station. This station was on the north side of East Main Street. It was on the east side of the tracks. An historical photo from around 1910 does not show a water tower near the RR station. The station's source of water is unknown. A creamery was cited in the 1964 MDH Sanitary Rpt, but no interconnection was mentioned. No breweries operated in the city, according to references cited.								
Unverified Well Data Compiled By: Geoffery Nash Compiled Date: 12/26/2012													

Source: MN Dep't. of Health - 12/26/2012

Restart

Appendix I:

City of Pequot Lakes Part I, WHP Plan Report

Amendment to the Wellhead Protection Plan

Part I

**Wellhead Protection Area Delineation
Drinking Water Supply Management Area Delineation
Well and Drinking Water Supply Management Area Vulnerability Assessments**

For

The City of Pequot Lakes

July 2012

Gail Haglund

Minnesota Department of Health

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Glossary of Terms

Data Element. A specific type of information required by the Minnesota Department of Health to prepare a wellhead protection plan.

Drinking Water Supply Management Area (DWSMA). The area delineated using identifiable land marks that reflects the scientifically calculated wellhead protection area boundaries as closely as possible (Minnesota Rules, part 4720.5100, subpart 13).

Drinking Water Supply Management Area Vulnerability. An assessment of the likelihood that the aquifer within the DWSMA is subject to impact from land and water uses within the wellhead protection area. It is based upon criteria that are specified under Minnesota Rules, part 4720.5210, subpart 3.

Emergency Response Area (ERA). The part of the wellhead protection area that is defined by a one-year time of travel within the aquifer that is used by the public water supply well (Minnesota Rules, part 4720.5250, subpart 3). It is used to set priorities for managing potential contamination sources within the DWSMA.

Wellhead Protection. A method of preventing well contamination by effectively managing potential contamination sources in all or a portion of the well's recharge area.

Wellhead Protection Area (WHPA). The surface and subsurface area surrounding a well or well field that supplies a public water system, through which contaminants are likely to move toward and reach the well or well field (Minnesota Statutes, part 103I.005, subdivision 24).

Well Vulnerability. An assessment of the likelihood that a well is at risk to human-caused contamination, either due to its construction or indicated by criteria that are specified under Minnesota Rules, part 4720.5550, subpart 2.

Acronyms

CWI - County Well Index

DNR - Minnesota Department of Natural Resources

EPA - United States Environmental Protection Agency

FSA - Farm Security Administration

MDA - Minnesota Department of Agriculture

MDH - Minnesota Department of Health

MGS - Minnesota Geological Survey

MnDOT - Minnesota Department of Transportation

MnGEO - Minnesota Geospatial Information Office

MPCA - Minnesota Pollution Control Agency

SWCD - Soil and Water Conservation District

USDA - United States Department of Agriculture

NRCS - Natural Resource Conservation Service

UMN - University of Minnesota

USGS - United States Geological Survey

1. Introduction

The Minnesota Department of Health (MDH) amended Part I of the wellhead protection (WHP) plan at the request of the city of Pequot Lakes (public water supply identification number 1180019). The work was performed in accordance with the Minnesota Wellhead Protection Rule, parts 4720.5100 to 4720.5590.

This report presents the delineation of the wellhead protection area (WHPA), the drinking water supply management area (DWSMA), and the vulnerability assessments for the public water supply wells and DWSMA. Figure 1 shows the boundaries for the WHPA and the DWSMA. The WHPA is defined by a 20-year time of travel combined with a surface water contribution area. Figure 1 also shows the emergency response area (ERA), which is defined by a 1-year time of travel. Definitions of rule-specific terms that are used are provided in the “Glossary of Terms.”

This report also documents the technical information that was required to prepare this portion of the WHP plan in accordance with the Minnesota Wellhead Protection Rule. Additional technical information is available from MDH.

The wells included in the WHP plan are listed in Table 2.

2. Assessment of the Data Elements

MDH staff met with representatives of the public water supplier on September 20, 2011, for a scoping meeting that identified the data elements required to amend Part I of the WHP plan. Table 1 presents the assessment of these data elements relative to the present and future implications of planning items that are specified in Minnesota Rules, part 4720.5210.

Table 1 - Assessment of Data Elements

Data Element	Present and Future Implications				Data Source
	Use of the Well (s)	Delineation Criteria	Quality and Quantity of Well Water	Land and Groundwater Use in DWSMA	
Precipitation	L	L	L	L	MN Climatology Office
Geology					
Maps and geologic descriptions	M	H	H	H	MGS, DNR, USGS
Subsurface data	M	H	H	H	MGS, MDH, DNR,
Borehole geophysics	M	H	H	H	MGS (None found)
Surface geophysics	L	L	L	L	(None found)
Maps and soil descriptions	L	L	L	L	NRCS
Eroding lands					
Water Resources					
Watershed units	L	L	L	L	DNR, USGS
List of public waters	L	L	L	L	DNR
Shoreland classifications					

Data Element	Present and Future Implications				Data Source
	Use of the Well (s)	Delineation Criteria	Quality and Quantity of Well Water	Land and Groundwater Use in DWSMA	
Wetlands map					
Floodplain map					
Land Use					
Parcel boundaries map	L	H	L	L	Crow Wing County
Political boundaries map	L	H	L	L	MnGEO, City
PLS map	L	H	L	L	MnGEO
Land use map and inventory	M	H	M	M	City Records, County
Comprehensive land use map	L	L	L	L	City, County
Zoning map	L	L	L	L	City
Public Utility Services					
Transportation routes and corridors	L	M	L	L	MnGEO, MnDOT
Storm/sanitary sewers and PWS system map	L	L	L	L	City
Oil and gas pipelines map					
Public drainage systems map or list					City, SWCD
Records of well construction, maintenance, and use	H	H	H	H	City, CWI, MDH files
Surface Water Quantity					
Stream flow data	L	M	L	L	DNR, USGS
Ordinary high water mark data	L	M	L	L	DNR, USGS
Permitted withdrawals	L	L	L	L	DNR
Protected levels/flows	L	L	L	L	DNR
Water use conflicts	L	L	L	L	DNR
Groundwater Quantity					
Permitted withdrawals	H	H	H	H	DNR
Groundwater use conflicts	H	H	H	H	DNR
Water levels	H	H	H	H	DNR, MPCA, MDA, MDH, City
Surface Water Quality					
Stream and lake water quality management classification					
Monitoring data summary					
Groundwater Quality					
Monitoring data	H	H	H	H	MPCA, MDH, MDA, USGS
Isotopic data	H	H	H	H	MDH, DNR
Tracer studies	H	H	H	H	(None found)
Contamination site data	M	M	M	M	MPCA, MDA
Property audit data from contamination sites					
MPCA and MDA spills/release reports					MPCA, MDA

Definitions Used for Assessing Data Elements:

High (H) - the data element has a direct impact

Moderate (M) - the data element has an indirect or marginal impact

Low (L) - the data element has little if any impact

Shaded - the data element was not required by MDH for preparing the WHP plan

Acronyms used in this report are listed on page ii, after the “Glossary of Terms.”

3. General Descriptions

3.1 Description of the Water Supply System

The public water supply obtains its drinking water supply from two primary wells; Table 2 summarizes information regarding them.

Table 2 - Water Supply Well Information

Local Well ID	Unique Number	Use/ Status ¹	Casing Diameter (inches)	Casing Depth (feet)	Well Depth (feet)	Date Constructed/ Reconstructed	Well Vulnerability	Aquifer
3	241514	P	8	118	143	1984	Vulnerable	Glacial Drift
4	626480	P	10	120	140	1999	Vulnerable	Glacial Drift

Note¹: Primary (P) Well

3.2 Description of the Hydrogeologic Setting

The description of the hydrologic setting for the aquifer used to supply drinking water is presented in the previous Part I WHP Plan (Walsh, 2002), hereafter referred to as the 2002 Part I WHP Plan. The hydrogeologic setting and conceptual model has not changed since the previous plan. The city wells are completed in a confined sand and gravel aquifer which is overlain by a significant thickness of glacial till materials. Figure 2 shows the location of existing wells in the area, a map of surficial geology, and the location of transect A-A'. Figure 3 shows local geology in cross-section view; this cross-section was constructed using stratigraphic information from existing wells located within the DWSMA. A summary of the hydrogeologic setting is provided in Table 3.

Table 3 - Description of the Hydrogeologic Setting

Attribute	Descriptor	Data Source
Aquifer Material	Fine Sand to Gravel	Interpreted from well records found in the CWI database.
Porosity Type and Value	25%	Conservative estimate for glacial materials (Freeze and Cherry, 1979).
Aquifer Thickness	At the Pequot Lakes Wellfield: 30 feet	Interpreted from well records. The representative value is weighted toward the base elevation at the wellfield and within the contribution area to the wells.
Stratigraphic Top Elevation	Range of 1,180 to 1,140 feet above mean sea level	Interpreted from well records.
Stratigraphic Bottom Elevation	1,143 feet above mean sea level	Estimated from well records. The representative value is weighted toward the base elevation at the wellfield and within the contribution area to the wells.
Hydraulic Confinement	Leaky Confined	Aquifer test, well records, and isotopic results.
Transmissivity (T)	Reference Value: 3,792 ft ² /day (see 2002 Part I WHP Plan, p. 4)	The aquifer test plan was approved on January 6, 2012. T was estimated from an aquifer test conducted at the wellfield.
Hydraulic Conductivity	Reference Value: 127 ft/day (see 2002 Part I WHP Plan, p. 6)	The reference value was obtained from the reference transmissivity value, using a conservative estimate of aquifer thickness of 30 feet.
Groundwater Flow Field	Local groundwater flow at the wellfield is predominately from the northeast; approximately 198 degrees (Figure 4).	Primarily defined by using static water level elevations from well records in the CWI database and information contained in the county geologic atlas (Peterson, 2007).

4. Delineation of the Wellhead Protection Area

4.1 Delineation Criteria

The boundaries of the WHPA for the public water supplier are shown in Figure 1. Table 4 describes how the delineation criteria that are specified under Minnesota Rules, part 4720.5510, were addressed.

Table 4 - Description of WHPA Delineation Criteria

Criterion	Descriptor	How the Criterion was Addressed
Flow Boundary	Surface Water Features	The major regional and local discharge features were included in the groundwater flow model. These features are described in the 2002 Part I WHP Plan, page 6. Vertical recharge to the aquifer was represented using given varel elements.
Flow Boundary	Geologic Boundaries -	The glacial sand and gravel aquifer serving the city wells was simulated as a confined, single layer aquifer. The boundaries of the aquifer serving the city wells were originally mapped using information from the records of existing wells. For this amendment, new geologic information published since the 2002 Part I WHP Plan was assessed, including maps published as part of the Crow Wing County Geologic Atlas (Setterholm, 2004; Peterson, 2007). The assumptions of the existing groundwater flow model were determined to be consistent with the newer information and were not changed as part of this amendment.
Flow Boundary	Other High-Capacity Wells - See Table 6	Aside from the PWS wells, one other high-capacity well was assessed as part of the 2002 Part I WHP plan (page 3). This well is still active and was included in this amendment, along with one additional high-capacity well that has been constructed since 2002.
Daily Volume of Water Pumped	See Table 5	Pumping information was obtained from the city and DNR Appropriations Permit PA 1979-3259. This was converted to a daily volume pumped by a well.
Groundwater Flow Field		The model calibration process addressed the relationship between the calculated versus observed groundwater flow field.
Aquifer Transmissivity	See Table 3	Aquifer transmissivity was determined from data collected during a 24-hour aquifer test at Well 3 (241514) as described in the 2002 Part I WHP Plan, page 4.
Time of Travel	20 years	The public water supplier selected a 20-year time of travel.

Previous pumping values have been reported to the DNR, as required by the city's Groundwater Appropriation Permit PA 1979-3259. This information was used to identify the maximum volume of water pumped annually by each well over the previous five-year period, as shown in Table 5. City staff provided estimates for future pumping volumes for the next five years; the estimates of projected use are also shown in Table 5. The maximum daily volume of discharge used as an input parameter in the model was calculated by dividing the greatest annual pumping volume by 365 days. For comparison purposes, the pumping rates used in the 2002 delineation are also provided in Table 5.

Table 5
Annual Volume of Water Discharged from Water Supply Wells

Well Name	Unique No.	2007	2008	2009	2010	2011	Future Pumping	2012 Daily Volume (gal/day)	2002 Daily Volume (gal/day)
3	241514	25.074	22.6431	18.6577	16.0474	17.7721	20.602734	68,696	56,411
4	626480	25.035	22.297	18.1481	16.6453	16.0527	18.609478	68,589	56,411
System Total		50.109	44.9401	36.8058	32.6927	33.8248	39.212212	137,285	112,822

(Expressed as million gallons. Bolding indicates greatest annual pumping volume.)

4.2 Method Used to Delineate the Wellhead Protection Area

In 2002, the 20-year capture zones for the Pequot Lakes public water supply wells were determined using a combination of two groundwater modeling methods, consisting of 1) an analytic element model called MLAEM (Version 5.1.08) and 2) an analytical model code named HUGO (Barnes and Soule, 2001). A complete description of the modeling approaches, results, calibration, and the sensitivity and uncertainty analyses are provided in the 2002 Part I WHP plan (pages 4-13). The capture zones produced by the two modeling approaches were similar in width, but diverged with respect to orientation in the upgradient direction. The trend of the MLAEM capture zones was to the northeast, whereas the HUGO capture zones trended to the northwest and Sibley Lake. The MLAEM groundwater model is a deterministic approach and is viewed as the more rigorous delineation method, whereas the HUGO approach reflects the potential or degree of uncertainty of the results. In 2002, it was determined to overlay the 20-year capture zones from both models and create a composite zone to represent the final wellhead protection area (WHPA) boundary until additional information could be collected. It was also recommended that a water sampling initiative be undertaken to address the discrepancy in the delineation results and determine whether or not Sibley Lake was a contributing source to the city wells. This recommendation was carried through to Part II of the city's WHP Plan (Objective E-1, page 27) and was subsequently implemented in 2007-2008.

For this amendment to the city's Part I WHP Plan, the original conceptual model and corresponding parameters were compared to new information published since 2002. Specifically, the new information assessed with respect to amending the WHPA boundaries were: 1) records of water wells and borings constructed since 2002, 2) Parts A and B of the Crow Wing Geologic Atlas (Setterholm, 2004; Peterson, 2007), and 3) water chemistry results from the implementation of the recommended monitoring initiative (Figure 2).

The original MLAEM Model was determined to be consistent and appropriate for the local hydrogeologic setting. For the most part, the MLAEM Model that was used to calculate the capture zones for the 2002 Part I WHP Plan was the same model used for this amendment effort, aside from two minor revisions. The revisions needed to update the model included: 1) modifying the pumping rates to reflect 5-year historical and projected pumping conditions, and 2) the addition of one other high-capacity well not included in the original model. Tables 5 and 6 summarize the model inputs associated with these changes.

With the assessment of the HUGO Model, it was determined that the 2002 capture zones could not be supported by the results of the stable isotope and water chemistry monitoring of Sibley Lake, Upper Hay Lake and Well 4 (626480). A discussion and summary of the monitoring initiative implemented in 2007-2008 is provided in Appendix A (Walsh, 2009). The testing results suggest that the city wells are not capturing any significant or identifiable quantity of water from Sibley or Upper Hay Lake. As a result, the HUGO Model was not used in combination with the MLAEM Model to delineate the WHPA boundaries for this amendment. Consequently, the final WHPA is significantly smaller in size compared to the 2002 WHPA. A comparison of the old and the new WHPA is shown in Figure 5.

Table 6 - Other Permitted High-Capacity Wells

Unique Number	Well Name	DNR Permit Number	Aquifer	Use	Annual Volume of Water Pumped (gallons)
650308	Independent School District 186	2001-3025	QWTA	Non-crop irrigation	4,666,700 (2007)
680395	Golf Course	2003-2006	QBAA	Non-crop irrigation	4,284,000 (2007)

5. Delineation of the Drinking Water Supply Management Area

Figure 1 shows the boundaries of the Drinking Water Supply Management Area (DWSMA) and were defined by the public water supplier using the following features:

- Highways, streets, or roads;
- Public Land Survey coordinates; and
- Property parcel boundaries.

For this amendment, electronic parcel information has been provided to MDH by Crow Wing County. This information was very useful in refining the DWSMA boundaries. A comparison between the old and new DWSMA is shown in Figure 5.

6. Summary of Comparisons Between Previous (2002) and Current WHPA and DWSMA Delineations

Overall the new DWSMA is approximately half the size of the previous DWSMA. This is primarily due to using the single modeling method, MLAEM, to calculate the capture zone boundaries for this plan amendment. In 2002, two groundwater modeling methods, MLAEM and HUGO, were used and their results were combined. Data collected since the 2002 Part I Plan was assessed and it was determined that it does not support the results of the HUGO Model; therefore, this model was not used in the delineation of the wellhead boundaries for this plan amendment.

The previous and current WHPAs that were calculated using the MLAEM modeling approach are very similar in size and shape. The only change of significance is that the 2012 WHPA is slightly larger with respect to the overall width. This is due to an approximate 22 percent increase in the annual volume of water pumped between the previous and current delineations.

7. WHP Plan Implementation - Results of Data Collection Activities

Data collection measures are outlined in Chapter Five, Section E of the 2003 Pequot Lakes Part II WHP Plan. The sampling program outlined in the city's plan was implemented in the summer of 2007 and spring of 2008. A summary of the results was provided to the city in 2009, and is included in Appendix A of this amendment report. The testing results indicated that the municipal wells were not capturing any significant or identifiable quantity of water from Sibley or Upper Hay Lake at the time of the study.

In addition, as part of this plan amendment, both city wells are scheduled to be sampled for tritium and other general chemistry parameters to confirm well and aquifer vulnerability. This work is planned for the summer of 2012.

8. Vulnerability Assessments

The Part I wellhead protection plan includes the vulnerability assessments for the public water supply wells and the DWSMA. These vulnerability assessments are used to help select appropriate measures for reducing the potential contaminant source threat to the public water supply.

8.1 Assessment of Well Vulnerability

The vulnerability assessment for each well used by the public water supplier is listed in Table 2. The well vulnerabilities have not changed since the 2002 Part I WHP Plan, and are based upon the following conditions:

- 1) The geologic sensitivity of the aquifer at the well sites is considered to be low at Well 3 (241514) and moderate at Well 4 (626480). Even though the wells are in close proximity to each other, the drillers' records vary with respect to the description of the clay till protective layer overlying the sand aquifer. In the case of Well 3 (241514), the materials are described as more of a classic hardpan, which is generally very protective and consistent with a low sensitivity ranking. However, in the case of Well 4 (626480), the till materials are described as having a component of sand, which is considered less protective and consistent with a moderate sensitivity ranking.
- 2) The previous tritium results from Pequot Lake Well 4 (626480) indicates that the aquifer contains a measurable component of post-1953 water. The tritium results support the vulnerable rating for the wells, indicating that the wells have the potential to be impacted by human activities occurring at the land surface. As part of this amendment, both of the city wells will be sampled for tritium to confirm the previous findings.

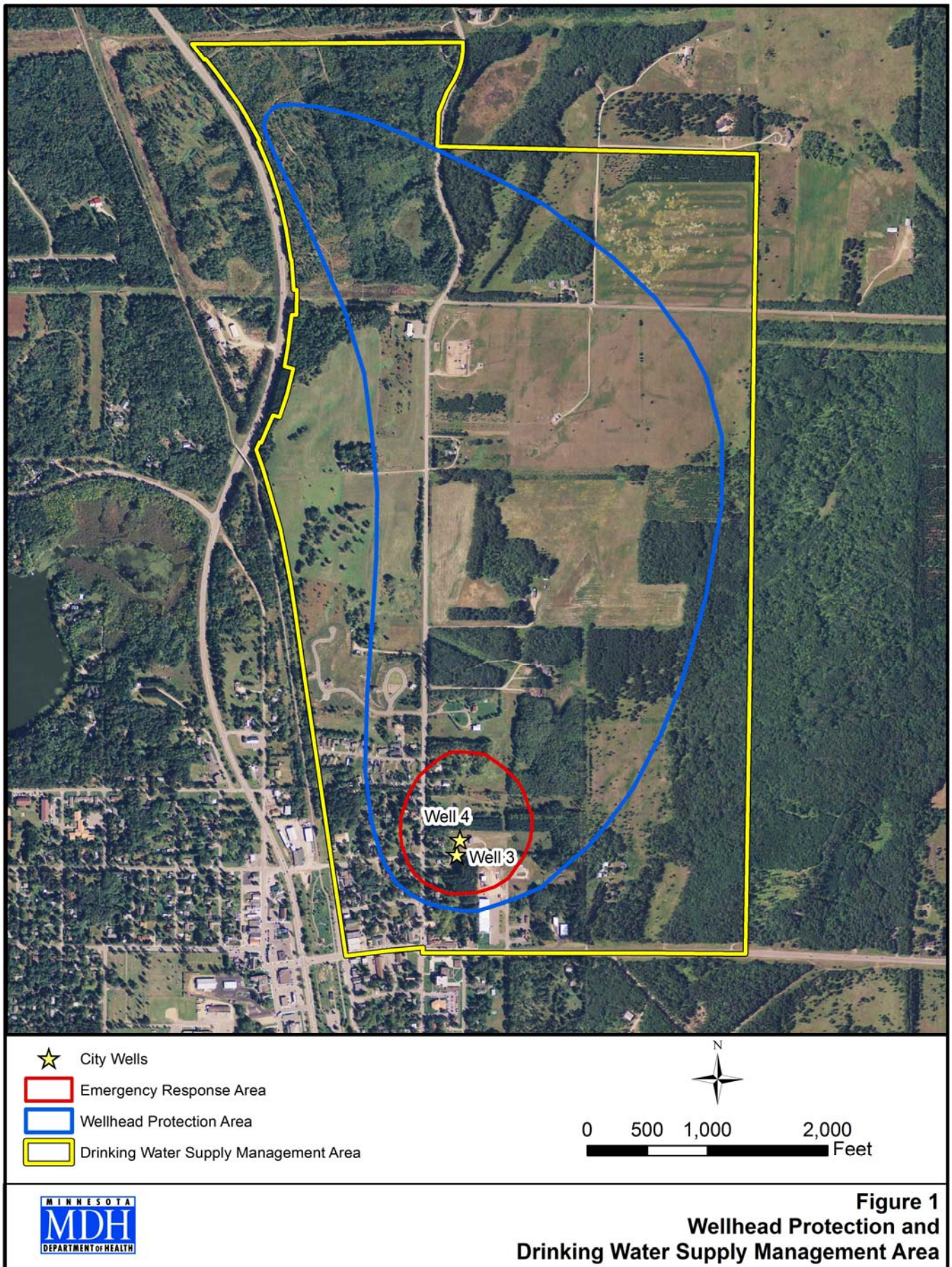
8.2 Assessment of Drinking Water Supply Management Area Vulnerability

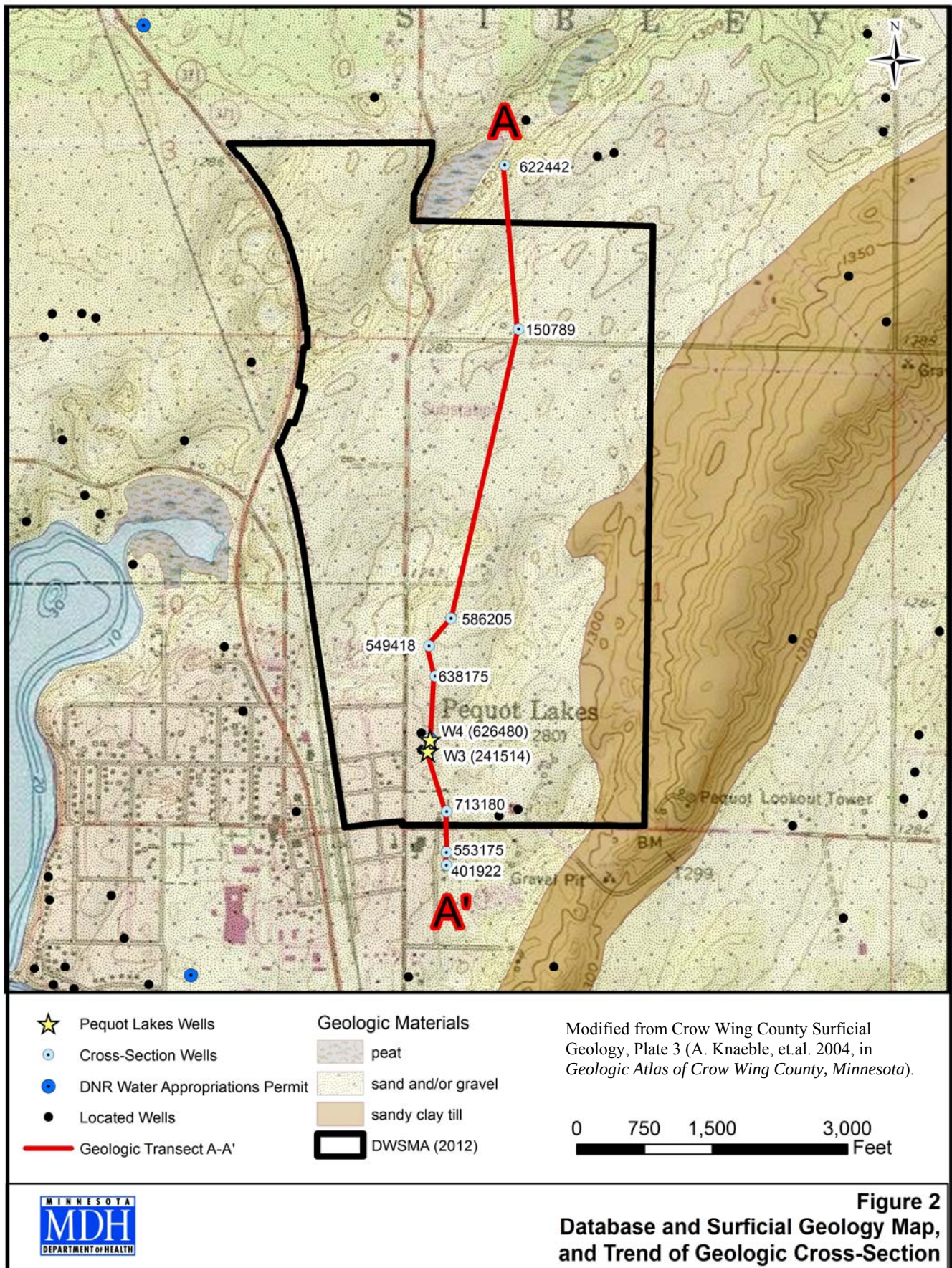
The vulnerability of the aquifer used by the city of Pequot Lakes has not changed since the previous WHP plan, and is still considered moderate. Geologic records for wells in the Pequot Lakes DWSMA indicate that clay till is present above the aquifer used by the city, although its thickness varies from less than 10 feet to more than 50 feet (Figure 3). Drillers' records indicate that this glacial till varies between sandy to clay-rich in composition. This overlying till provides a measure of protection to the city's aquifer, however, it does allow for surface water infiltrating from the land surface to reach the buried sand aquifer over a time period of decades at most (Geologic Sensitivity Workgroup, 1991) as indicated by the presence of tritium in water sampled from Well 4 (626480). As a result, the aquifer is considered moderately vulnerable throughout the DWSMA.

9. Selected References

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- Petersen, T.A., and Solstad, J.A. (2007), *Geologic atlas of Crow Wing County, Minnesota*, County Atlas Series, C-16, Part B, Minnesota Department of Natural Resources, Division of Waters, St. Paul, Minn., 4 plates, scale 1:125,000 and smaller.
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- Walsh, J.F. (2002), *Wellhead protection plan for the city of Pequot Lakes, Minnesota--Part 1*, Minnesota Department of Health, St. Paul, Minn., 23 p.
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Figures





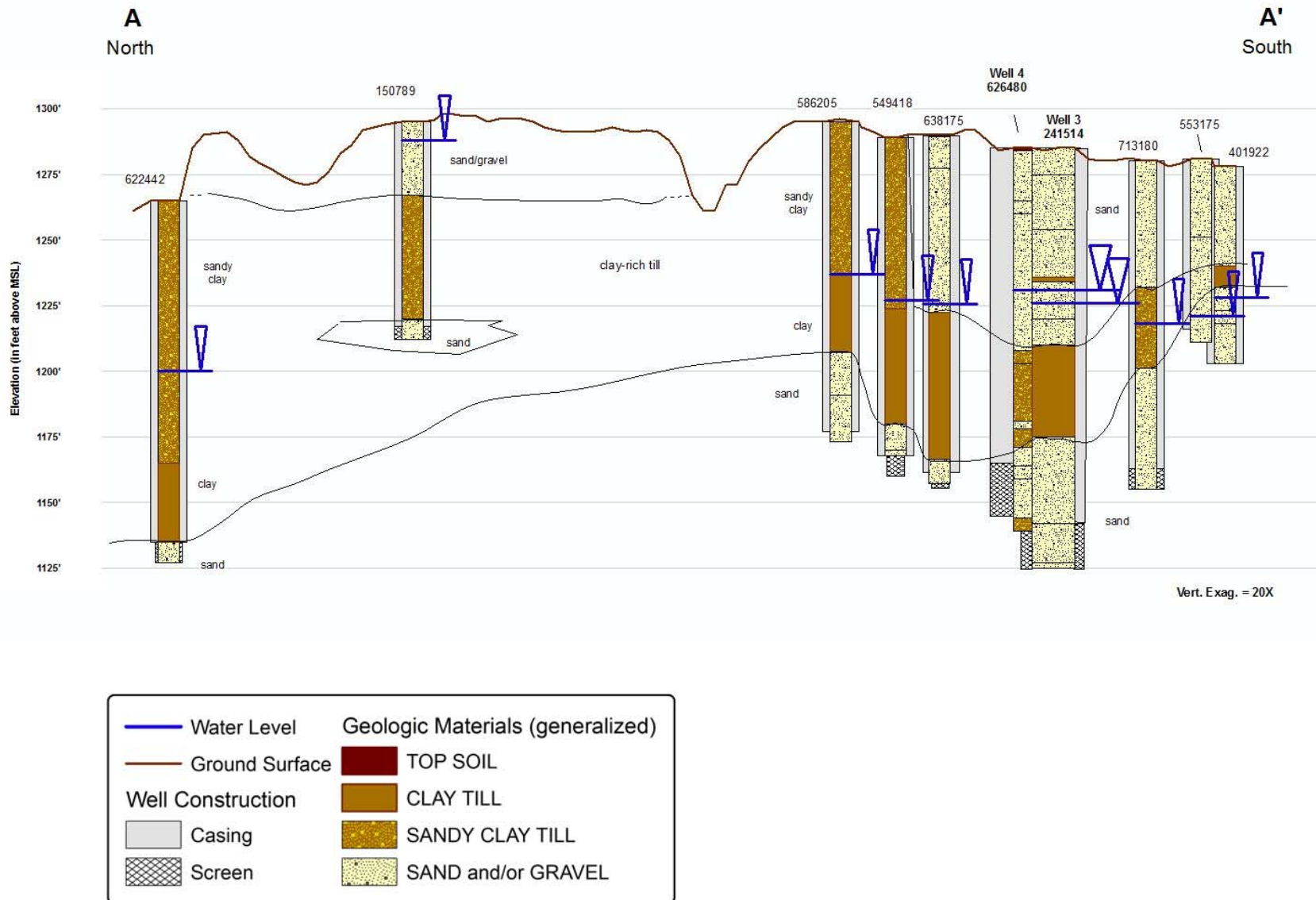


Figure 3
Geologic Cross-Section A-A'

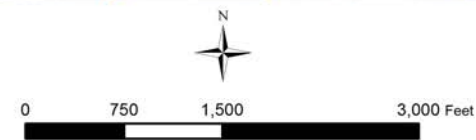
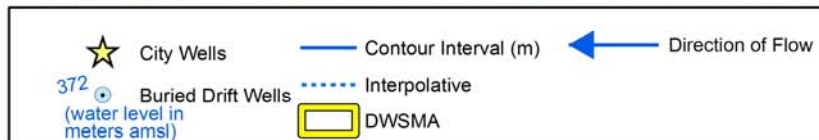
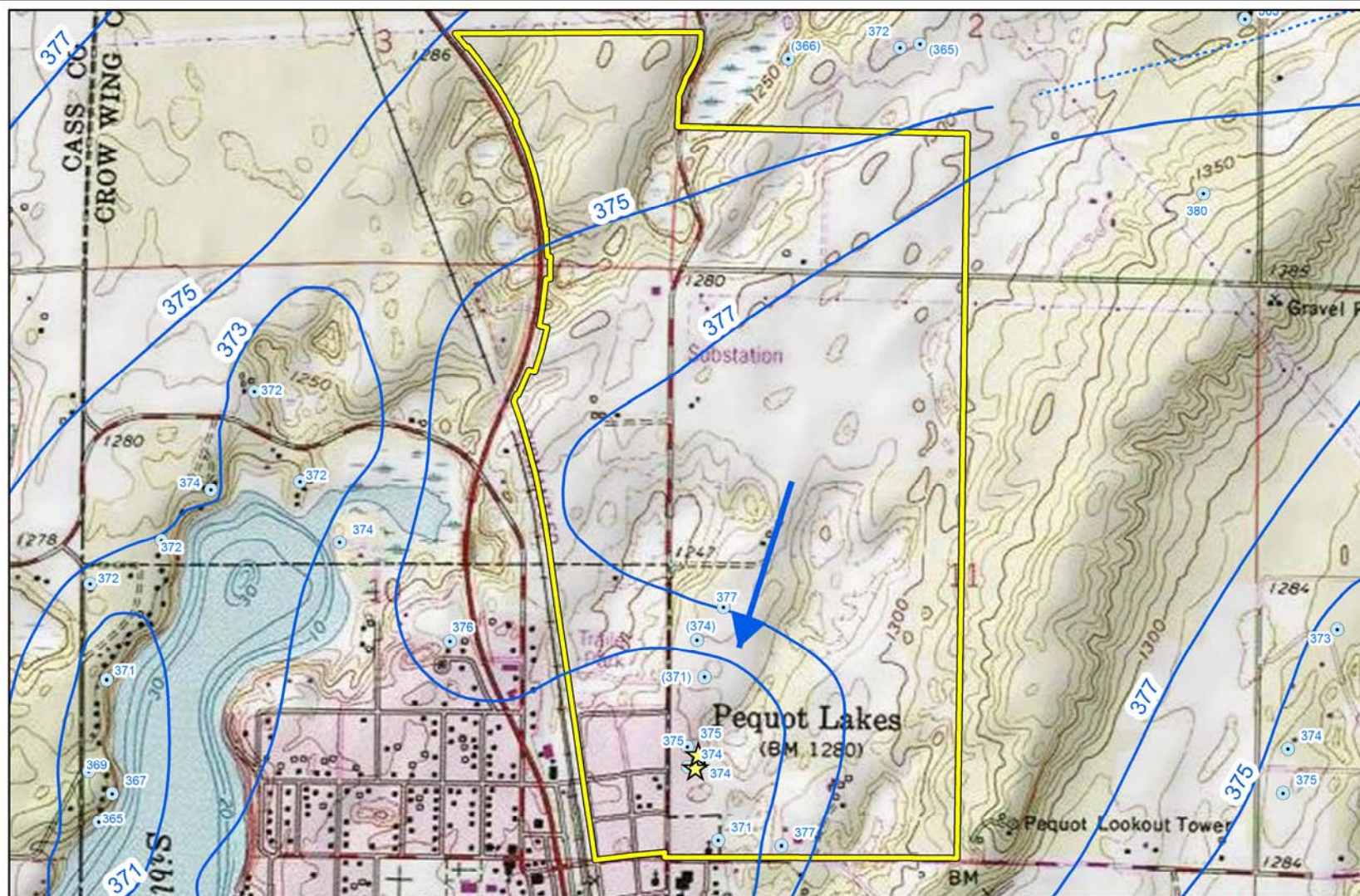
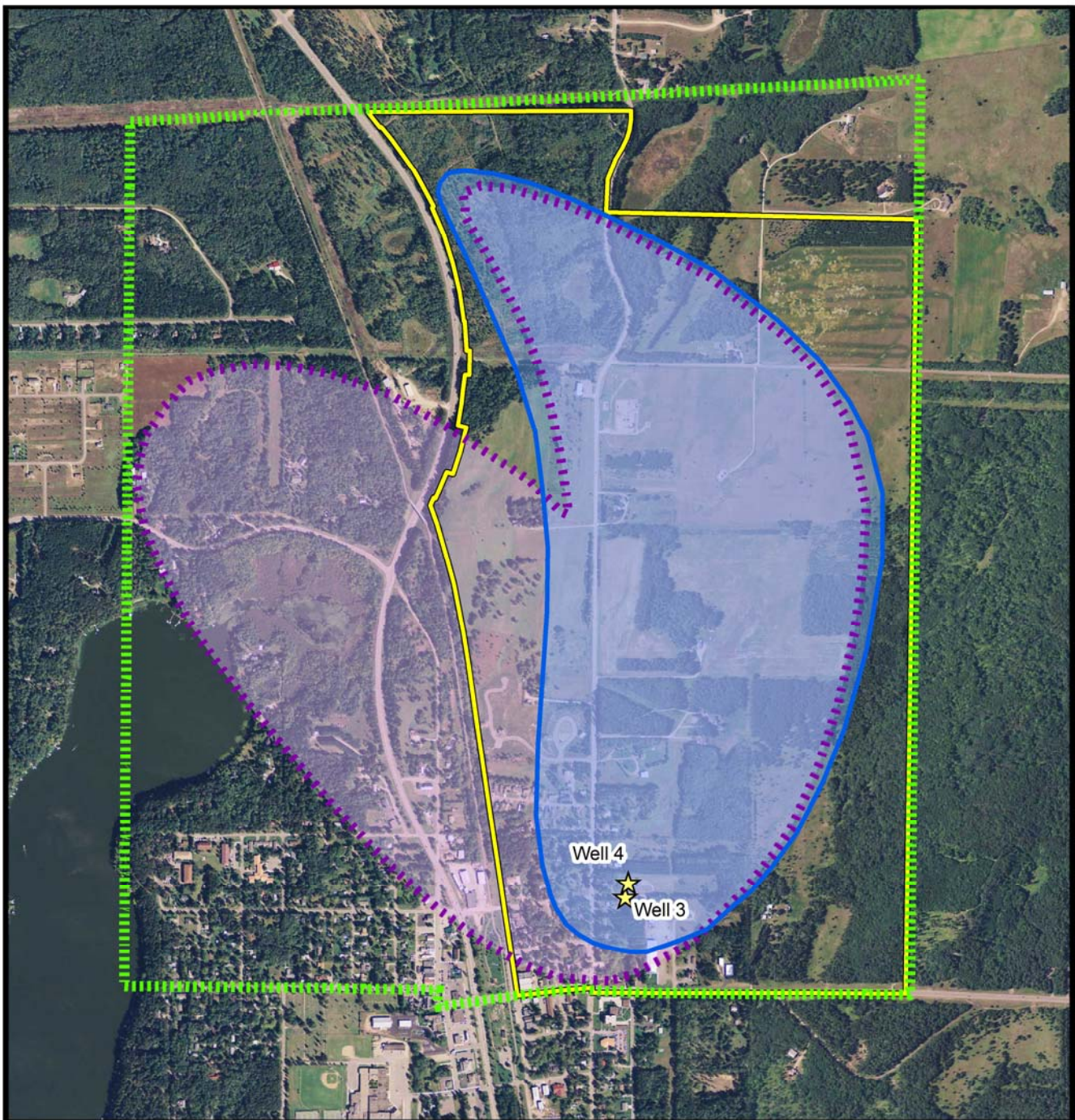


Figure 4
General Direction of Groundwater Flow



- ★ City Wells
- New (2012) 20-Year Wellhead Protection Area
- Old (2002) Drinking Water Supply Management Area
- New (2012) Drinking Water Supply Management Area
- Old (2002) 20-Year Wellhead Protection Area



0 500 1,000 2,000
 Feet



Figure 5
Comparison Between
New and Old WHPAs and DWSMAs

Appendix A

Stable Isotope and Chemical Sampling Results for Pequot Lakes Wellhead Protection Plan

James Walsh, MDH

March 11, 2009

In order to determine if the Pequot Lakes municipal wells capture water that originates at nearby lakes, a sampling program was initiated as part of the implementation of the city's wellhead protection plan. The program consisted of obtaining water samples from City Well 4 (Unique Well No. 626480), Sibley Lake and Upper Hay Lake. These lakes were selected because groundwater flow modeling conducted for delineating the city's wellhead protection area suggested that they were the most likely sources of surface water to influence the city's wells. Water samples were collected on both July 3, 2007, and April 25, 2008, in order to test for seasonal variability. Samples were collected by city staff and were analyzed for the stable isotopes of oxygen and hydrogen and for chloride and bromide. Isotope samples were analyzed at the Environmental Isotope Laboratory at the University of Waterloo in Ontario, Canada. Chloride and bromide were analyzed at the Minnesota Department of Health Public Health Laboratory in St. Paul, Minnesota.

The results are presented in the following two figures. Figure 1 shows the results of the stable isotope testing, whereas Figure 2 shows the results of the chloride and bromide analyses.

Figure 1 shows that water samples from both lakes plot off of the Global Meteoric Water Line, showing the effect of evaporation on these samples. In contrast, the water samples from Well 4 consistently plot on the meteoric water line. This means that the well was only capturing water that had soaked directly into the aquifer without being exposed to evaporation. As a result, this means that the well was not capturing an identifiable quantity of lake water.

Figure 2 shows the ratio of chloride to bromide plotted versus the chloride concentration. The lake water samples generally had relatively high chloride and chloride/bromide values, suggesting that they were somewhat impacted by runoff, probably containing salt from sources such as road de-icing or wastewater. By contrast, the well water samples had low concentrations of chloride and low chloride/bromide ratios. This means that the well was capturing relatively pristine water that was not impacted by the same runoff as the lakes.

In summary, the testing results suggest that the Pequot Lakes municipal wells were not capturing any significant or identifiable quantity of water from Sibley or Upper Hay Lake at the time of the study. As a result, there is no need to include the nearby lakes or their surface watersheds in the city's wellhead protection area.

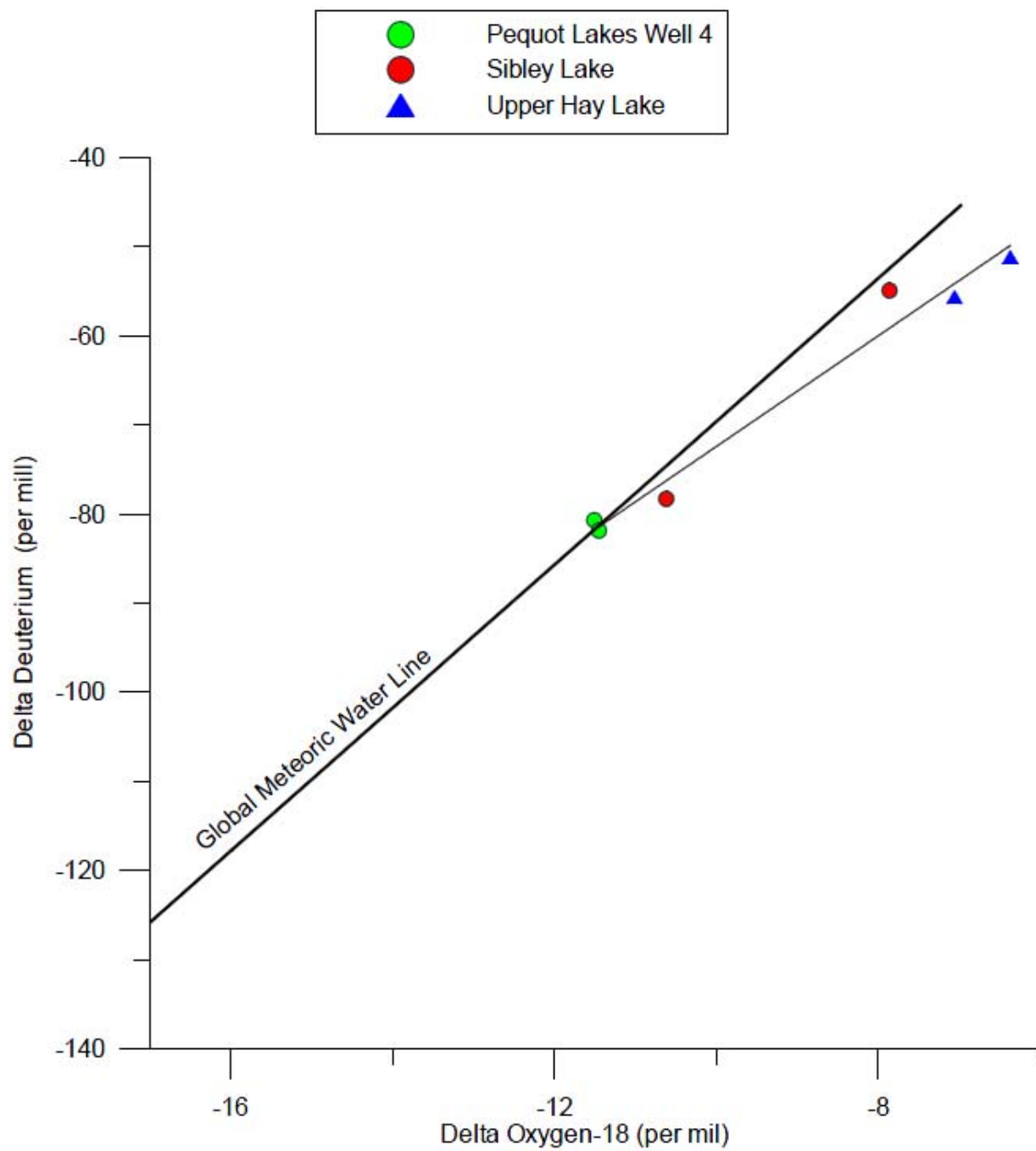


Figure 1. Stable isotope results for Pequot Lakes.

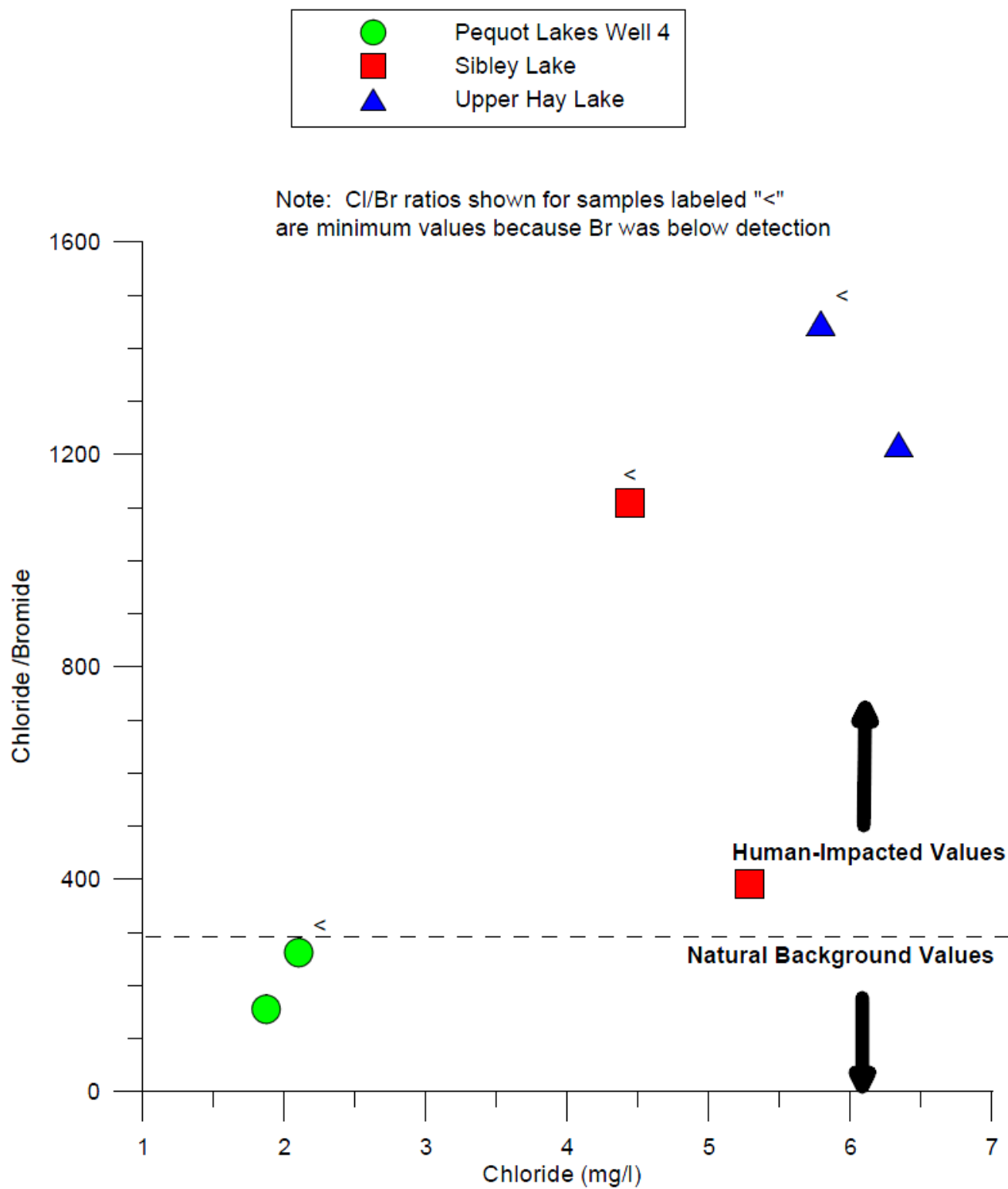
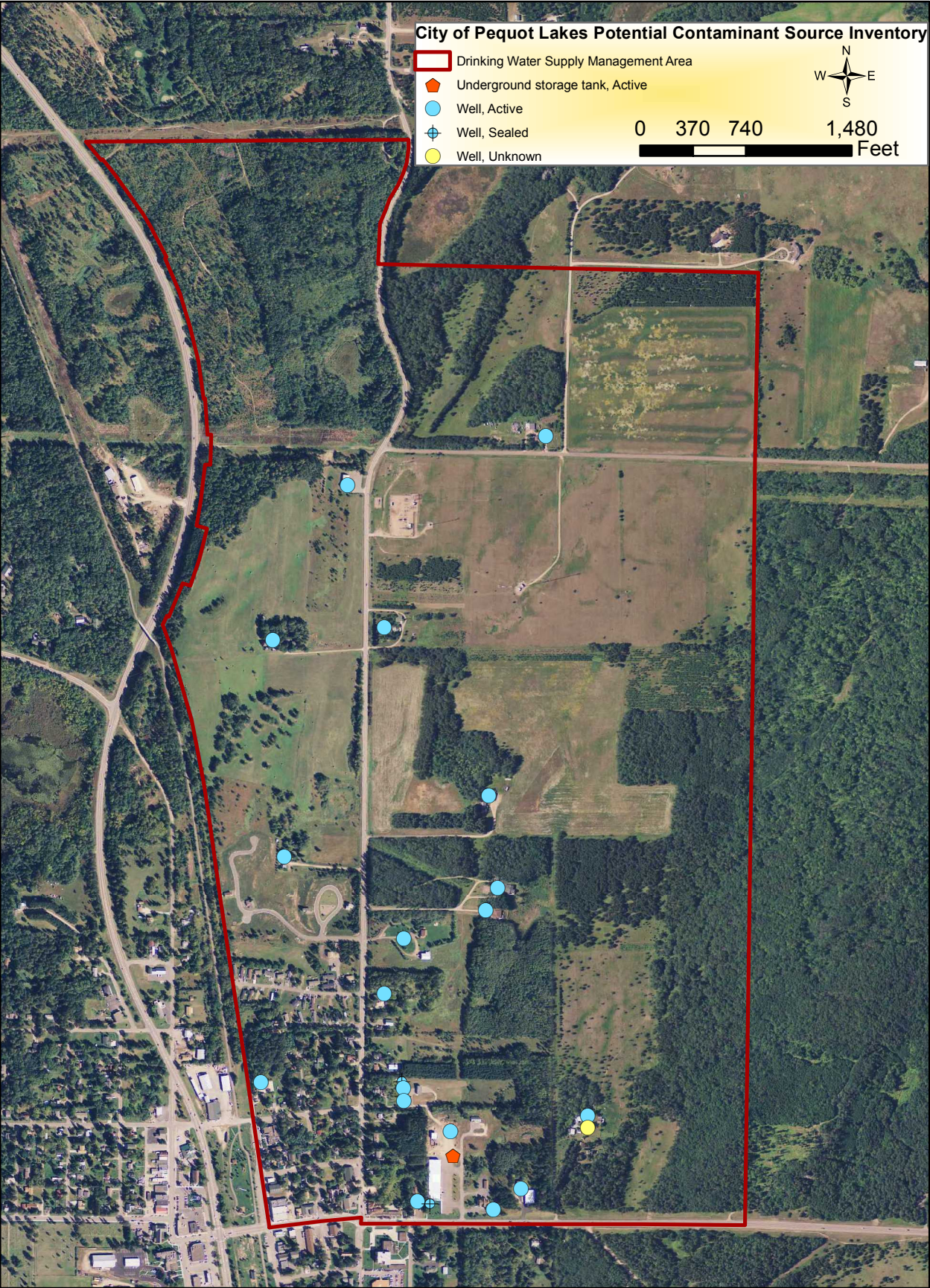


Figure 2. Chloride and bromide results for Pequot Lakes.

Appendix II:

City of Pequot Lakes: Potential Contaminant Source Inventory Map & Spreadsheet



Pequot Lakes Potential Contaminant Source Inventory: Wells & Tanks

<u>FAC ID</u>	<u>PIN</u>	<u>ST ADDRESS</u>	<u>INV</u>	<u>INV STAT</u>	<u>WELL ID #</u>	<u>FAC COMM</u>
1	290104100A00009	31467 Co. Rd. 112	Well	Active	643423	Residential Well
2	290113300CAA009	4638 Co. Rd. 11	Well	Sealed	608063	Location of existing PWS Wells & Treatment Plant
2	290113300CAA009	4638 Co. Rd. 11	Well	Sealed	608062	Location of existing PWS Wells & Treatment Plant
2	290113300CAA009	4638 Co. Rd. 11	Well	Active	626480	Location of existing PWS Wells & Treatment Plant
2	290113300CAA009	4638 Co. Rd. 11	Well	Active	241514	Location of existing PWS Wells & Treatment Plant
3	290113200E00009	31368 Co. Rd. 112	Well	Active	549418	Residential Well
4	290113200C00889	31282 Co. Rd. 112	Well	Active	638175	Residential Well
5	290113300KA0009	4590 Main St.	Well	Active	713180	Well serves a residence and small commercial bldg.
6	290113200d00009	4631 Patriot Place	Well	Active	586205	Residential Well
7	290113300AC0009	4464 Co. Rd. 11	Well	Active	607657	Commercial/Retail
8	290113300AAC009	4638 Co. Rd. 11	Well	Sealed	615269	City Hall
9	2900233000000009	4712 Akerson Rd.	Well	Active	150789	Residential Well
10	290113300AAB009	31095 Bergquist Dr.	Well	Active	681149	Residential Well
11	290113200F00009	4611 Patriot Place	Well	Active	685987	Residential Well
12	290113400A00009	4762 Co. Rd. 11	Well	Active	753591	Two wells on property. Possible unsealed well. Pielow Well # 198017
12	290113400A00009	4762 Co. Rd. 11	Well	Unknown	198017	Two wells on property. Possible unsealed well. Pielow Well # 198017
13	290113300BA0009	4720 Co. Rd. 11	Well	Active		Residential Well
14	290112200E00009	31744 Co. Rd. 112	Well	Active		Residential Well
15	290101100A00009	31941 Co. Rd. 112	Well	Active		Residential Well
16	290101100B00009	31743 Co. Rd. 112	Well	Active		Residential Well
17	2901123000000009	31510 Co. Rd. 112	Well	Active		Residential Well
18	29103000910E009	4396 East Sibley St.	Well	Active		Residential Well
2	290113300CAA009	4638 Co. Rd. 11	Underground storage tank	Active	267605	Location of existing PWS Wells & Treatment Plant

Appendix III:

Pequot Lakes Water Supply Contingency Strategy

Chapter Seven

Water Supply Contingency Plan (4720.5280)

Water Supply Contingency Plan Minnesota

Index

- A. Purpose
- B. Public Water Supply Characteristics
 - 1. Current Supply Source
 - 2. Treatment
 - 3. Storage and Distribution
 - 4. Maps and Plans
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Annual Plan Review

<i>Date Reviewed</i>	<i>Reviewer</i>	<i>Comments</i>

Plan Distribution

<i>Person</i>	<i>Organization</i>	<i>Plan Location</i>

Prepared By: Dawn Bittner & Mike Loven
City of Pequot Lakes

Date Approved: With WHP Plan Approval

A. Purpose

The purpose of this Contingency Plan is to establish, provide, and keep updated certain emergency response procedures and information for the City of Pequot Lakes which may become vital in the event of a partial or total loss of public water supply services.

B. Public Water Supply Characteristics

1. Current supply source:

City of Pequot Lakes	Well Number 3	Well Number 4
Unique Well #	241515	626480
Supply Source	Quaternary	Quaternary
Well Depth (ft.)	143 ft	140 ft
Well Diameter (in.)	10 in	12 in
Well Capacity (gpm)	500	500
Well Production (gpm)	300	300

2. Treatment

Aeration and sand filtration are used to remove iron and manganese. Chlorine is injected for disinfection. Fluoride is then introduced to the finished water.

3. Storage and distribution

The City of Pequot Lakes currently has one elevated storage tank with a capacity of approximately 200,000 gallons. The city provides 374 connections. There are 12 dead ends; however most of the city distribution system is looped.

4. Maps/plans

The City of Pequot Lakes has current maps of the water distribution system prepared and on file with the city engineer, Widseth, Smith & Nolting in Baxter, Minnesota. Copies of the maps are also available at City Hall and the City Water Plant.

C. Priority of Water Users During Water Supply Emergency

Table C1: Water Use Priority Grouping

Priority Group and Rank	Maximum Daily Use (gpd)	Minimum Daily Use (gpd)
Residential #1	28,078	19,068
Institutional #2	n/a	n/a
Commercial #3	59,349	36,252
Industrial #4	n/a	n/a
Unaccounted	n/a	n/a

Triggers for Implementing Water Supply Reduction/Allocation Procedures:

In the event of a major system disruption, failure, or an emergency, conservation procedures would be enacted by the Public Works Director, Mayor and City Council.

D. Alternative Water Supply Options

1. Surface water sources and treatment needs.

Sibley Lake is the closest surface water. The Minnesota National Guard Unit at Camp Ripley can provide emergency treatment of surface waters for human consumption. The MN National Guard has the ability to provide Reverse Osmosis Water Purification Units (ROWPU) capable of supplying 1500 gph or 25 gpm of potable water. The ROWPU units are available through a call-up of the National Guard.

All requests for National Guard equipment and/or staff must be initiated at the local law enforcement level. The Pequot Lakes Police Department has a joint powers agreement with Crow Wing County Emergency Management which spells out the process and procedure to request support.

2. Bottled water supplies, delivery and distribution:

The MN National Guard at Camp Ripley can furnish equipment capable of hauling up to 2,000 gallons of potable water from another water supply to a city distribution point or facility in an emergency. Culligan Water, Baxter, MN will deliver bottled water upon request. The vendor has large quantities of five-gallon bottles on hand at all times. The 24-hour contact is:

Loann Reponen
218-829-5137
218-839-6811 (emergency)

3. System interconnects with other water supplies.

There are no system interconnects available at this time.

4. New well.

No new wells are planned at this time.

5. Emergency or backup wells:

No emergency or backup wells are available.

6. Emergency treatment of water system.

The City would rely on Camp Ripley's ROWPU for emergency treatment. The city has a back-up generator and ability to run the water treatment plant and treat water in the event of a power disruption. Large quantities of water may also be hauled through the use of Camp Ripley's equipment from the City of Pine River.

7. Source management (blending).

The City water system is providing blended water from the two existing wells located approximately 150 feet apart.

8. Other.

No other alternatives have been identified by the City at this time.

E. Inventory of Available Emergency Equipment and Materials

Table E1 contains a list of services, equipment, and supplies that are available to the City of Pequot Lakes to respond to a disruption in the water system. It is believed that the items contained in Table E1 would be adequate to respond to most (if not all) water system emergencies.

Table E1: Available Emergency Equipment and Materials

Description	Owner	Telephone	Location	Acquisition Time
Well Repair	North Star Well	218-825-0882	Brainerd, MN	30 min.
Pump Repair	Braun Pump	218-566-4994	Grand Rapids, MN	2 hrs.
Electrician	Holden Electric	218-829-4759	Brainerd, MN	30 min.
Plumber	Tom Jones	218-568-5498	Pequot Lakes, MN	n/a
Backhoe/Excavator	Eric's Excavating	218-562-4197	Breezy Point, MN	n/a
Chemical Feed	Hawkins	701-293-9618	Fargo, ND	5 hrs.
Meter Repair	Fargo Water	800-437-4034	Fargo, ND	5 hrs.
Generator	City of Pequot Lakes	218-8313086	Pequot Lakes, MN	n/a
Valves	Fargo Water	800-437-4034	Fargo, ND	5 hrs.
Pipe & Fittings	Fargo Water	800-437-4034	Fargo, ND	5 hrs.

F. Emergency Identification Procedures

Table F1: Emergency Procedural Operations

Incident	Response Procedure & Comments
Identify Disruption	Person identifying disruption contacts City Hall. City Hall contacts Response Personnel Coordinator, and / or Alternate Response Coordinator.
Notify Response Personnel (Coordinator)	Notify Response Personnel Coordinator or Alternate Personnel Coordinator
Identify Incident Direction and Control	Response Personnel Coordinator or Alternate assesses situation and determines incident direction and control, begin solving problem
Identify Internal Communication	Response Personnel Coordinator or Alternate contacts City Hall to inform of situation
Inform Public	Response Coordinator contacts appropriate organizations to inform public of problem
Assess Incident on Continual Basis	Response Personnel Coordinator or Alternate continue to monitor/solve problem
Assess Contamination Disruption	Response Personnel Coordinator or Alternate determines if water supply is contaminated. Monitor/solve problem as needed
Assess Mechanical Disruption	Response Personnel Coordinator or Alternate assesses mechanical disruption. Monitor and solve disruption as needed.
Provide Alternate Water Supply	If needed, alternate water supply is located and provided
Impose Water Use Restrictions	If needed, Public Works Director, Mayor and Council may impose water use restrictions.

G. Notification Procedures

1. Agency notification

Table G1 contains the names and telephone numbers for contacts at various local and state agencies that may be notified in the event of a public water supply system emergency. Based on the nature of the emergency and the information available, various representatives from this listing will be selected by the response coordinator to be part of *the emergency oversight committee*, which will then meet throughout the duration of the emergency to aid in decision-making and positive outcomes.

Table G1: Agency Emergency Contact Listing

Personnel	Name	Home Telephone	Work Telephone
Public Works Supervisor	Mike Loven		218-831-3086
Mayor	Nancy Adams	218-568-8110	---
Council Member	Jerry Akerson	218-568-5807	---
Council Member	Tyler Gardner	218-820-0024	---
Council Member	Scott Pederson	218-831-1867	---
Council Member	Dave Sjoblad	218-568-8392	---
Response Coordinator	Mike Loven	---	218-831-3086
Alt. Response Coordinator	Nancy Adams	218-568-8110	
State Incident Duty Officer	N/A	N/A	(800) 422-0798
County Emergency Director	John Bowen	----	218-829-4749
Fire Chief	Tom Nelson	218-839-1448	
Sheriff	Todd Dahl	---	218-829-4749
Police Chief	Eric Klang	---	218-851-3019
System Operator	Pine River Sanitary District	---	218-851-9060 (on call #)
Alt. System Operator	Pine River Sanitary District	---	218-851-9060 (on call #)
School Superintendent		---	218-568-9205
Ambulance	North Ambulance	---	911
Hospital	Essentia Health/St. Joseph's	---	218-829-2861
Medical Facility or Doctor	Essentia Health/Pequot Clinic	---	218-568-4416
Power Company	MN Power – Pine River	---	218-587-4401
County Highway Department	Crow Wing County	---	218-824-1110
State Highway Department	Minnesota Highway Department	---	218-828-2460
Telephone Company	TDS	---	888-837-3050
Neighboring Water System	City of Pine River (city hall #)	---	218-587-2440
MPCA		---	(800) 657-3864
MRWA Technical Services	Dave Neiman	---	(800) 367-6792
MDH District Engineer	John Groethe	320-808-5009	320-223-7339
MDH Source Water Protection	Mark Wettlaufer	320-293-7991 (c)	320-232-7342

2. Critical response personnel:

Table G2: Critical Response Personnel

Title	Name	Response Assignment
Response Coordinator	Mike Loven	Coordinate actions to address emergency
Alt. Response Coordinator	Nancy Adams	Coordinate actions to address emergency
Water Operator	Pine River Sanitary Dist.	Direct or contact firms to resolve issue
Alt. Water Operator	Pine River Sanitary Dist.	Direct or contact firms to resolve issue
Public Relations	Nancy Adams	Contact media to inform citizens/businesses of emergency
Alt. Public Relations	City Clerk	Contact media to inform citizens/businesses of emergency
Public Health/Medical	Police Dept., Fire Dept., First Responders, Sheriff's Office, State Duty Officer	Assist City as needed to address emergency
Alt. Public Health/Medical	Police Dept., Fire Dept., First Responders, Sheriff's Office, State Duty Officer	Assist City as needed to address emergency

3. Public information plan:

a) Public relations center and primary spokesperson:

Name: Nancy Adams
Title: Mayor
Address: Pequot Lakes, MN
Home Phone: 218-568-8110
Work Phone:

Public information center location during emergency:

City Hall, 4638 County Road 11, Pequot Lakes, MN

Times available:

City Hall will be open as needed to respond and coordinate emergency response.

Alternate information center location site:

Pequot Lakes Library, 31069 County Road 112, Pequot Lakes, MN

b) Information checklist to be conveyed to the public and media:

- 1) Name of water system
- 2) Contaminant of concern and date
- 3) Source of contamination
- 4) Public health hazard
- 5) Steps the public can take
- 6) Steps the water system is taking
- 7) Other information

c) Media contacts:

Media	Name	Telephone	Address
Newspaper	Echo Publishing Brainerd Dispatch	218-568-8521 218-829-4705	Pequot Lakes, MN Brainerd, MN
Television	KAWB Public Television	218-855-0022	Brainerd, MN
Radio	KTIG	218-568-6872	Pequot Lakes, MN

H. Mitigation and Conservation Plan

1. Mitigation

a) Infrastructure maintenance/upgrades/maps:

The City flushes the water system one time per year; infrastructure maps are 75 percent accurate and are updated as necessary.

b) Regular inspection of tower, well, pump house:

System personnel inspect pumps, wells, and the treatment facility daily. The tower is inspected once every two weeks.

c) Staff emergency training:

Staff reviews emergency equipment as needed, at least 1 – 2 times annually. The City Water Department works with the Fire Department for high flow situations, emergency response and preparedness.

d) System security analysis:

The water tower and water treatment facility are locked, lighted and inspected. Controls are operated by staff only.

e) Site new backup well:

There are currently no plans for new wells although a back up well is under consideration.

f) System valving to isolate problems:

The system is currently inadequately valved to isolate problem areas. The City is installing new valves as funding is available.

g) Sanitation procedures for construction/repairs:

Staff or contractor undertakes shock chlorination after construction or repairs are completed.

h) Other:

None.

2. Conservation

a) Water meters:

Ninety-five percent of the connections are metered and read monthly. The City tracks usage by connections.

b) Public education:

Consumer Confidence Reports are published in the local newspaper annually.

c) Rate structure:

The basic rate for a residential connection is \$17.67 per month for the first 2,000 gallons used and \$6.62 per thousand gallons for usage over 2,000 gallons.