

**WELLHEAD PROTECTION PLAN
FOR THE
City of Cuyuna, Minnesota**



This plan is in effect from:

To be determined following Plan approval by MDH

FINAL DRAFT – December, 2012

Forward

This document presents the wellhead protection (WHP) plan for the City of Cuyuna 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
198644	Well #1	P

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

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Cuyuna Drinking Water Supply Management Area (DWSMA) MN-00594 - Moderate Vulnerability

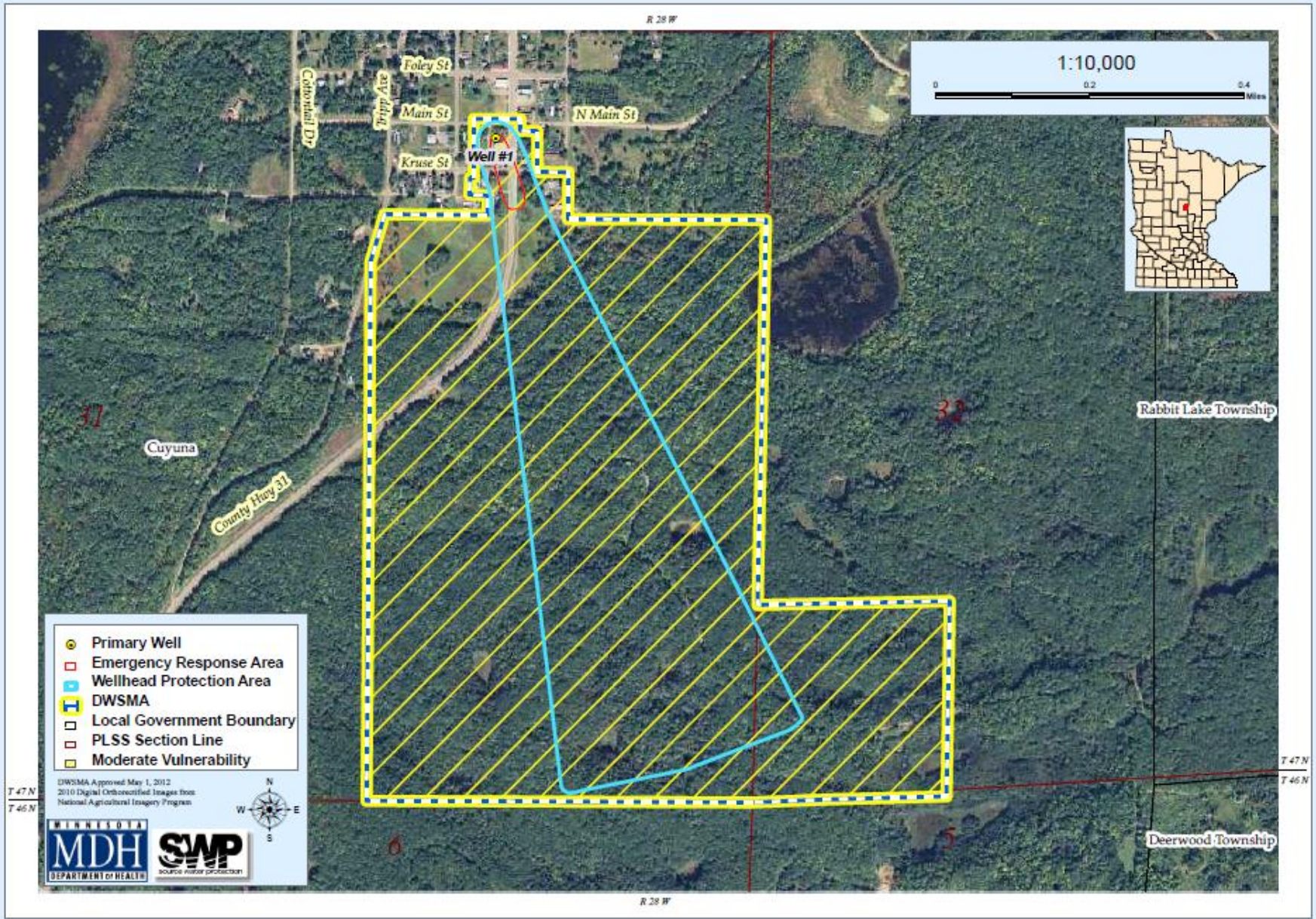


Figure 1 – Drinking Water Supply Management Area (DWSMA)

Chapter 1 – Introduction

3.2 Background

The wellhead protection (WHP) plan for the City of Cuyuna was prepared in cooperation with the Minnesota Department of Health (MDH) and the Minnesota Rural Water Association. It contains specific actions that the city will take to fulfill WHP requirements that are specified under Minnesota Rules, part 4720.5510 to 4720.5590. 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 its 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.
- Appendix IV contains copies of maps, figures and other supporting data and/or documents which are referred to throughout this Plan.

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 1) delineate the WHPA and the DWSMA and to assess DWSMA and well vulnerability and 2) 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 October 26, 2010, 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 June 25, 2012, discussed the data elements required to 1) identify potential risks to the public water supply and 2) 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. A copy of the Scoping Decision Notice No. 2 is

included in Appendix IV for reference. Not all of the data elements listed in the WHP rule had to be addressed in the WHP plan because of the moderate vulnerability 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 shaded are not required or needed, as previously stated, because of the moderately vulnerable setting. These data elements are included in the table for information purposes only. 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 the four 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	Availability of Data
	Use of the Well (s)	Delineation Criteria	Quality and Quantity of Well Water	Land and Groundwater Use in DWMA		
Precipitation						
Geology						
Maps and geologic descriptions	M	H	H	H	Setterholm (2004), Peterson et. Al. (2007), MGS, DNR, USGS	Y
Subsurface data	M	H	H	H	MGS, MDH, DNR	Y
Borehole geophysics	M	H	H	H	MGS (None Available)	Y
Surface geophysics	L	L	L	L	City (None Available)	Y
Maps and soil descriptions						
Eroding lands						
Soils						
Maps and soil descriptions						
Eroding lands						
Water Resources						
Watershed units						
List of public waters						
Shoreland classifications						
Wetlands map						
Floodplain map						
Land Use						
Parcel boundaries map	L	H	L	H	Crow Wing County (2009)	Y
Political boundaries map	L	H	L	L	City, Crow Wing County	Y
PLS map	L	H	L	L	MnGEO	Y
Land use map and inventory	M	H	M	H	State data	Y
Comprehensive land use map	L	L	L	L	None exists	Y
Zoning map	L	L	L	H	City	Y
Public Utility Services						
Transportation routes and corridors	L	L	L	H	City, Crow Wing County	Y
Storm/sanitary sewers and PWS	L	L	L	M	City, Crow Wing County	Y

Data Element	Present and Future Implications				Data Source	Availability of Data
	Use of the Well (s)	Delineation Criteria	Quality and Quantity of Well Water	Land and Groundwater Use in DWSMA		
system map						
Oil and gas pipelines map	L	L	L	L	None Found	Y
Public drainage systems map or list	L	L	L	L	None Found	Y
Records of well construction, maintenance, and use	H	H	H	H	City, CWI, MDH files	Y
Surface Water Quantity						
Stream flow data						
Ordinary high water mark data						
Permitted withdrawals						
Protected levels/flows						
Water use conflicts						
Groundwater Quantity						
Permitted withdrawals	H	H	H	H	DNR	Y
Groundwater use conflicts	M	M	H	H	DNR (None Found)	Y
Water levels	H	H	H	M	MDH, City	Y
Surface Water Quality						
Stream and lake water quality management classification						
Monitoring data summary						
Groundwater Quality						
Monitoring data	H	H	H	H	MDH	Y
Isotopic data	H	H	H	H	MDH, DNR	Y
Tracer studies	H	H	H	H	None Found	Y
Contamination site data	M	M	M	M	MPCA, MDA (None Found)	Y
Property audit data from contamination sites	M	M	M	M	None Found	Y
MPCA and MDA spills/release reports	M	M	H	H	None Found	Y

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 Appendix I. The City of Cuyuna requested that MDH do this work and it was performed by Gail Haglund, who is licensed as a 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 1 (Unique No. 198644). The WHPA for this water supply well is shown in Figure 1.

The DWSMA boundaries were designated using the following criteria:

- Edge or center-lines of highways, streets, roads;
- Public Land Survey coordinates;
- Property parcel boundaries (Crow Wing County, 2009)

3.2 Well Vulnerability Assessment

The well construction and water quality obtained from the primary well used by the City of Cuyuna is included in the assessment of well vulnerability. The city well is considered **vulnerable** because well construction does not meet current State Well Code specifications (the well is not grouted through the full length of the casing). Additionally, tritium was found in a water sample taken on May 11, 2011, concentration at 11.2 tritium units, which indicates that the water in the aquifer has been significantly affected by recent recharge.

3.3 DWSMA Vulnerability Assessment

The vulnerability of the drinking water aquifer utilized by the City of Cuyuna was evaluated primarily on the basis of 1) geologic logs from wells located in the area, and 2) groundwater quality data obtained from the city's well (198644).

A vulnerability rating of **moderate** is assigned to the DWSMA. Well logs indicate that the aquifer is covered by several layers of clay-rich till, which achieve a low aquifer sensitivity rating. However, the tritium found in water from the city well indicates that a significant amount of young water in the aquifer is recharging the well. Therefore, it is prudent to assign a moderate vulnerability rating to the entire DWMA.

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, wells, other types of boreholes, excavations that may reach the aquifer, certain types of Environmental Protection Agency Class V Wells, spills, transportation corridors and petroleum storage tanks have a potential to impact the city wells.

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.

4.2 Inventory Results and Risk Assessment

A 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 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 Cuyuna 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
Domestic Well	0	n/a
City test well #198645	1	H

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 Well <100 feet deep	0	0	n/a	0	n/a
Domestic Well >100 feet deep	0	0	n/a	0	n/a
Petroleum Storage Tank	0	0	n/a	0	n/a
Transportation Corridor	1	1	M	1	M
Spills	0	0	n/a	0	n/a
Class V Well	0	0	n/a	0	n/a

Chapter 5 - Impact of Land and Water Use Changes on the Public Water Supply Well

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 will all occur within the city's jurisdictional land-use authority. 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 Cuyuna and property owners within the DWSMA.

Table 4 - Expected Land and Water Use Changes

Expected Changes	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 change is anticipated. NOTE: Iron mining in the area has been dormant for many years, with no additional mining activity in the foreseeable future.	Does not apply	Does not apply	Does not apply
Land Use: The City is proposing the development of a mountain bike road course and park, with primitive camping, picnicking and a trail center in the NW corner of the DWSMA.	The current area is undeveloped and additional use may include the need for the extension of city utilities, or a new well for drinking water and for road course maintenance. Depending on well depth, the increased water use could impact the aquifer recharge.	The City can influence the impact that the proposed development will have on the aquifer through use of judicial planning tools at the City Council level.	The city does not have a long-range comprehensive plan. The City Council reviews and approves all land use changes, and can apply conditions to the approval which will address any groundwater concerns.
Land Use: The City provides water and sewer utilities to the current core area of the city; however, infrastructure for city utilities does not exist for future development of county tax-forfeit land(s).	The county tax-forfeit land is undeveloped and any future change in use may include the need for a well, or extension of city infrastructure, for drinking water and sewer utilities.	The City Council will need to consider long-range land use and future development when planning water and sewer infrastructure improvements.	The City recognizes the need for the development of a long-range land use plan, and planning of future water/sewer infrastructure improvements, if existing tax-forfeit lands are sold.
Surface Water: No change is anticipated.	Does not apply	Does not apply	Does not apply
Groundwater: The city is interested in finding a location for a future public water supply well(s), in the event they are ever needed.	Additional wells and increased water use may alter current DWSMA boundaries and may increase the rate at which surface water recharges the aquifer, depending on where well is constructed.	The city would need to amend its groundwater appropriations permit from the DNR. MDH SWP Implementation grant may be used to locate a site for new public water supply well.	The city will have to work with MDH, a consultant, and well driller to locate a site for future wells and to design the future well and submit plans to MDH for approval. Also, the city may need to acquire property on which to construct the well. Nearby landowners may have to be consulted to participate in an aquifer test to document that an additional high-capacity well will not affect other local wells.
Ground Water Additional ground water use from new or	Additional groundwater use within the DWSMA presents concerns over water	The City will have to rely on the MDH well approval process and the DNR Water	An adequate water supply is vital to public health, safety and the economy of the City. Therefore,

existing high-capacity wells within the DWSMA could result in increased pumping of the source water aquifer	availability and potential contaminant loading to the City's water supply aquifer	Appropriation Permit process to assure high capacity wells would not have a negative impact on the City water supply	the City would need to determine technically and financially if City water could be supplied to a new, high-water-use customer
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Chapter 6 - Issues, Problems, and Opportunities

6.1 Identification of Issues, Problems and Opportunities

The City of Cuyuna 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 1) input from public meetings and written comments it received, 2) the data elements identified by MDH during the scoping meetings, and 3) 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 on June 25, 2012 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. No comments were received.

One issue expressed by the City Council is the fact that, while the City maintains land-use authority for property inside the DWSMA, much of the area is County Tax-forfeit land which is managed by the County and can be subject to sale in the future. The City does not currently have a long-range comprehensive land use plan. Future use of tax-forfeit lands is a major concern for the City.

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
The City has no backup well, or alternative source of drinking water.	Aquifer, Well water Quantity, DWSMA, Public Health	In the event the city would lose the existing city well, there is no other water supply source.	With the assistance of MDH, MRWA, a well consultant and well driller, the city can explore the opportunities for the location of a new, and possibly deeper, water supply well. Apply for MDH SWP Grant funds.	The MDH SWP and Well Management Units have processes in place to assist with the exploration for new drinking water wells. MDH SWP Implementation Grant Program.

Vehicular transportation routes through the DWSMA.	Aquifer DWSMA Well Water Quality	Potential spills and leaks from vehicles and accidents.	The City will work with local first-responders and Crow Wing County to develop an emergency response plan for contaminant releases. Utilize SWP Grant funds.	Crow Wing County Emergency Management coordinates with local, state, and federal agencies to preserve life, property, and the well-being of citizens from natural, technological, and man-made disasters.
Old Municipal dug well (located just outside of the western DWSMA boundary).	Public Health, Aquifer, DWSMA and Well Water Quality	Potential impact on groundwater quality and aquifer recharge.	The City believes this well was sealed by backfilling with native materials in 1983. City staff will attempt to verify this with a search of old records and discussions with city residents.	The MDH Well Management Section does not have records of this well having been sealed. MDH can assist with verifying the location of the old well.
City test well (#198645) located approximately 30' NW of current City Well.	Public Health, Aquifer, DWSMA and Well Water Quality	Potential impact on groundwater quality and aquifer recharge.	Work with MDH Well Management to have this well properly sealed. Apply for available well sealing grant money from MDH.	MDH Well Management can assist with sealing the well.
The City recognizes this is a 10 year WHP Plan and those issues, problems, and opportunities can change, from current status, which can impact the implementation strategies.	Public Health, Aquifer, DWSMA and Well Water Quality	The City must have the flexibility to address changing situations.	The City has the opportunity to address those issues, problems and opportunities that may change over the next 10 years. Utilize MDH-SWP Grant funds when applicable.	The City, local and state governments have existing controls in place to address most issues as they occur. The City, local and state governments are continually updating land use controls as new issues, new problems and new opportunities occur.
Use and sale of County tax-forfeit lands.	Public Health, Aquifer, DWSMA and Well Water Quality	Some of the land within the DWSMA is County tax-forfeit land. However unlikely, the possibility exists that some of that land may be sold in the future. Land-use changes and additional development may affect the DWSMA.	The City Council must work with Crow Wing County Land Services to stay abreast of pending tax-forfeit land sales and exercise control over impacts to the aquifer that may occur.	Some of the tax-forfeit land is within city limits. Explore the development of a City Comprehensive Land Use Plan which would outline future use of this property.

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

In addition to its own controls, the City of Cuyuna 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 Cuyuna

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 Cuyuna

Government Unit	Type of Program	Program Description
City Council	1) Zoning & Land-use, Shoreland, subdivisions	1) Establishes City wide goals and priorities towards current and future community development.
City Council	1) Land Use Permits 2) Conditional Use Permits 3) Zoning Inspection 4) Septic Systems	1) Regulates land-uses to comply with zoning ordinance. 2) Specifies performance standards needed to offset environmental risk presented by a specific land use. 3& 4) Contracts with private firm to oversee compliance with zoning regulations and on-site sewage treatment system ordinance requirements.
Public Works	1) Construction, repair and maintenance of City roads & streets 2) Construction, repair, and maintenance of City water and sewer utilities 3) Water use and deficiencies	1) Specifies the design, construction, and maintenance of City roads & streets, and storm water related to them. 2) Governs the design, construction and maintenance of City water and sewer utilities. 3) Manages water use through backflow/cross-connection controls, fee schedules and water-use bans during drought conditions or heavy water consumption.

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	Type of Program	Program Description
Crow Wing County Environmental Services (for DWSMA land within the County jurisdiction)	1) Household Hazardous Waste Collection. 2) Land Use Permits 3) Conditional Use Permits	1) Provides education to landowners and an on-going program for disposing of household hazardous waste, in conjunction with Crow Wing County. 2) Regulates land-uses to comply with zoning ordinances. 3) Specifies performance standards

	4) On-site Waste Water Treatment	needed to offset environmental risk presented by a specific land use. 4) Approves the design, installation, operation, and performance of on-site wastewater treatment systems.
Crow Wing County Emergency Management/Homeland Security Department	1) Transportation accidents causing contaminant spills 2) Natural disasters	1) Directs the response and the extent of initial cleanup of fuel, chemical, or other hazardous substances that are released due to transportation accidents. 2) Coordinate the development of effective emergency management operations plans through education, training, and exercising.
Crow Wing County Soil and Water Conservation District	1) Agricultural BMPs 2) Storm Water Management 3) Wetland Management 4) Feedlots 5) Residential BMPs 6) Well Sealing Cost Share	The Crow Wing County SWCD promotes the protection of water and soil resources in the County through educational programs, cost-sharing and collaboration with other local, state and federal agencies.

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 Cuyuna 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	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.

7.4 Support Provided by Nonprofit Organizations

The Minnesota Rural Water Association (MRWA) has provided technical assistance to the City of Cuyuna throughout the development of this WHP Plan and will assist with implementing its WHP Plan by providing: 1) referenced educational and outreach materials, and 2) on-site technical assistance.

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 1) changing land and water uses have presented to drinking water quality over time and 2) future changes that need to be addressed to protect the community's drinking water:

- Maintain a safe and adequate drinking water supply for residents, visitors and neighbors;
- Prevent contaminants from reaching levels that present a risk to people's health;
- Provide area residents with educational materials and other resources to assist with drinking water protection issues:
 - Private well use, maintenance and sealing assistance;
 - Maintenance and operation of above and below-ground storage tanks;
 - Transportation corridor emergency preparedness plan;
 - Continuing data collection;
 - Storm water management
 - Scheduled WHP Plan evaluation

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 Cuyuna:

1. Create public awareness and general knowledge about the importance of WHP for maintaining an adequate and safe drinking water supply.
2. Collect additional data to substantiate information contained within this Plan, and to provide more detail for future Plan amendments.
3. Provide landowners with best management practices and other information to assist with management of private property located within the DWSMA.
4. Provide direction to City and local planning bodies regarding future land use and development of property within the DWSMA.
5. Address issues associated with potential spills and leaks of hazardous materials on, or near, vehicular routes through the DWSMA.
6. Provide emergency response coordination for any impact to, or endangerment of, the water supply system.
7. Conduct regular evaluations of Plan implementation and effectiveness.

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 1) the lead party and any cooperators, 2) the anticipated cost for implementing the measure and 3) 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:

- Monitoring, Data Collection and Assessment;
- IWMZ Management;
- Land Use Planning;
- Potential Contamination Source Management;
- Public Education and Outreach;
- Reporting and Evaluation;
- Water Use and Contingency Strategy.

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 Cuyuna WHP Team defines priority for implementing a WHP measure as starting with those potential contaminant sources that pose the most significant risk to the water supply and working through to those posing the least amount of risk. The following table lists each measure that it will implement over the ten year period the city's WHP plan is in effect as well as the priority that it has assigned to each measure.

Table 9 - WHP Plan of Action

Monitoring, Data Collection and Assessment												
Measure	Priority	Description	Objective Addressed	City Action Alone Unless Cooperator is Noted	Cost	Implementation time frame						
						2012	2013	2014	2015	2016	2017	2018
1	H	Verify the locations of new wells constructed within a one-mile radius of the DWSMA. Send a letter to listed cooperators requesting to be notified of well construction activities in the DWSMA, including irrigation and high capacity wells.	2	MDH, DNR, Well Drillers		*	*	*	*	*	*	*
2	H	During any planned well maintenance, and if possible, pull the pump from Well #1 and televise the casing for leaks. Assist the MGS to gamma log the well bore hole. Contact the MDH-SWP staff, to assist with analyzing the information gained from the down-hole work in order to improve on the delineation approach for future amendments of the WHP Plan. Pursue MDH SWP Grant funds to assist with this effort.	2	MDH, MGS	\$10,000		*					
3	H	Contact the MDH SWP Program staff, to plan the city's help in gathering and submitting samples of the raw well water to determine if there are changes in the amount of the tritium isotope in the aquifer. MDH will pay for the laboratory costs.	2	MDH							*	
4	H	Call Gail Haglund, MDH, to plan for the collection of water samples from the city well and Agate Lake, for stable isotope analysis, to confirm previous results that indicate limited surface water influence on the aquifer and city well. MDH will pay for the analytical work done at the MDH laboratory.	2	MDH						*		
5	H	Meet with MDH staff to evaluate sampling data collected under items #3 & 4, and any new well information available, to enhance ground water flow modeling used for delineation of the WHPA for the city well for future Plan amendments.	2	MDH								*
6	H	The City Council should carefully review and comment on any proposed land use changes being considered in the DWSMA, for potential impact on groundwater quality or quantity, and use land-use control options to minimize potential impact to the aquifer used by the city (require hookup to city utilities).	2,4	MDH, MRWA, County		*	*					
7	H	Arrange meetings with MDH and MRWA to develop a work plan, and list of things to consider, in siting a new source of drinking water, related to geology, groundwater chemistry, aquifer yield, current and future land uses, etc., and develop an approach to evaluate the impact these may have on the aquifer.	2,4	MDH, MRWA					*	*		

8	H	With assistance from MDH & MRWA, meet to assess potential sites for an additional water source in relation to items identified in step #7. Identify sites for placing test well(s) to evaluate water quality and quantity for a future city water source.	2,4	MDH, MRWA						*	*						
---	---	---	-----	--------------	--	--	--	--	--	---	---	--	--	--	--	--	--

Inner Wellhead Management Zone (IWMZ)																	
Measure	Priority	Description	Objective Addressed	City Action Alone Unless Cooperator is Noted	Cost	Implementation time frame											
						2012	2013	2014	2015	2016	2017	2018	2019	2020	2021		
9	H	Assist MDH with updating the IWMZ Survey and address identified measures.	2	MDH		*					*						
10	H	Implement measures that are specified in the Sanitary Survey, found in the Public Water Supply Routine Inspection Report received from MDH.	3	MDH, MRWA			*					*					
11	H	Monitor and maintain the 200' radius around the wells to insure that setback distances for new potential contaminant sources are met.	3			*	*	*	*	*	*	*	*	*	*	*	*
12	H	Arrange meetings with residents and identify resource needs of adjoining property owners to meet setback distances and/or manage potential contaminate sources.	3					*			*			*			

Land Use Planning																	
Measure	Priority	Description	Objective Addressed	City Action Alone Unless Cooperator is Noted	Cost	Implementation time frame											
						2012	2013	2014	2015	2016	2017	2018	2019	2020	2021		
13	H	Explore the feasibility of developing a City Comprehensive Land Use Plan, to control future development and growth within the City and DWSMA.	4	CWC Land Services				*	*								
14	H	Work with Crow Wing County Land Services to stay abreast of potential sales of County Tax-forfeited lands and implement planning measures to control any adverse impacts to the aquifer.	4	CWC Land Services		*	*	*	*	*	*	*	*	*	*	*	*
15	H	Update current City Land Use Controls, Zoning Ordinances and Subdivision Ordinance to include references to the DWSMA and groundwater water quality concerns.	4						*								

16	H	Meet with local planning staff(s), when they are updating comprehensive plans, to reflect existing WHP issues and identify changes in local controls that can be made to protect the community water supply wells and aquifer.	4	CWC Land Services					*								
17	H	In cooperation with with MDH, League of Minnesota Cities and city planning staff, the City Council will consider the development of an ordinance that specifies the circumstances which control the placement of new private wells within the City's jurisdiction, and potential for hookup to city utilities.	4	MDH, League of MN Cities					*								

Potential Contaminant Source Management																	
Measure	Priority	Description	Objective Addressed	City Action Alone Unless Cooperator is Noted	Cost	Implementation time frame											
						2012	2013	2014	2015	2016	2017	2018	2019	2020	2021		
18	H	Research the location and status of the old dug municipal well and verify that it has been properly sealed.	2	MDH MRWA			*										
19	H	Contact MDH, DNR & MGS, to determine if there is a reason to maintain City Test well #189645 for aquifer monitoring purposes, and if not, properly seal the well. Utilize MDH grant funds to seal the well.	2	MDH	\$2500		*										
20	H	Contact Gail Haglund, MDH Hydrologist, to determine whether potential spills or leaks may present risk to the community wells and drinking water quality.	2,5	MDH			*										
21	H	Notify MDH and/or DNR about any new or proposed High-Capacity wells located within two (2) miles of the DWSMA boundaries.	2	MDH, DNR			*			*			*				
22	H	Send a letter to request that MDH & DNR inform the City of Cuyuna when permits are granted for new wells, maintenance of existing wells, when existing wells are disclosed during property transfer, or when private wells are sealed.	2	MDH, DNR			*										
23	H	Arrange meetings with the local fire department, the Crow Wing County Highway Dept., and Crow Wing County Emergency Management office to develop and implement a coordinated spill response plan.	5,6	FD, CWC Highway & Emergency Management				*									

Education and Outreach												
Measure	Priority	Description	Objective Addressed	City Action Alone Unless Cooperator is Noted	Cost	Implementation time frame						
						2012	2013	2014	2015	2016	2017	2018
24	H	Apply for a MDH SWP Grant to revise the City web site to provide a method of communication with land owners and resource partners regarding WHP issues.	1,3	MDH SWP Grant Program	\$2500		*					
25	M	Prepare an annual summary of wellhead protection activities for release to the public in a City newsletter, on the City website and post in public locations.	1,3			*	*	*	*	*	*	*
26	M	Prepare and distribute a handout, describing WHP activities and the status of Plan implementation, at community events.	1,3	MRWA	\$150	*	*	*	*	*	*	*
27	M	Erect & maintain SWP informational signs at the entrances to the city.	1,3		\$150		*					

Reporting & Evaluation												
Measure	Priority	Description	Objective Addressed	City Action Alone Unless Cooperator is Noted	Cost	Implementation time frame						
						2012	2013	2014	2015	2016	2017	2018
28	M	Complete an Evaluation Report every 2.5 years that evaluates the progress of plan of action and the impact of any contaminant release on the aquifer supplying the water supply wells.	7	MDH, MRWA				*		*	*	
29	M	Summarize all WHP Plan implementation efforts in a report to MDH in the 8 th year.	7	MDH, MRWA							*	
30	M	Hold meetings, as needed, with the WHP Team, local resource partners, and City Management, to discuss WHP Plan implementation activities, budget needs and pursue MDH SWP Grant funds to help with implementation efforts.	1,4	CWC Land Services		*	*	*	*	*	*	*
31	H	Maintain a WHP FOLDER or binder that contains records and documentation of all WHP activities the City has completed.	7			*	*	*	*	*	*	*

Water Use and Contingency Planning												
Measure	Priority	Description	Objective Addressed	City Action Alone Unless Cooperator is Noted	Cost	Implementation time frame						
						2012	2013	2014	2015	2016	2017	2018
32	H	Meet with City Fire Department to make them aware of drinking water vulnerability issues, so they can consider the DWSMA vulnerability when responding to fires or contaminant spills; specifically identify the impacts that firefighting or cleanup procedures may have on contaminant movement to city wells or the aquifer.	5	Fire Department		*					*	
33	H	Distribute the City's WHP Contingency Strategy Plan to identified cooperators. Review every 5 years and update if necessary. Coordinate emergency response initiatives with Crow Wing County.	5	CWC Emergency Management		*					*	

9.4 Commitments From Cooperators

The agencies listed in Table 10 have been requested to support the City of Cuyuna with implementing the WHP measure(s) in which they are identified. (See example letter to cooperating Agencies in Appendix IV).

Table 10 - Cooperating Agencies List

Agency	Measure
Minnesota Department of Health	1,2,3,4,5,6,7,8,9,10,17,18,19,20,21,22,24,28,29
Minnesota Department of Natural Resources	1,21,22
Minnesota Rural Water Association	6,7,8,10,18,26,28,29
Minnesota Geologic Survey	2
Crow Wing County Land Services	6,13,14,16,30
Crow Wing County Highway Department	23
Crow Wing County Emergency Management	23,33
Fire Department	23,32
League of Minnesota Cities	17
Well Driller(s)	1

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 Objective 7, 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 will provide the basis for documenting whether each action step for that year was implemented.
2. The WHP team will meet, at a minimum, every two-and-one-half years 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 report to the city council.
4. The city will prepare a written report that documents how it has assessed plan implementation and the action items that were carried out. The report will be presented to MDH at the first scoping meeting held 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/MRWA and presented in Appendix III of this plan. A copy of this plan is available for public review during regular business hours at the city offices and is referenced in this section.

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 Cuyuna 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 Cuyuna 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 Cuyuna 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

AST	Above Ground Storage Tank
BMP	Best Management Practices
CWC	Crow Wing County
DNR	MN Department of Natural Resources
DOT	Department of Transportation
DWSMA	Drinking Water Supply Management Area
EQUIP	Environmental Quality Incentive Program
FD	Local Fire Department
SSTS	Subsurface Sewage Treatment System
IWMZ	Inner Wellhead Management Zone
LUST	Leaking Underground Storage Tank
MDA	MN Department of Agriculture
MDH	MN Department of Health
Mg/l	Milligrams per Liter
Mg/y	Million Gallons per Year
MGS	MN Geological Survey
MN	Minnesota
MPCA	MN Pollution Control Agency
MRWA	Minnesota Rural Water Association
NRCS	Natural Resources Conservation Service
P&Z	Planning & Zoning
PCSI	Potential Contaminant Source Inventory
PWS	Public Water Supply
RST	Registered Storage Tank
SWCD	Soil & Water Conservation District
TOT	Time of Travel
US EPA	United States Environmental Protection Agency
UST	Underground Storage Tank
WHP	Wellhead Protection
WHPA	Wellhead Protection Area

APPENDICIES

Appendix I – WHP Plan Part 1

Appendix II – Potential Contaminant Source Inventory

Appendix III – Contingency Plan

Appendix IV – Maps, Figures and Supporting Documentation

Appendix I – WHP Plan Part 1

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

City of Cuyuna

January 2012

**Tracy J. Lund
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.

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 public water supplier must manage the IWMZ to help protect it from sources of pathogen or chemical contamination that may cause an acute health effect.

Wellhead Protection (WHP). 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, section 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

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

1. Introduction

The Minnesota Department of Health (MDH) developed Part I of the wellhead protection (WHP) plan at the request of the city of Cuyuna (PWSID 1180011). The work was performed in accordance with the Minnesota Wellhead Protection Rule, parts 4720.5100 to 4720.5590.

This report presents delineations of the wellhead protection area (WHPA) and drinking water supply management area (DWSMA), and the vulnerability assessments for the public water supply well and DWSMA. Figure 1 shows the boundaries for the WHPA and the DWSMA. The WHPA is defined by a 10-year time of travel. 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 1.

Table 1 - Water Supply Well Information

Local Well ID	Unique Number	Use/ Status ¹	Casing Diameter (inches)	Casing Depth (feet)	Well Depth (feet)	Date Constructed/ Reconstructed	Aquifer	Well Vulnerability
1	198644	P	8	60	75	1983	QBAA	Vulnerable

Note: 1. Primary (P) Well
2. Quaternary Buried Unconfined Aquifer (i.e., glacial clay, sand and gravel materials)

2. Assessment of the Data Elements

MDH staff met with representatives of the city of Cuyuna on October 26, 2010, for a scoping meeting that identified the data elements required to prepare Part I of the WHP plan. Table 2 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 2 - 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					
Geology					
Maps and geologic descriptions	M	H	H	H	Setterholm (2004), Peterson et. al (2007), 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	City (None Found)
Maps and soil descriptions					
Eroding lands					
Water Resources					
Watershed units					
List of public waters					
Shoreland classifications					
Wetlands map					
Floodplain map					
Land Use					
Parcel boundaries map	L	H	L	L	Crow Wing County
Political boundaries map	L	H	L	L	Crow Wing County, 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	
Zoning map	L	L	L	L	City
Public Utility Services					
Transportation routes and corridors					
Storm/sanitary sewers and PWS system map					
Oil and gas pipelines map					
Public drainage systems map or list					
Records of well construction, maintenance, and use	H	H	H	H	City, CWI, MDH Files
Surface Water Quantity					
Stream flow data					
Ordinary high water mark data					
Permitted withdrawals					
Protected levels/flows					
Water use conflicts					
Groundwater Quantity					
Permitted withdrawals	H	H	H	H	DNR
Groundwater use conflicts	H	H	H	H	DNR (None Found)

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 levels	H	H	H	H	MDH, City
Surface Water Quality					
Stream and lake water quality management classification					
Monitoring data summary					
Groundwater Quality					
Monitoring data	H	H	H	H	MDH
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 (None Found)
Property audit data from contamination sites					
MPCA and MDA spills/release reports					

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 city of Cuyuna obtains its drinking water supply from one primary well; Table 1 summarizes information regarding it.

3.2 Description of the Hydrogeologic Setting

The description of the hydrologic setting for the aquifer used to supply drinking water is presented in Table 3.

Table 3 - Description of the Hydrogeologic Setting

Attribute	Descriptor	Data Source
Aquifer Material	Unconsolidated sand and gravel materials	CWI
Porosity Type and Value	Primary: 25%	Fetter, 2001
Aquifer Thickness	29 feet (8.84 meters) at Cuyuna Well 1 (198644), which is the only well completed through the entire aquifer unit in the area, so the full areal extent throughout the WHPA is unknown.	Geologic cross sections (Figures 4 and 5), CWI well log 198644, and other area well logs in CWI.
Stratigraphic Top Elevation	The aquifer top can be found between 1,158 and 1,211 feet MSL within the area, with an elevation of 1,203 feet MSL at Cuyuna Well 1 (198644).	Geologic cross sections (Figures 4 and 5), CWI well log 198644, and other area well logs in CWI.
Stratigraphic Bottom Elevation	1,174 feet MSL. Cuyuna Well 1 (198644) is the only well completed through the entire aquifer unit in the area, so the full areal extent throughout the WHPA is unknown.	Geologic cross sections (Figures 4 and 5), CWI well log 198644, and other area well logs in CWI.
Hydraulic Confinement	Confined	Geologic cross sections (Figures 4 and 5) and other area well logs in CWI.
Transmissivity	Range of Values: 1,100 - 3,500 ft ² /day	A range of transmissivity values was used to reflect changes in aquifer composition as well as uncertainties related to the quality of existing aquifer test data as discussed in the aquifer test plan. See Table 4 for the reference value.
Hydraulic Conductivity	Range of Values: 40 - 120 ft/day	The range of values was obtained from the above transmissivity range of values.
Groundwater Flow Field	See Figure 2 - Ambient Groundwater Flow Field	Defined by using static water level elevations from well records in the CWI database and documents listed in the “Selected References” section of this report.

Figures 3, 4, and 5 show the distribution of the aquifer and its stratigraphic relationships with adjacent geologic materials. [They were prepared using well record data that is contained in the CWI database. The geological maps and studies that were used to further define local hydrogeologic conditions are provided in the “Selected References” section of this report.](#)

4. Delineation of the Wellhead Protection Area

4.1 Delineation Criteria

The boundaries of the WHPA for the city of Cuyuna 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	None	There are no known groundwater flow boundaries close enough to the Cuyuna city well to have an impact on the capture area.
Flow Boundary	Other High-Capacity Wells (Table 6)	No nearby high-capacity wells exist within two miles of the city's primary well.
Daily Volume of Water Pumped	See Table 5	Pumping information was obtained from the DNR, Appropriations Permit PA-1984-3157, and was converted to a daily volume pumped by the well.
Groundwater Flow Field	See Figure 2	The model calibration process addressed the relationship between the calculated versus observed groundwater flow field.
Aquifer Transmissivity (T)	Reference Value: 2,320 ft ² /day	The aquifer test plan was approved on November 15, 2011, and T was determined from an existing pump test on Cuyuna Well 1 (198644) and the city's test well (198645). Uncertainty regarding aquifer transmissivity was addressed as described in Section 4.4.
Time of Travel	10 years	The public water supplier selected a 10 year time of travel.

Information provided by the city of Cuyuna was used to identify the maximum volume of water pumped annually by the city's well over the previous five-year period, as shown in Table 5. Also, the estimated pumping for the next five years is shown. Previous pumping values have been reported to the DNR, as required by the public water supply's Groundwater Appropriation Permit No. 1984-3157. 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.

Table 5
Annual Volume of Water Discharged from Water Supply Wells

Well Name	Unique No.	2006	2007	2008	2009	2010	Future Pumping	Daily Volume (gal/day)
1	198644	2.9	3.0	3.5	2.9	2.9	3.5	9,582.5

(Expressed as millions of gallons except as where indicated. Bolding indicates greatest annual pumping volume.)

4.2 Method Used to Delineate the Wellhead Protection Area

The WHPA for the city of Cuyuna's well was determined using a combination of two methods. The first involved calculating the groundwater capture zone deterministically using representative aquifer

parameters that were input into MLAEM, a groundwater modeling code (Strack, 1989). The second approach used the analytical groundwater flow method Oneka (Barnes and Soule, 2002). The resulting WHPA boundaries are a composite of the capture zones calculated using these two approaches (Figure 1). The input files for both models are available at MDH upon request.

The MLAEM Code was selected because it is a semi-quantitative method capable of simulating the influence of vertical infiltration and the pumping influence of multiple high-capacity wells, if necessary. It produces a conservative estimate because aquifer recharge is not used as an input parameter. It is appropriate to use MLAEM for these particular delineations because no flow boundaries were directly observed in drillers' logs in the area around the primary city well, at least in the areas defined by a 1-year and 10-year time of travel. It does have somewhat limited capabilities to address aquifer settings that exhibit variable geologic conditions or variations in the direction of the groundwater flow field.

A second code, using the analytical groundwater flow method named Oneka (Barnes and Soule, 2003), was used to assess the probability of impacts that local variations in hydrogeologic conditions may have on a well capture zone. This model treats the aquifer properties and the available water level measurements as variable input parameters. The locations of wells, water levels, and the aquifer geometry were evaluated using information from the CWI database. For the solution, Oneka finds the flow field that best fits the network of water level elevations by varying the values of the aquifer thickness and transmissivity. Oneka then evaluates the probability of the capture of a given point based on the number of times it is included in the capture areas generated by the total number of solutions. The output from the model is a capture zone probability map for the specified time of travel (10 years).

4.3 Results of Model Calibration and Sensitivity Analysis

Model calibration is a procedure that compares the results of a model based on estimated input values to measured or known values. This procedure can be used to define model validity over a range of input values, or it helps determine the level of confidence with which model results may be used. As a matter of practice, groundwater flow models are usually calibrated using water elevation or flux. However, owing to the relatively limited amount of water elevation data for the Quaternary sand and gravel aquifer available in the Cuyuna area, a flowpath model based on available hydraulic head observations was calculated and a model uncertainty analysis was conducted in place of a traditional model calibration. Flowpath lines were calculated in the MLAEM Model using equations that reflected 1) a constant pumping rate, 2) direction of groundwater flow, 3) hydraulic gradient, 4) aquifer thickness, 5) aquifer permeability, and 6) aquifer porosity. As such, it was a simple calculation of the portion of the aquifer that contributes water, based on the width of the flow field that is affected by pumping.

The Oneka Model was used to support the MLAEM Model results by using an iterative process which provides the best fit for the ranges of values assigned to its input parameters. This helped to define the subset of values for which the delineation results were most likely to reflect local hydrogeologic conditions and, therefore, provided the best calibration results.

Model sensitivity is the amount of change in model results caused by the variation of a particular input parameter. Because of the simplicity of the MLAEM Model, the direction and extent of the modeled capture zone may be very sensitive to any of the input parameters:

- The pumping rate directly affects the volume of the aquifer that contributes water to the well. An increase in pumping rate leads to an equivalent increase in the volume of aquifer within the capture zone, proportional to the porosity of the aquifer materials. However, the pumping rate is based on the results presented in Table 5 and, therefore, is not a variable factor that will influence the delineation of the WHPA.

- The direction of groundwater flow determines the orientation of the capture area. Variations in the direction of groundwater flow will not affect the size of the capture zone but are important for defining the areas that are the source of water to the well. The ambient groundwater flow field that is defined in Figure 2 provides the basis for determining the extent to which each model run reflects the conceptual understanding of the orientation of the capture area for a well.
- An hydraulic gradient of zero produces a circular capture zone, centered on the well. As the hydraulic gradient increases, the capture zone changes into an elliptical shape, with the well centered on the down-gradient focal point. The hydraulic gradient was determined by using water level elevations that were taken from wells that have verified locations (Figure 2). Generally, the accuracy of the hydraulic gradient determination is directly proportional to the amount of available data that describes the distribution of hydraulic head in the aquifer.
- The aquifer thickness, permeability, and porosity influence the size and shape of the capture zone. A decrease in either thickness or porosity causes a linear, proportional increase in the areal extent of the capture zone; whereas permeability defines the relative proportions of the capture zone width to length. A decrease in permeability decreases the length of the capture zone and increases the distance to the stagnation point, making the capture zone more circular in shape and centered around the well.

4.4 Addressing Model Uncertainty

Using computer models to simulate groundwater flow necessarily involves representing a complicated natural system in a simplified manner. Local geologic conditions may vary within the capture area of the public water supply well, but the amount of existing information that is needed to accurately define this degree of variability is often not available for portions of the WHPA. In addition, the current capabilities of groundwater flow models may not be sufficient to represent the natural flow system exactly. However, the results are valid within a range defined by the reasonable variation of input parameters for this delineation setting.

The MLAEM Code, used as it was in this delineation, has limited capabilities to address these kinds of uncertainties, other than by using multiple runs in which the following six input parameters are varied: 1) constant pumping rate, 2) hydraulic gradient, 3) direction of ambient flow, 4) aquifer thickness, 5) aquifer permeability, and 6) porosity. The uncertainty associated with the MLAEM Code results from 1) the model deficiencies mentioned above, 2) the sensitivity of the code itself, and 3) the fact that the model cannot be calibrated.

The steps employed for this delineation to address model uncertainty were:

- 1) Pumping Rate - For each well, a maximum historical (five-year) pumping rate or an engineering estimate of future pumping, whichever is greater (Minnesota Rules, part 4720.5510, subpart 4).
- 2) Ambient Flow Field - A composite of capture zones created from angles of flow that are 10 degrees greater and 10 degrees lesser than the representative angle of ambient flow (Minnesota Rules, part 4720.5510, subpart 5, B(2)).
- 3) Aquifer Thickness - The smaller open-hole interval of the well was used rather than a representative thickness of the aquifer for the Oneka analysis.
- 4) Porosity - A range of porosity values was used to address variability in aquifer composition that may affect the dimensions of the capture zone.

5) Probability Analysis - The Oneka Model was used to estimate capture zone probability.

Capture areas were developed for a range of groundwater flow directions, aquifer permeabilities, and times of travel of one and ten years (Figure 7). As the model code uses constant input values for each run, several runs were required to include all variations in input parameters. Table 6 documents the variables used to address MLAEM Model uncertainty.

Table 6 - Model Parameters Used in MLAEM Model Runs

Well Name	File Name	Discharge (m ³ /day)	Transmissivity (m ² /day)	Gradient	Flow Angle (N of E)	Porosity (%)	Aquifer Thickness (meters)	Remarks
1 (198644)	Cuyuna_base .txt	36.3	216	0.0037	107	25	8.84	Base flow direction
1 (198644)	Cuyuna_minus 10.txt	36.3	216	0.0037	97	25	8.84	Base flow direction minus 10 degrees
1 (198644)	Cuyuna_plus 10.txt	36.3	216	0.0037	117	25	8.84	Base flow direction plus 10 degrees

Oneka Model - Uncertainty related to water levels reported on well records is based on the accuracy of the ground elevation assigned to the well using topographic maps and the transient variability of the water levels in the aquifer over time. Water levels that are probably inaccurate were identified using data from 1) the CWI database, and 2) DNR observation well measurements. Only water levels that fit the flow field (Figure 2) were used for the Oneka analysis.

The Oneka Model helps to address uncertainties related to aquifer parameters as variations of the flow field. A 10-year capture zone probability map (Figure 7) was generated for the Cuyuna city well; the values used for the Oneka Model are shown in Table 7. The Oneka results fit well with the capture zones calculated from the MLAEM Code model. The probability map for the Cuyuna city well shows that uncertainty of the capture zone increases as the distance from the well increases (Figure 7).

Table 7 - Range of Values Used for the Oneka Model

Well Number	File Name	Hydraulic Conductivity (meters/day)	Thickness (meters)	Porosity (%)
1 (198644)	Final_Oneka.one	12.2 – 36.6	8.84	25

5. Delineation of the Drinking Water Supply Management Area

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

- Edge- or center-lines of highways, streets, roads;
- Public Land Survey coordinates; or
- Property parcel boundaries (Crow Wing County, 2009).

6. Vulnerability Assessments

The Part I wellhead protection plan includes the vulnerability assessments for the city of Cuyuna well and DWSMA. These vulnerability assessments are used to help define potential contamination sources within the DWSMA and select appropriate measures for reducing the risk that they present to the public water supply.

6.1 Assessment of Well Vulnerability

The vulnerability assessment for the well used by the city of Cuyuna is listed in Table 1 and is based upon the following conditions:

- 1) Well construction does not meet current State Well Code specifications (Minnesota Rules, part 4725) because the well is not grouted through the full length of the casing;
- 2) The geologic conditions at the well site include a cover of clay-rich geologic materials over the aquifer that is sufficient to retard or prevent the vertical movement of contaminants;
- 3) Nitrates have not been detected in water samples from the well; however
- 4) Tritium was found in a water sample taken May 11, 2011. The concentration, at 11.3 tritium units, indicates that the water in the aquifer has been significantly affected by recent recharge.

6.2 Assessment of Drinking Water Supply Management Area Vulnerability

The vulnerability of the drinking water aquifer located within the Cuyuna DWSMA was evaluated primarily on the basis of 1) geologic logs from wells located in and around the DWSMA, and 2) groundwater quality data from the city's primary well (198644).

A vulnerability rating of moderate is assigned to the DWSMA. Existing well logs indicate that the aquifer is covered by several layers of clay-rich till; the thickness of this materials achieves a low aquifer sensitivity rating. However, the tritium found in water from Cuyuna Well 1 (198644) indicates that a significant amount of young water is recharging this well. Therefore, it is prudent to assign a moderate vulnerability rating to the entire DWSMA, given the available information.

7. Selected References

- Barnes, R.J., and Soule, R.G. (2002), *Oneka: A simple analytical element model for stochastic capture zone delineation*, 8 p., St. Paul, Minn., draft paper.
- Fetter, C.W. (2001), *Applied hydrogeology*, 4th ed., Prentice-Hall, Upper Saddle River, N.J., 598 p.
- Geologic Sensitivity Project Workgroup (1991), *Criteria and guidelines for assessing geologic sensitivity of ground water resources in Minnesota*, Minnesota Department of Natural Resources, Division of Waters, St. Paul, Minn., 122 p.
- Olsen, B.M., and Mossler, J.H. (1982), *Geologic map of Minnesota: Depth to bedrock*, State Map Series, S-14, Minnesota Geological Survey, St. Paul, Minn., 2 sheets, scale 1:1,000,000.
- 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.
- Setterholm, D.R., (Project mgr.) (2004), *Geologic atlas of Crow Wing County, Minnesota*, County Atlas Series, C-16, Part A, Minnesota Geological Survey, St. Paul, Minn., 6 plates, scales 1:100,000 and 1:200,000.
- Strack, O.D.L. (1989), *Groundwater mechanics*, Prentice Hall, Englewood Cliffs, N.J., 732 p.

Figures

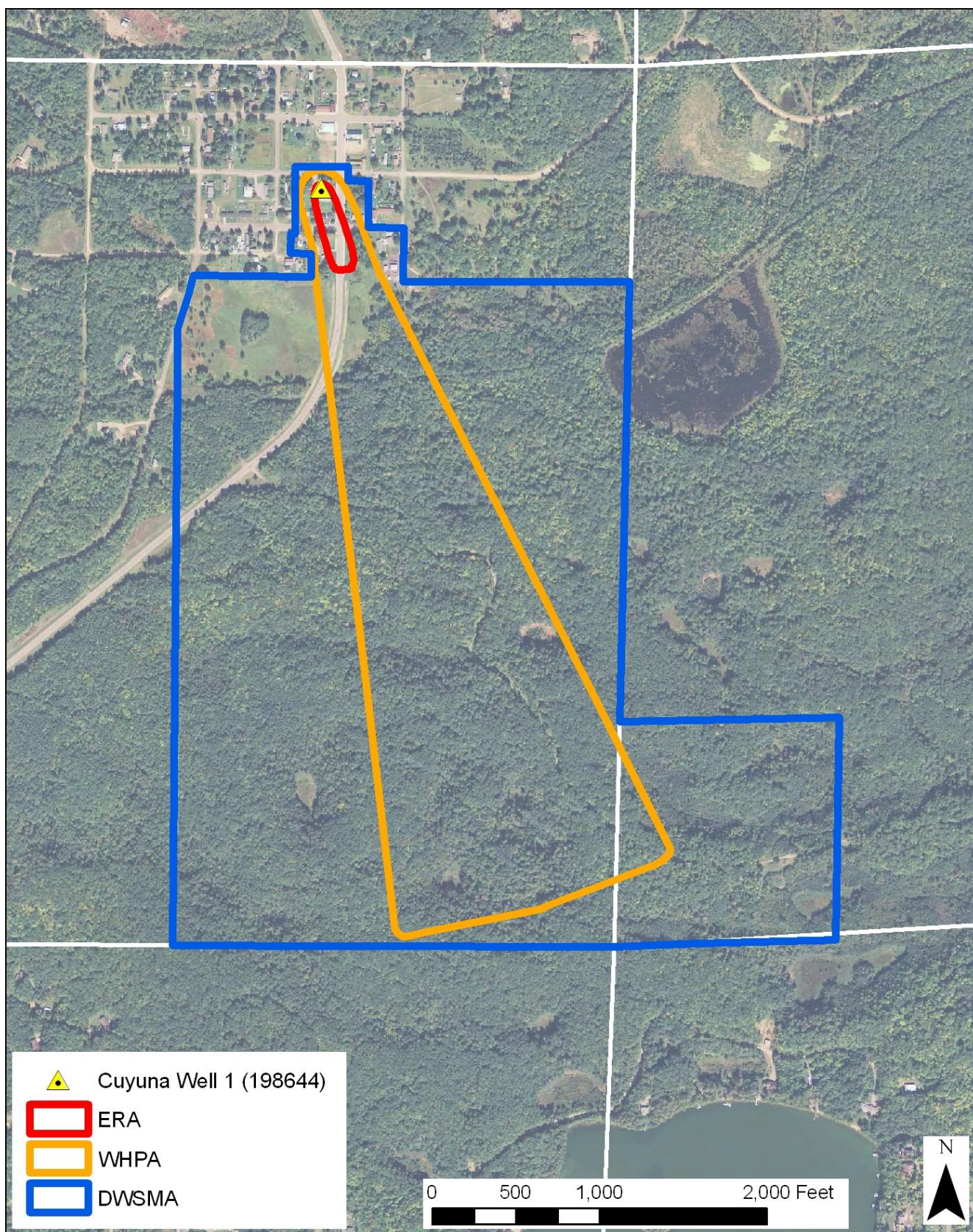
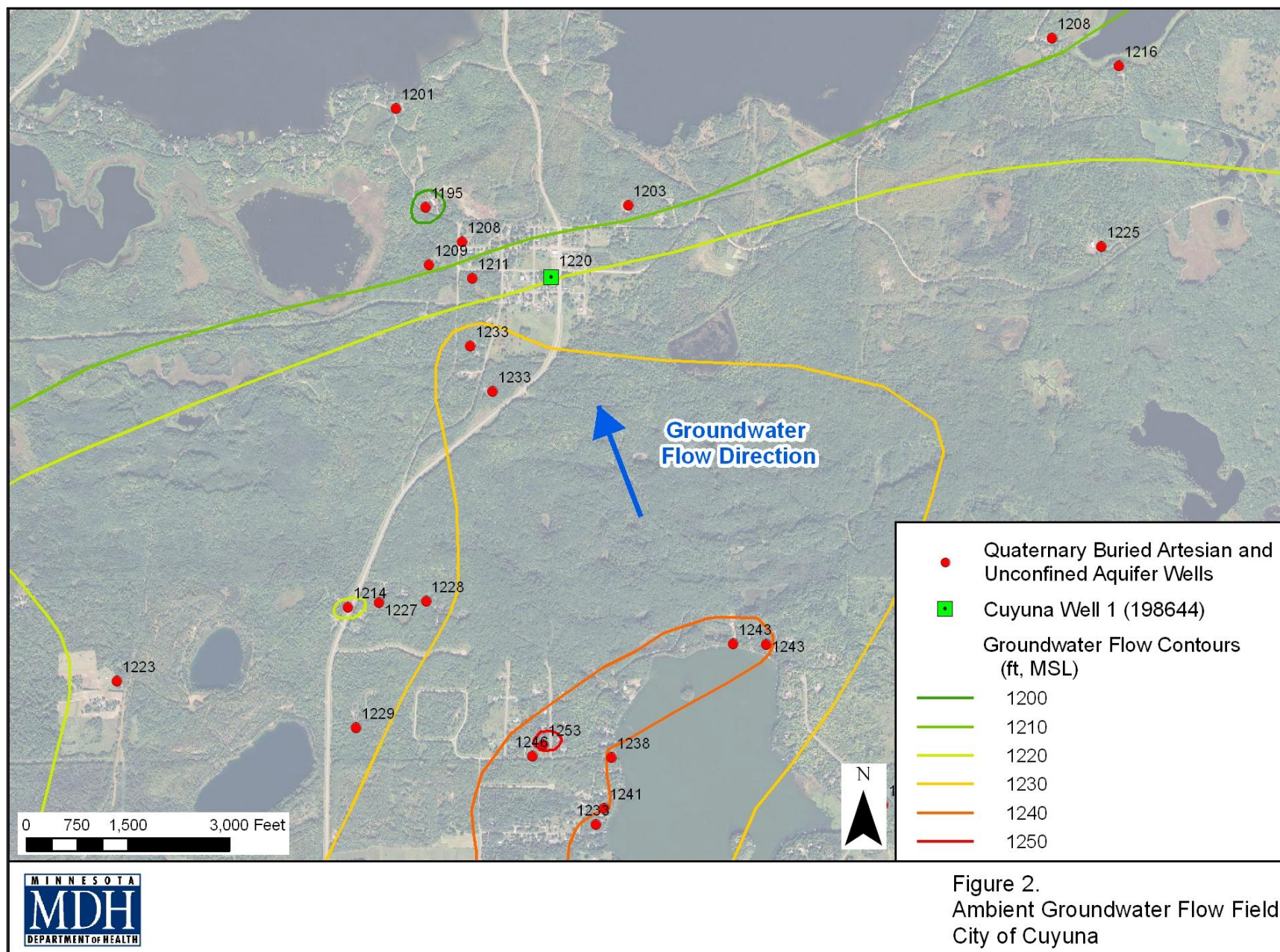


Figure 1.
Map of the Wellhead Protection Area and Drinking Water Supply Management Area
City of Cuyuna



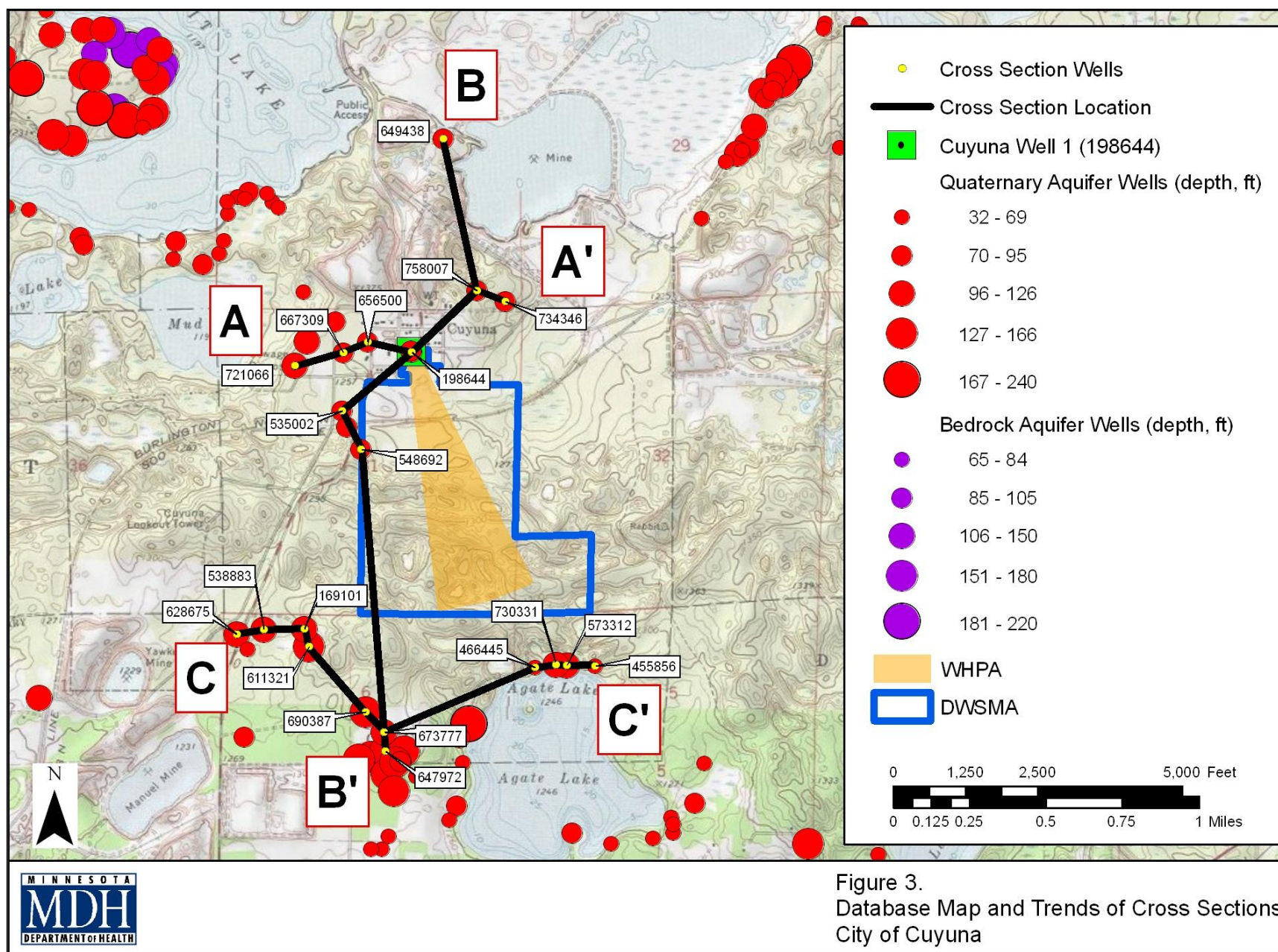
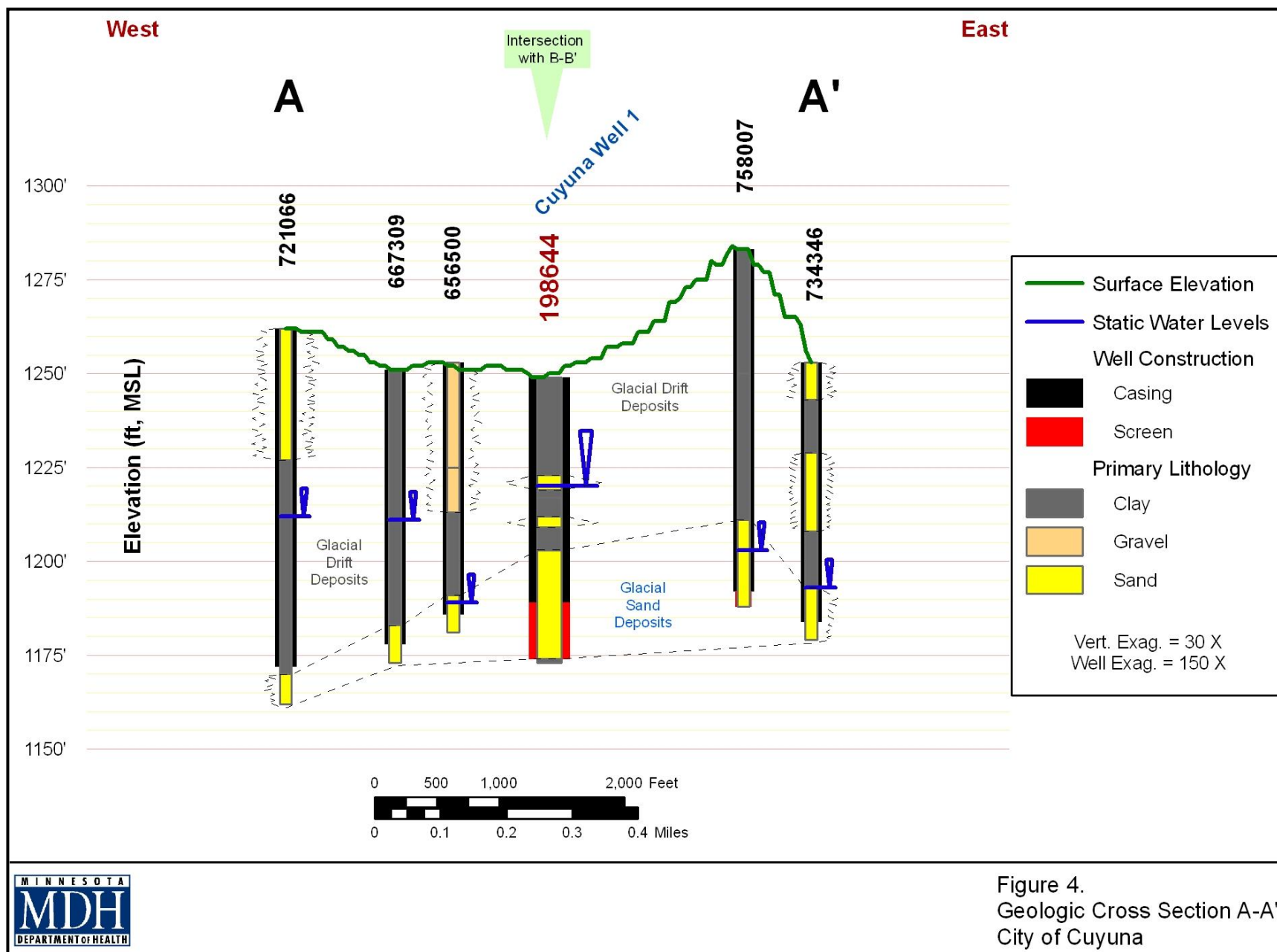
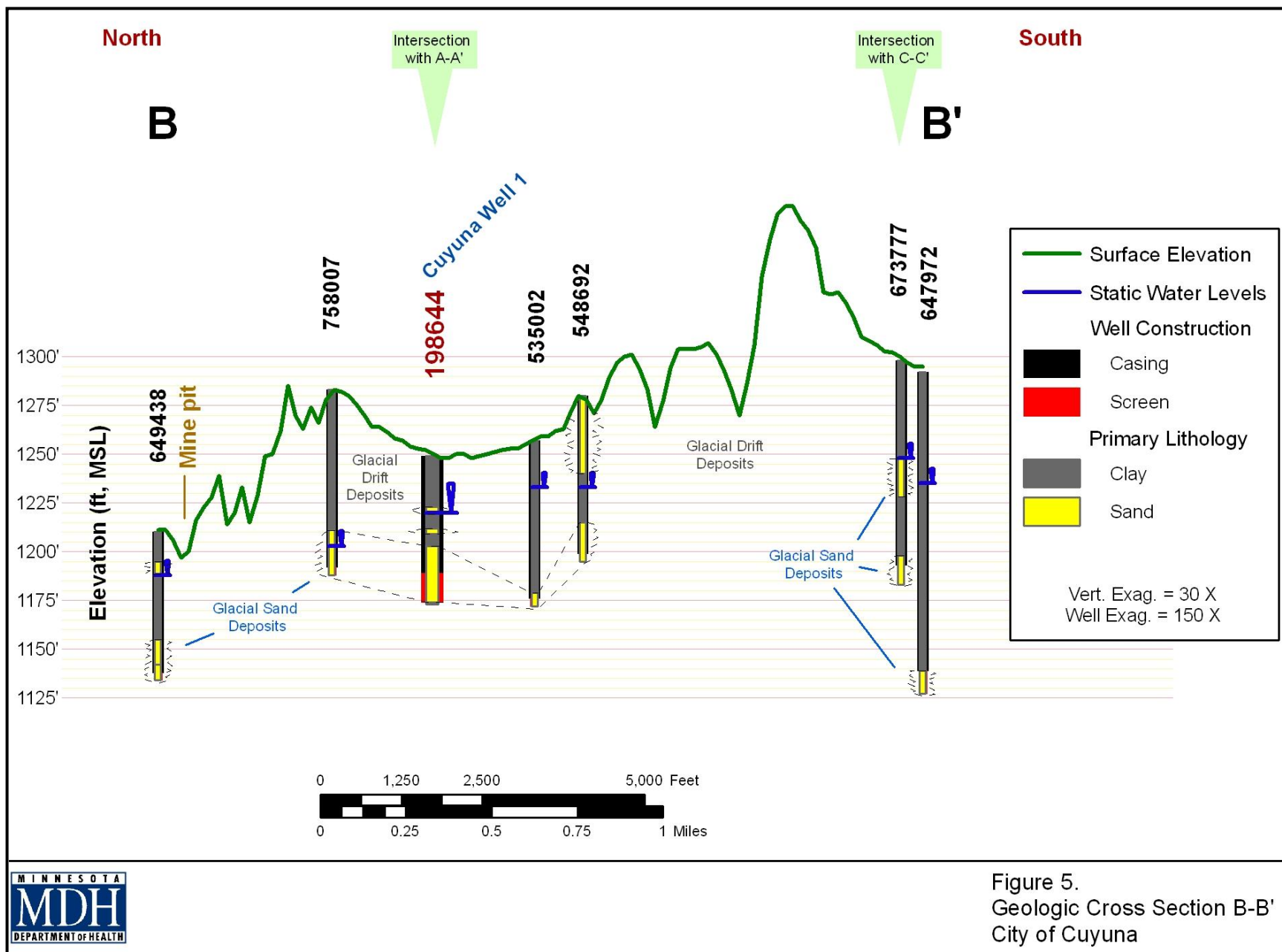
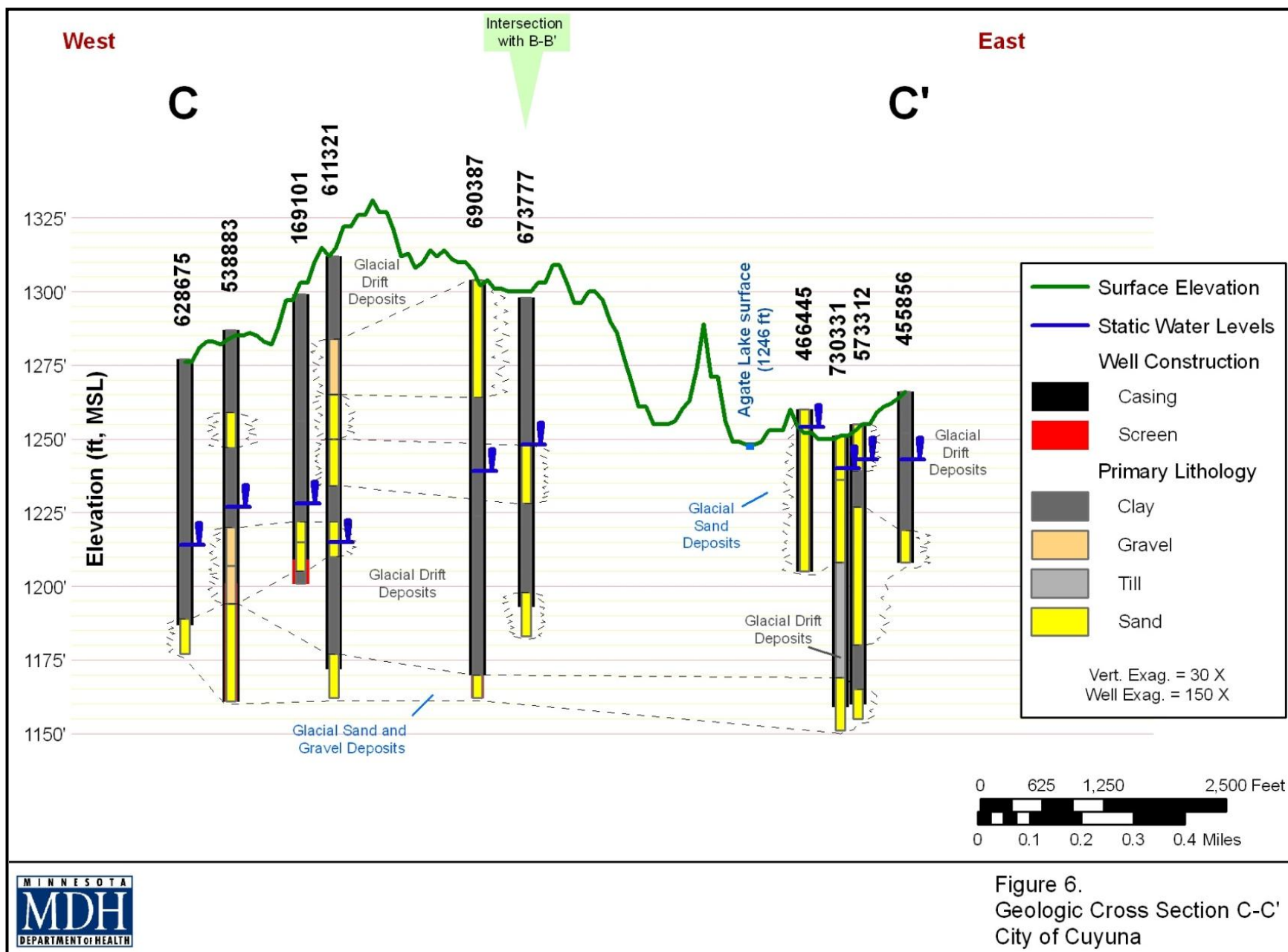


Figure 3.
Database Map and Trends of Cross Sections
City of Cuyuna







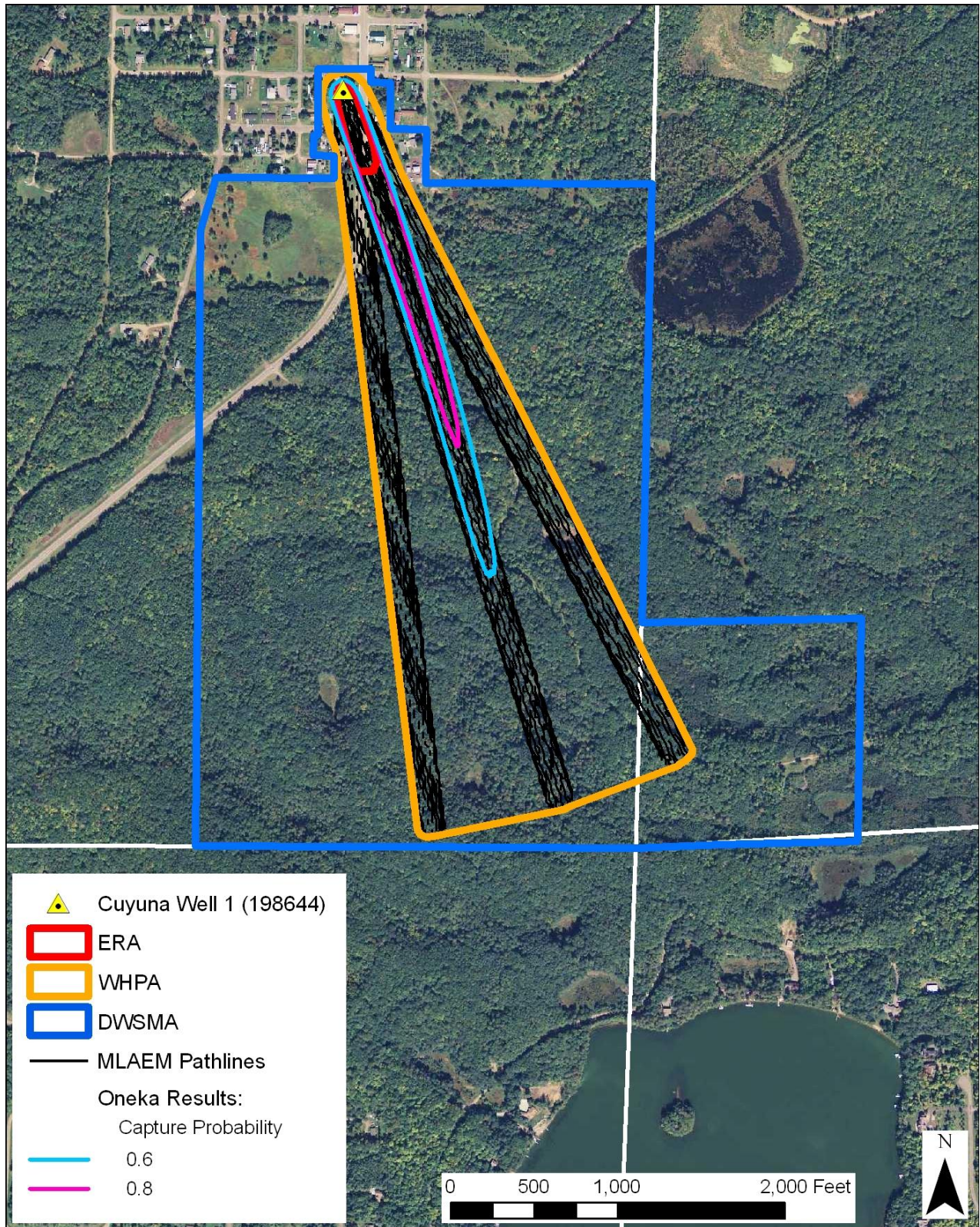
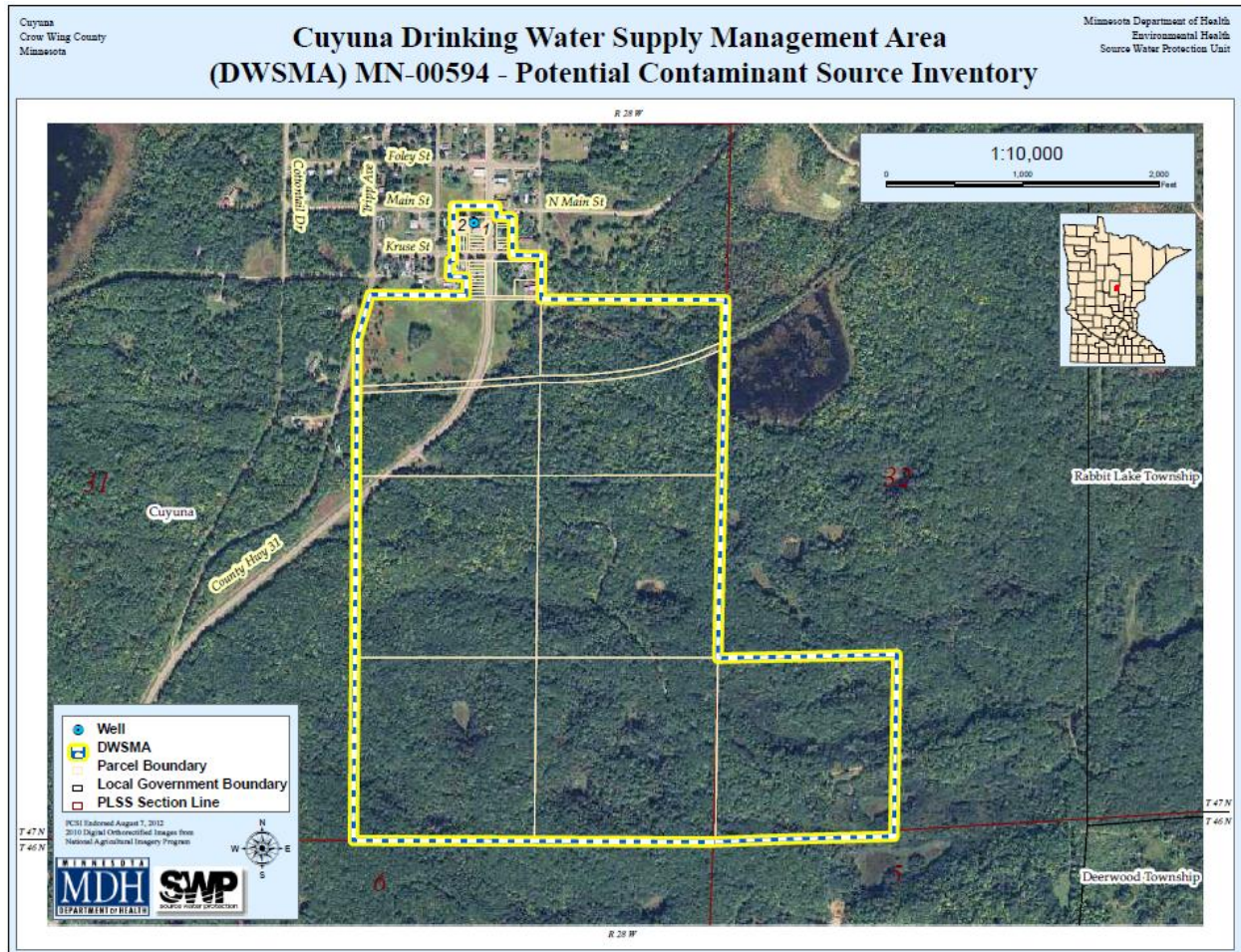


Figure 7.
Pathlines and Groundwater Capture Zones for MLAEM and Oneka Delineation Analyses
City of Cuyuna

Appendix II – Potential Contaminant Source Inventory



Cuyuna
PCSI Report

<i>FID NAME</i>	<i>TYPE</i>	<i>ADDRESS</i>	<i>CITY</i>	<i>ZIP</i>	<i>PIN</i>	<i>COMMENTS</i>	<i>ACRES</i>
1 City of Cuyuna			Cuyuna	56444			0.35
<i>Inv Id</i> <i>Pcsi</i>	<i>Status</i>	<i>Material</i>	<i>Value</i>	<i>Program</i>	<i>Program ID</i>	<i>Inv Comments</i>	
1 Well	Unknown		75FT	CWI	198645	Cuyuna Test Well	
2 Well	Active		76FT	CWI	198644	Cuyuna 1	



Value for Well is Depth Drilled, for Tanks is Capacity. Value Unit Codes: G= gallons, FT=feet, YD3=cubic yards.

Tuesday, August 07, 2012

Page 1 of 1

Appendix III – Contingency Plan

WATER SUPPLY CONTINGENCY/EMERGENCY PLAN

THE CITY OF CUYUNA, MN

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D. ALTERNATIVE WATER SUPPLY OPTIONS	-
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2. Bottled Water	-
3. System Interconnects	-
4. Other Alternative Water Resources	-
E. INVENTORY OF AVAILABLE EMERGENCY EQUIPMENT AND MATERIALS	-
F. EMERGENCY IDENTIFICATION PROCEDURES	-
G. NOTIFICATION PROCEDURES	-
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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: Bill Bedard, Lou Dirkes & Lloyd Brix

Date: August 2012

A. PURPOSE

The purpose of this Contingency Plan is to establish, provide and keep updated, certain emergency response procedures and information for the public water supply system 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 -

	Well Number 1
Supply Source	Glacial tilt
Well Depth (ft.)	75
Well Diameter (in.)	10
Latitude of Well	46.516760971095
Longitude of Well	-93.92371403245
Well Capacity (gpm)	175
Well Production (gpm)	150

2. Treatment - Fluoride, chlorine & polyphosphate are added at pump building.

3. Storage and Distribution - 50,000 gallon elevated water tower. Distribution through 4,6, and 8" water mains.

4. Maps/Plans - Available at the pump house, City Hall, Fire Department Hall, and with the City Clerk.

C. PRIORITY OF WATER USERS DURING WATER SUPPLY EMERGENCY

Table C-1 - Water Use Priority Grouping

Priority Group and Rank	Maximum Daily Use (gpd)	Minimum Daily Use (gpd)
Residential--#1	13700	7270
Institutional--#2	n/a	n/a
Commercial--#3	300	100
Industrial--#4	n/a	n/a
Irrigation--#5	n/a	n/a
Unaccounted	n/a	n/a
Wholesale	n/a	n/a

Triggers for implementing water supply reduction/allocation procedures: Water-use restrictions will be implemented following natural or manmade disasters, contamination of the water supply, or major mechanical failure.

D. ALTERNATIVE WATER SUPPLY OPTIONS

1. Bottled water supplies, delivery and distribution.

Company: Wal-Mart, Brainerd
Contact: On-duty Manager
Telephone: 218-829-3848

Jake Stockard
218-851-4678

2. New well.

The City is currently working with MDH and a local well driller to locate a site for an additional city water well.

E. INVENTORY OF AVAILABLE EMERGENCY EQUIPMENT AND MATERIALS

Table E-1 contains a list of services, equipment and supplies that are available to the public water supply system to respond to a disruption in the water system. It is believed that the items contained in Table E-1 would be adequate to respond to most (if not all) water system emergencies.

Table E-1

Description	Owner	Telephone	Location	Acquisition Time
Well Repair	Trout Well	800-728-5091	St. Cloud MN	1 day
Pump Repair	Trout Well	800-728-5091	St. Cloud MN	1 day
Electrician	Knox Electric	218-546-8132	Crosby MN	1 day
Plumber	Godfrey Plumbing	218-534-3557	Deerwood MN	1 day
Backhoe	Holmwig Excavating	218-820-2447	Crosby MN	1 day
Chemical Feed	Hawkins Inc	715-392-5152	Superior WI	2 day
Meter Repair	Hawkins Inc	715-392-5152	Superior WI	2 day
Generator	City	218-546-5883	Deerwood MN	1 day
Valves	USA Bluebook	800-548-1234	Midwest	2 day
Pipe & Fittings	USA Bluebook	800-548-1234	Midwest	2 day

F. EMERGENCY IDENTIFICATION PROCEDURES

Table F-1 Procedural Operations

Emergency Response Coordinator:

Name: Brian Wasserzieher, Operator
Address: 24151 2nd Ave
Deerwood, MN 56444
Cell Phone: 218-851-2736
Home Phone: n/a
E-mail contact:

Alternate:

Bill Bedard, Clerk
Address: 22270 Powderhouse Road
Deerwood, MN 56444
Cell Phone: 218-866-0754
Home Phone: 218-546-5883
E-mail contact: bbedard52@hotmail.com

The duties of the response coordinator or the alternate are listed in the following table.

Duties of the Emergency Response Coordinator or the Alternate

Incident	Response Procedure & Comments
Identify Disruption (Mechanical Failure or Contamination)	Identifies the nature of the water supply disruption and communicates this information to the city government, the alternate response coordinator, and members of the emergency oversight committee.
Notify Response Personnel	Notifies city staff and others who will be responding to the water supply emergency about the disruption and coordinates their efforts to correct it.
Incident Direction and Control	Identifies the actions that are needed to correct the water supply emergency and directs responders to implement corrective actions.
Internal Communication	Communicates the status of response efforts to the primary spokesperson and the emergency oversight committee as needed to keep these parties informed of progress.
Assess Incident Response on Continual Basis	Assesses the efforts to correct the water supply disruption on a continual basis so that the emergency oversight committee can take additional corrective actions and the city government and public are updated on issues and progress.
Define the Extent of a Contamination Disruption	Coordinates efforts to define the extent and level of the contamination with local, state, and federal agencies. This may continue after initial corrective actions have been implemented.
Define the Extent of a Mechanical Disruption	Coordinates efforts to define the cause(s) of the mechanical failure and the equipment, data, and expertise that are needed to correct it. Identifies measures for reducing the likelihood that a similar mechanical failure will not occur in the future.
Identify Need for an Alternate Water Supply	Evaluates the need to obtain an alternate water supply, the time period it is needed before the water supply emergency is corrected, and the actions that are needed to achieve it.

Mayor:

Name: Lloyd Brix, Mayor
Address: 24151 2nd Ave
Deerwood, MN 56444
Cell Phone: 218-851-2736
Home Phone: n/a
E-mail contact:

Alternate:

Bill Bedard, Clerk
Address: 22270 Powderhouse Road
Deerwood, MN 56444
Cell Phone: 218-866-0754
Home Phone: 218-546-5883
E-mail contact: bbedard52@hotmail.com

The duties of the mayor or alternate are listed in the following table.

Duties of the Mayor or the Alternate

Incident	Response Procedure & Comments
Inform Public	Identifies to the public the nature of the water supply disruption.
Impose Water Use Restrictions	Evaluates the need to restrict system water usage during the interruption.

G. NOTIFICATION PROCEDURES

1. Agency Notification

Table G-1 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 G-1. Agency Emergency Contact Listing

Personnel	Name	Home Telephone	Work/Cell Telephone
Mayor/Board Chair	Lloyd Brix	218-546-6967	218-820-6968
Council Members	Lou Dirkes	218-838-4270	218-838-4270
Council Members	David Zontelli	218-546-8290	218-546-8290
Council Members			
Council Members	Adam Bedard	218-546-5883	218-851-2280
Response Coordinator	Brian Wasserzieher	218-851-2736	218-851-2736
Alt. Response Coordinator	Lou Dirkes	218-838-4270	218-838-4270
State Incident Duty Officer			800-442-0798
County Emergency Director	John Bowen	218-825-3445	218-829-4749
Fire Chief	Lou Dirkes	218-838-4270	218-838-4270
Sheriff	Todd Dahl	911	911
Police Chief	Tim Leonard	218-851-3012	218-851-3012
System Operator	Brian Wasserzieher	218-851-2736	218-851-2736
Alt. System Operator	Lloyd Brix	218-546-6967	218-820-6968
School Superintendent	Jamie Skjeveland	218-545-8817	218-545-8801
Ambulance	Cuyuna Regional Medical Ctr	911	911
Hospital	Cuyuna Regional Medical Ctr	911	218-546-7000
Doctor or Medical Facility	Cuyuna Regional Medical Ctr	911	911
Power Company	Minnesota Power	-	800-307-6937
Highway Department	Crow Wing County	218-829-4749	218-824-1110
Telephone Company	Century Link	800-788-3600	800-788-3600
Neighboring Water System	City of Crosby	911	218-546-5686
MPCA Groundwater Division	Walt Haas		218-316-3878
MRWA Technical Services	Dave Neiman	800-367-6792	218-820-0593
MDH District Engineer	Dave Schultz		320-223-7328
MDH Source Water Protection	Mark Wettlaufer		320-223-7342

2. Critical Response Personnel

Table G-2

Title	Name	Address	Telephone
Response Coordinator	Brian Wasserzieher	24151 2 nd Ave Deerwood MN 56444	218-851-2736
Alternate Response Coordinator	Lou Dirkes CFD	22629 Kruse Street Cuyuna, MN 56444	218-838-4270
Water Operator	Brian Wasserzieher	24151 2 nd Ave Deerwood MN 56444	218-851-2736
Alternate Water Operator	Lloyd Brix	22721 Kruse Street Deerwood MN 56444	218-820-6968
Public Relations	Lloyd Brix	22721 Kruse Street Deerwood MN 56444	218-820-6968
Alternate Public Relations	David Zontelli	22883 Agate Shores Road Deerwood MN 56444	218-546-5883
Public Health/Medical	Cuyuna Regional Medical Center	320 Main Street E Crosby MN 56441	911
Alternate Public Health/Medical	Cuyuna Regional Medical Center	320 Main Street E Crosby MN 56441	911

3. Public Information Plan

- a) Public relations center: Cuyuna Fire Hall

Public information center location during emergency: Cuyuna Fire Hall

Times available: As required

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

Name of water system: City of Cuyuna

Contaminant of concern and date: To be announced at time of emergency

Source of contamination:

Public health hazard:

Steps the public can take:

Steps the water system is taking:

c) Media contacts

Media	Name	Telephone	Address
Newspaper	Crosby Ironton Courier	218-546-5029	12 Main Street Crosby MN 56441
Television	KSTP- 5	651-646-5555	3415 University Ave St. Paul MN
Television	KAWB	218-855-0022	422 NW 3 rd St Brainerd MN 56401
Television	KARE- 11	763-593-1111	8811 Olson Memorial Hwy. Minneapolis, MN 55427
Radio	KKIN	218-927-2100	37208 US Hwy 169 Aitkin MN 56321
Radio	KLIZ	218-828-1244	13225 Dogwood Drive Baxter MN 56401
Radio	WJJY	218-828-1244	13225 Dogwood Drive Baxter MN 56401
Radio	Minnesota Public Radio	218-829-1072	501 W College Drive Brainerd MN 56401

H. MITIGATION AND CONSERVATION PLAN

1. Mitigation

- a. Infrastructure maintenance/upgrades/maps: Located in pump house, City Hall, Fire Hall, and with Clerk.
- b. Regular inspection of tower, well(s), pump house: Tower inspected yearly, MDH inspects well/pump house yearly, and operator inspects operation daily.
- c. Staff emergency training: Cuyuna Fire Department members certified and water operator certified.
- d. System security analysis: To be completed 2012
- e. Site new backup well(s): TBD
- f. System valving to isolate problems: system has valves to isolate sections
- g. Sanitation procedures for construction/repairs: follow standard sanitation procedures including chlorine purge.

2. Conservation

- a. Water meters: all service connections are metered
- b. Public education: Will pursue water system education for public via postcards and city website.
- c. Rate structure: \$7.00/1000 gallons water usage

Appendix IV – Maps, Figures and Supporting Documentation

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Protecting, maintaining and improving the health of all Minnesotans

July 19, 2012

Mr. Brian Wasserzieher
Water Superintendent - City of Cuyuna
P.O. Box 536
Cuyuna, Minnesota 56444-0536

Dear Mr. Wasserzieher:

Subject: Second Scoping Decision Notice

This letter provides notice of the results of the second scoping meeting held with Lloyd Brix, Mayor; Louis Dirkes, Councilman; Dave Neiman, Minnesota Rural Water Association (MRWA) and myself on June 25, 2012, at the Cuyuna City Hall regarding Part II of your wellhead protection (WHP) plan. During the meeting, we discussed data elements that must be included and used to prepare the part of the WHP plan related to the management of potential contaminants in the approved drinking water supply management area. The enclosed Scoping 2 Decision Notice lists the data elements that were discussed at the meeting.

The City of Cuyuna has met the requirements to distribute copies of the first part of the wellhead protection plan to local units of government and hold an informational meeting for the public. The city of Cuyuna will have until September 15, 2012, to complete its wellhead protection plan.

If a data element is marked on the enclosed notice as a data element that must be used and it does not exist, it is helpful if your plan notes this. Dave Neiman, MRWA, will be working with you to develop a draft of the remainder of the wellhead protection plan. I will be contacting you to review the progress of the development of Part II of your plan. If you have any questions regarding the enclosed notice, contact me by email at mark.wettlaufer@state.mn.us or by phone at 320/223-7342.

Sincerely,

A handwritten signature in black ink, reading "Mark Wettlaufer", is positioned below the "Sincerely," text.

Mark Wettlaufer, Planner
Environmental Health Division
3333 West Division Street - Suite 212
St. Cloud, Minnesota 56301-4557

MJW:kmc
Enclosures

cc: Dave Schultz, MDH Engineer, St. Cloud District Office
Dave Neiman, Minnesota Rural Water Association
Byron Adams, Water Monitoring Section, Minnesota Pollution Control Agency
Joe Richter, Division of Waters, Minnesota Department of Natural Resources
Ron Struss, Minnesota Department of Agriculture
Eric Mohring, Hydrologist, Board of Water and Soil Resources
William Bedard, Clerk, City of Cuyuna

General Information: 651-201-5000 • Toll-free: 888-345-0823 • TTY: 651-201-5797 • www.health.state.mn.us

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SCOPING 2 DECISION NOTICE

➤ Remainder of the Wellhead Protection Plan

Name of Public Water Supply:		Date:
City of Cuyuna	PWSID 1180011	July 19, 2012
Name of the Wellhead Protection Manager:		
Mr. Brian Wasserzieher, Water Superintendent		
Address:	City:	Zip:
P.O. Box 536	Cuyuna	56444-0536
Unique Well Numbers:		Phone:
198644 (Well 1)		218/851-2736

Instructions for Completing the Scoping 2 Form

N	R	S	N = Not required. If this box is checked, this data element is NOT necessary for your wellhead protection plan because it is not needed or it has been included in the first scoping decision notice. Please go to the next data element.
X			

N	R	S	R = Required for the remainder of the plan. If this box is checked, this data MUST be used for the "remainder of the plan."
	X		

N	R	S	S = Submit to MDH. If this box is checked, this data element MUST be included in your wellhead protection plan and submitted to MDH. If there is NO check mark in the "S" box but there is an "x" in the "R" box, this data element MUST be included in your plan, but should NOT be submitted to MDH. This box will only be checked if MDH does not have access to this data element. This will help to reduce the cost by reducing the amount of paper and time to reproduce the data element.
		X	

Note: Any data elements required in the first scoping decision notice must also be used to complete the remainder of the wellhead protection plan.

DATA ELEMENTS ABOUT THE PHYSICAL ENVIRONMENT

PRECIPITATION			
N	R	S	An existing map or list of local precipitation gauging stations.
X			
Technical Assistance Comments:			
N	R	S	An existing table showing the average monthly and annual precipitation in inches for the preceding five years.
X			
Technical Assistance Comments:			
GEOLOGY			
N	R	S	An existing geologic map and a description of the geology, including aquifers, confining layers, recharge areas, discharge areas, sensitive areas as defined in Minnesota Statutes, section 103H.005, subdivision 13, and groundwater flow characteristics.
	X		
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about these data elements.			
N	R	S	Existing records of the geologic materials penetrated by wells, borings, exploration test holes, or excavations, including those submitted to the department.
	X		
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about these data elements.			
N	R	S	Existing borehole geophysical records from wells, borings, and exploration test holes.
	X		
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect the geology of the area(s).			
N	R	S	Existing surface geophysical studies.
	X		
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect the geology of the area(s).			
SOILS			
N	R	S	Existing maps of the soils and a description of soil infiltration characteristics.
X			
Technical Assistance Comments:			
N	R	S	A description or an existing map of known eroding lands that are causing sedimentation problems.
X			
Technical Assistance Comments:			

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

DATA ELEMENTS ABOUT THE LAND USE

LAND USE			
N	R	S	An existing map of parcel boundaries.
	X	X	
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element.			
N	R	S	An existing map of political boundaries.
	X	X	
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element.			
N	R	S	An existing map of public land surveys including township, range, and section.
	X	X	
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element.			

N	R	S	A map and an inventory of the current and historical agricultural, residential, commercial, industrial, recreational, and institutional land uses and potential contaminant sources.
	X	X	
Technical Assistance Comments: The inventory, mapping and management of land uses and potential sources of contamination for all the Drinking Water Supply Management Areas(s) must reflect what is known about these data elements, as follows: <u>Moderate Vulnerability</u> - 1) All potential contaminant sources and facility designations as listed on the attachment, 2) a land use/land cover map and table, and 3) an inventory of the Inner Wellhead Management Zone (IWMZ). As a starting point, MDH will provide a 1992 or 2001 land cover map and table from federal data bases. This data set must be used unless an alternative electronic data set that is more current and detailed is available. Management strategies must be developed for all land uses and potential sources of contamination.			
N	R	S	An existing comprehensive land-use map.
	X	X	
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element.			
N	R	S	Existing zoning map.
	X	X	
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element.			
PUBLIC UTILITY SERVICES			
N	R	S	An existing map of transportation routes or corridors.
	X		
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element.			
N	R	S	An existing map of storm sewers, sanitary sewers, and public water supply systems.
	X	X	
Technical Assistance Comments: It is not necessary to include a map of your public water supply system in your plan if you feel it would pose a threat to the security of your system. An existing map of the storm sewers and sanitary sewers in the Drinking Water Supply Management Area(s) must be included in the wellhead protection plan and must also be submitted to MDH as part of the approval.			
N	R	S	An existing map of the gas and oil pipelines used by gas and oil suppliers.
	X	X	
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element.			
N	R	S	An existing map or list of public drainage systems.
	X		
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element.			

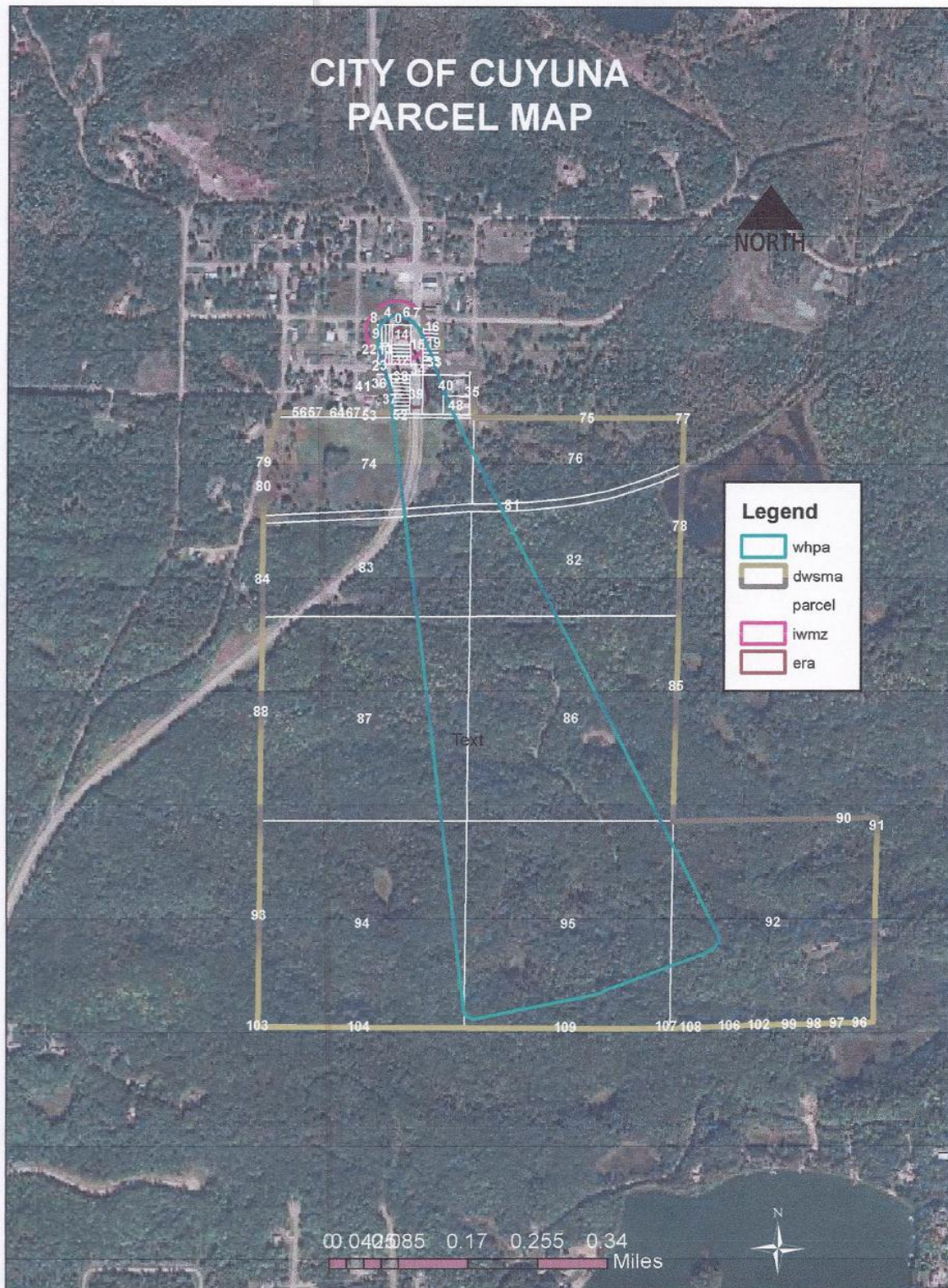
N	R	S	An existing record of construction, maintenance, and use of the public water supply well and other wells within the drinking water supply management area.
	X		
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about these data elements.			

DATA ELEMENTS ABOUT WATER QUANTITY

SURFACE WATER QUANTITY			
N	R	S	An existing description of high, mean, and low flows on streams.
X			
Technical Assistance Comments:			
N	R	S	An existing list of lakes where the state has established ordinary high water marks.
X			
Technical Assistance Comments:			
N	R	S	An existing list of permitted withdrawals from lakes and streams, including source, use, and amounts withdrawn.
X			
Technical Assistance Comments:			
N	R	S	An existing list of lakes and streams for which state protected levels or flows have been established.
X			
Technical Assistance Comments:			
N	R	S	An existing description of known water-use conflicts, including those caused by groundwater pumping.
X			
Technical Assistance Comments:			
GROUNDWATER QUANTITY			
N	R	S	An existing list of wells covered by state appropriation permits, including amounts of water appropriated, type of use, and aquifer source.
	X		
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element.			
N	R	S	An existing description of known well interference problems and water use conflicts.
	X	X	
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element.			
N	R	S	An existing list of state environmental bore holes, including unique well number, aquifer measured, years of record, and average monthly levels.
	X		
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element.			

DATA ELEMENTS ABOUT WATER QUALITY

SURFACE WATER QUALITY			
N	R	S	An existing map or list of the state water quality management classification for each stream and lake.
X			
Technical Assistance Comments:			
N	R	S	An existing summary of lake and stream water quality monitoring data, including:
X			1. bacteriological contamination indicators; 2. inorganic chemicals; 3. organic chemicals; 4. sedimentation; 5. dissolved oxygen; and 6. excessive growth or deficiency of aquatic plants.
Technical Assistance Comments:			
GROUNDWATER QUALITY			
N	R	S	An existing summary of water quality data, including: 1. bacteriological contamination indicators; 2. inorganic chemicals; and 3. organic chemicals.
	X		
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element.			
N	R	S	An existing list of water chemistry and isotopic data from wells, springs, or other groundwater sampling points.
	X		
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element.			
N	R	S	An existing report of groundwater tracer studies.
	X		
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element.			
N	R	S	An existing site study and well water analysis of known areas of groundwater contamination.
	X		
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about these data elements.			
N	R	S	An existing property audit identifying contamination.
	X		
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element.			
N	R	S	An existing report to the Minnesota Department of Agriculture and the Minnesota Pollution Control Agency of contaminant spills and releases.
	X		
Technical Assistance Comments: The management of all the Drinking Water Supply Management Area(s) must reflect what is known about this data element.			





parcel

FID	APPRCL	OWNAME
0		
1	191010030210009	BICKNELL, ROBERT W
2	191010030200009	BICKNELL, ROBERT W
3	191010030190009	TAX FORFEITED
4	191010030180009	TAX FORFEITED
5		
6	191010030170009	BASS, CYNTHIA M
7		
8	191010060030009	SMITH, DANIEL EVERETT
9	191010060040009	SMITH, DANIEL EVERETT
10	191010060050009	SMITH, DANIEL EVERETT
11	191010060060009	SMITH, DANIEL EVERETT
12	191010060070009	SMITH, DANIEL EVERETT
13		
14	19101006008Z009	FIRST NATIONAL BANK OF CROSBY
15		
16	191010050080009	KAPLAN, RICHARD L ET AL
17	191010050090009	KAPLAN, RICHARD L ET AL
18	191010050100009	KAPLAN, RICHARD L ET AL
19	19101005011Z009	LOUKS, JAMES G
20	191010060130009	CITY OF CUYUNA
21	191010060220009	FERRARI, RAYMOND I & CATHERINE L
22	191010060210009	FERRARI, RAYMOND I & CATHERINE L
23	191010060200009	FERRARI, RAYMOND I & CATHERINE L
24	191010060190009	FERRARI, RAYMOND I & CATHERINE L
25	191010060180009	FERRARI,

FID	APPRCL	OWNAME
		RAYMOND I & CATHERINE L
26	191010060140009	CITY OF CUYUNA
27	191010050140009	IMBERI, DONALD D
28	191010060150009	CITY OF CUYUNA
29	191010050150009	IMBERI, DONALD D
30	191010060160009	TURK CONSTRUCTION LLC
31	191010050160009	IMBERI, DONALD D
32	191010060170009	TURK CONSTRUCTION LLC
33	191010050170009	IMBERI, DONALD D
34		
35		
36	19101007003Z009	DIRKES, LOUIS W & PATRICIA L
37		
38	191010070080009	LUDKE, DARLENE M
39		
40	19101008001Z009	BRIX, LLOYD & CAROLE J
41	191010070020009	DIRKES, LOUIS W & PATRICIA L
42	191010070090009	LUDKE, DARLENE M
43	191010070100009	LUDKE, DARLENE M
44	191010070110009	LUDKE, DARLENE M
45	191010070120009	LUDKE, DARLENE M
46	191010070130009	LUDKE, DARLENE M
47	191010070180009	BIERMAN, ROGER WILLIAM
48	19101008018Z009	BRIX, LLOYD & CAROLE J
49	191010070140009	LUDKE, DARLENE M
50	191010070150009	LUDKE, DARLENE M
51	191010070160009	LUDKE, DARLENE M
52	191010070170009	LUDKE, DARLENE M
53		
54	191050080300009	JENSEN, JAMES E

FID	APPRCL	OWNAME
55	191050080290009	JENSEN, JAMES E
56	191050080280009	TAX FORFEITED
57	19105008024Y009	FIRST NATIONAL BANK OF DEERWOOD
58	19105008024A009	DECENT, MAXINE
59	191050080230009	DECENT, MAXINE
60	191050080220009	PETERSON, HARLAN & MARIE
61	191050080210009	BORDWELL, MARIE HOMVIG
62	191050080200009	BORDWELL, MARIE HOMVIG
63	191050080190009	BORDWELL, MARIE HOMVIG
64	191050080180009	PETERSON, HARLAN & MARIE
65	191050080170009	PETERSON, HARLAN & MARIE
66		
67		
68	191010070240009	BIERMAN, ROGER WILLIAM
69	191010070230009	BIERMAN, ROGER WILLIAM
70	191010070220009	BIERMAN, ROGER WILLIAM
71	191010070210009	BIERMAN, ROGER WILLIAM
72	191010070200009	BIERMAN, ROGER WILLIAM
73	191010070190009	BIERMAN, ROGER WILLIAM
74	170311300000009	CITY OF CUYUNA
75	17031110000X009	RADINOVICH, JAMES D
76	17031140000X009	RADINOVICH, JAMES D
77	170322200000AH0	TAX FORFEITED
78	170322300000AD0	TAX FORFEITED
79	170312400BA0009	WYNN, BRIAN C & DEBRA K
80	170312400BB0009	WYNN, KIM & SUSAN
81	170290000A00009	SOO LINE RAILROAD CO
82	17031140000X009	RADINOVICH, JAMES D
83	170311300000009	CITY OF

FID	APPRCL	OWNAME
		CUYUNA
84	170312400DB0009	THEIS, MICHAEL J & CINDY J
85	170323200000AD0	TAX FORFEITED
86	170314100000009	HENO, PETER S & EILEEN E
87	170314200000009	TAX FORFEITED
88	170313100000009	TAX FORFEITED
89	170323100000AD0	TAX FORFEITED
90	170323200000AF0	TAX FORFEITED
91	170323400000009	TAX FORFEITED
92	170323300000009	TAX FORFEITED
93	170313400000009	TAX FORFEITED
94	170314300000009	HENO, PETER S & EILEEN E
95	170314400000009	HENO, PETER S & EILEEN E
96	150052204AA0009	KIVISTO, PHILIP V & SALLY K
97	170323300000009	TAX FORFEITED
98	170323300000009	TAX FORFEITED
99	170323300000009	TAX FORFEITED
100	150052204BBA009	KRONLOKKEN, PAUL J & BARBARA J
101	150052204BB0009	PEROVICH, JON G & JEANINE R
102	150052204BB0009	PEROVICH, JON G & JEANINE R
103	150062103AA0009	BEDARD, WILLIAM F & ANDREA
104	150061202000009	ZONTELLI, DAVID & MARCIA
105	150052204BBB009	LARSON, ROBYN L & KEITH L
106	150052204BBB009	LARSON, ROBYN L & KEITH L
107	150052204CA0009	BLANICH, STEVE R & JOSEPHINE
108	150052204CA0009	BLANICH, STEVE R & JOSEPHINE
109	150061101000AA0	BLANICH, STEVE R & JOSEPHINE



CROW WING COUNTY



1 inch = 1,375 feet

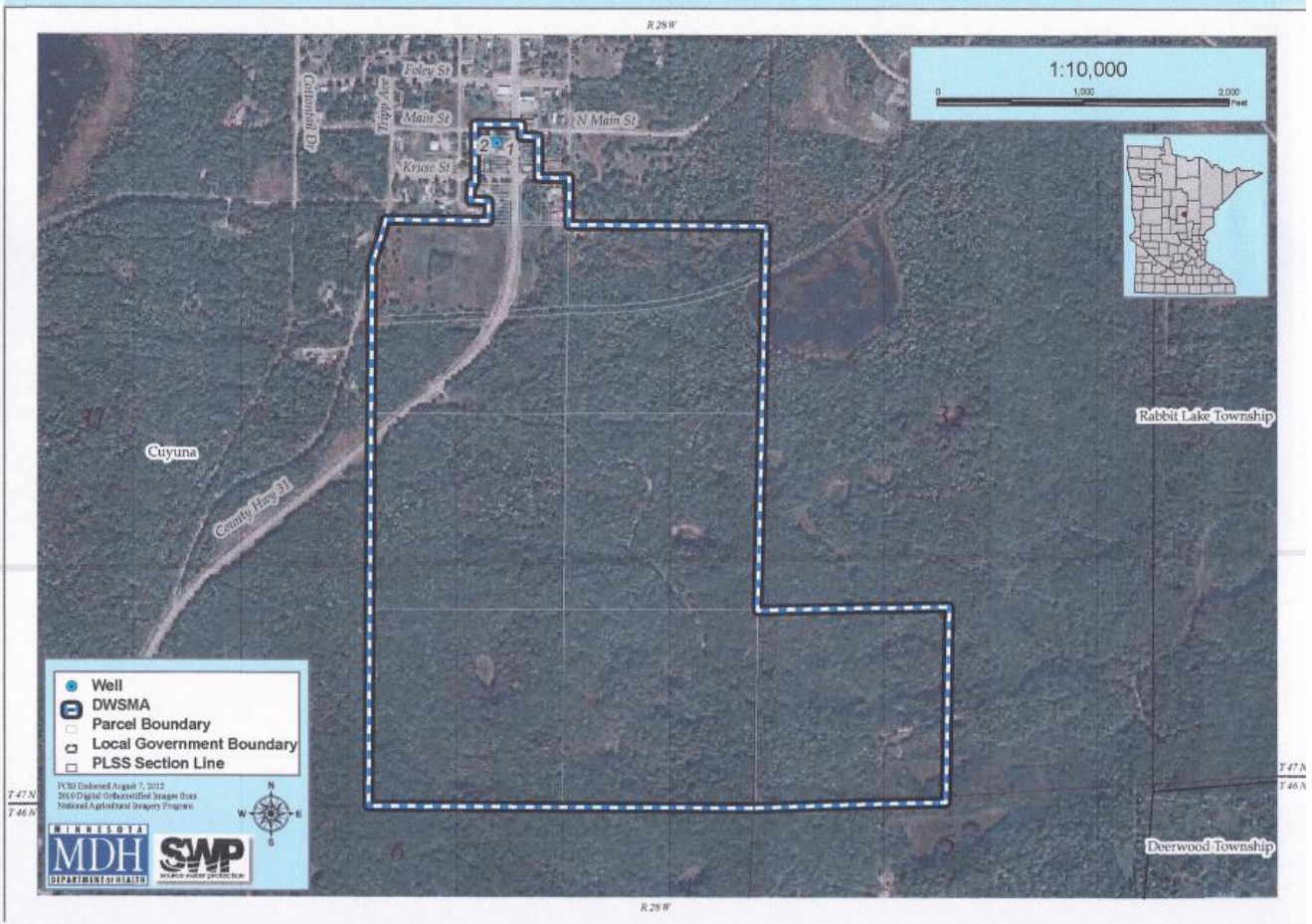
City of Cuyuna

This data is provided on an "AS-IS" basis, without warranty of any type, expressed or implied, including but not limited to any warranty as to their performance, merchantability, or fitness for any particular purpose.

Author: GIS Dept. Doug H
Date: 7/30/2012

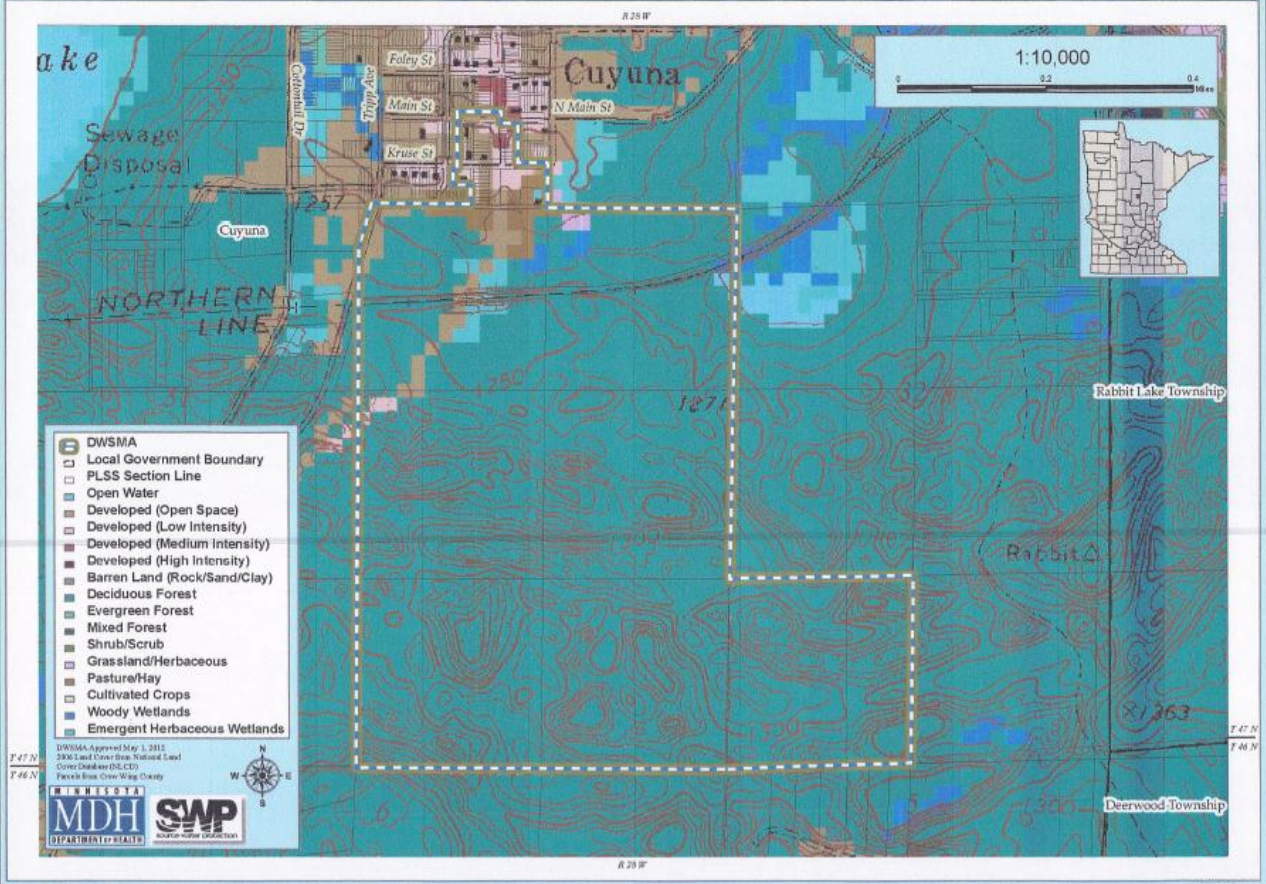
POLITICAL BOUNDARIES MAP

Cuyuna Drinking Water Supply Management Area (DWSMA) MN-00594 - Potential Contaminant Source Inventory



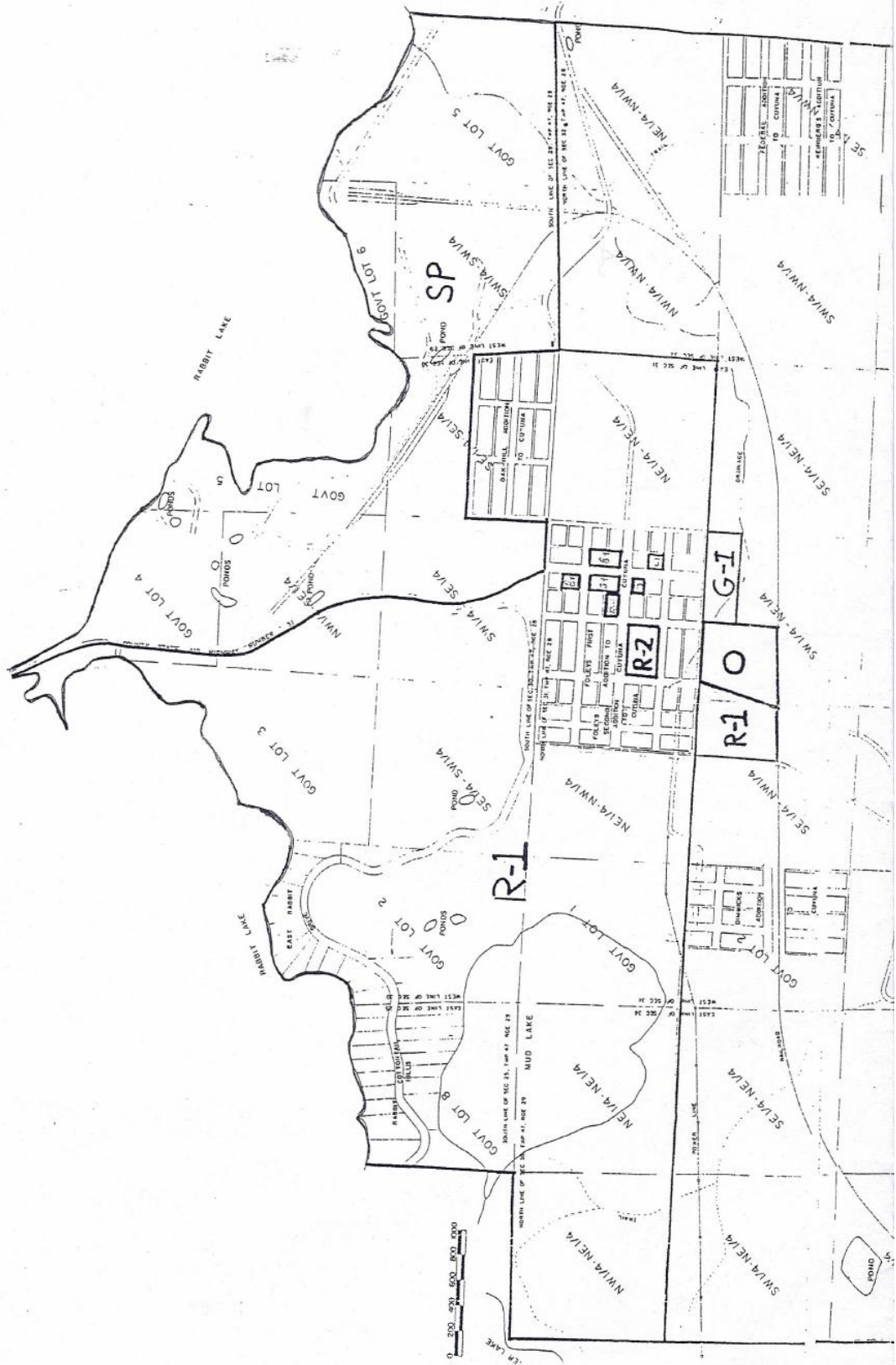
GOVERNMENT LAND SURVEY MAP

Cuyuna Drinking Water Supply Management Area (DWSMA) MN-00594 - Land Cover 2006

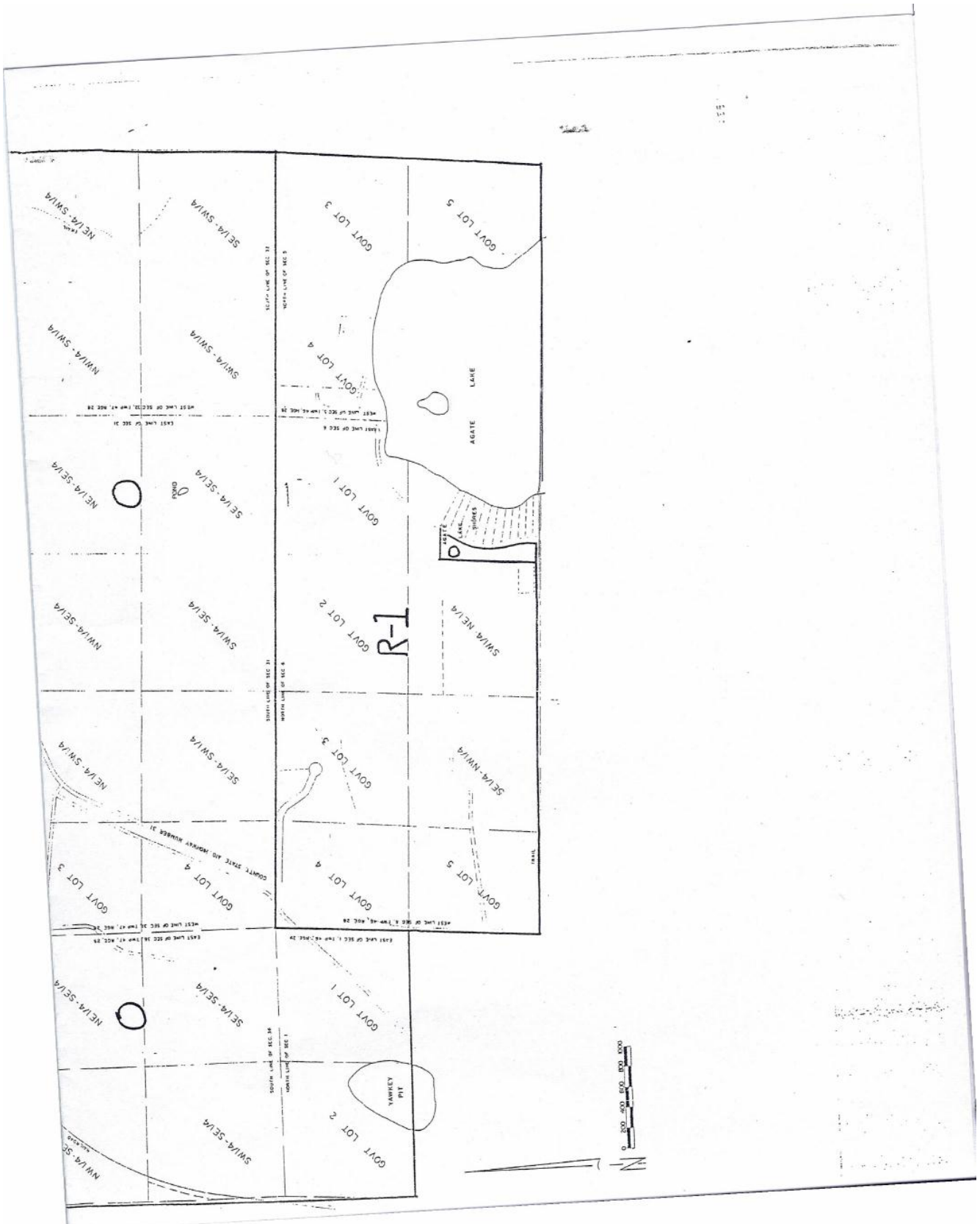


LAND COVER MAP

CITY OF CUYUNA ZONING MAP



ZONING MAP



ZONING MAP KEY

O – Open

R1 – Single Family Residential

R2 – Multiple Families Residential

G1 – General

B – Business

SP – Special District (Mine Waste Sites)



SANITARY SEWER MAP (Proposed)

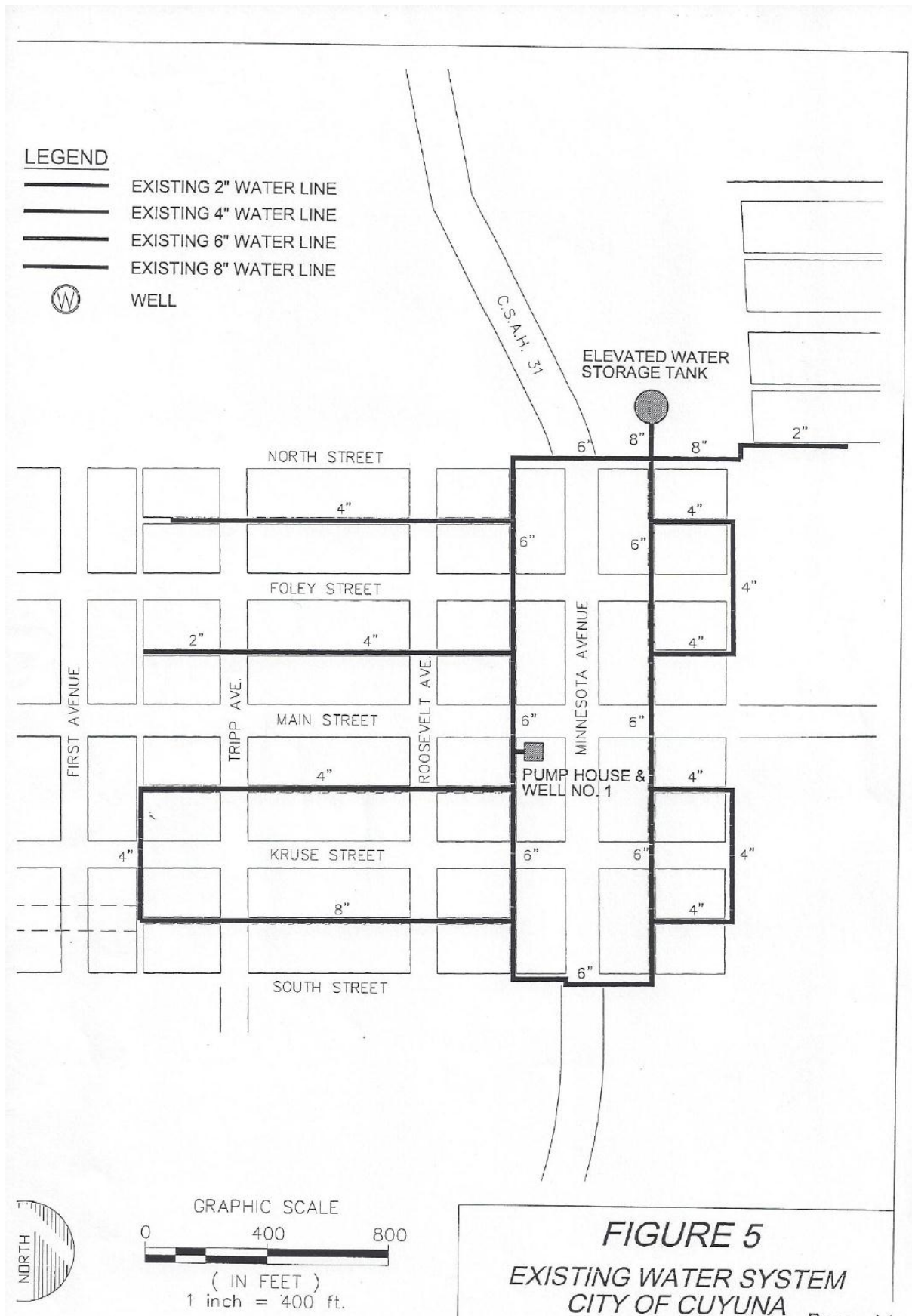
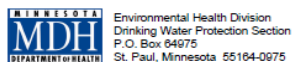


FIGURE 5
EXISTING WATER SYSTEM
CITY OF CUYUNA

WATER SYSTEM MAP



INNER WELLHEAD MANAGEMENT ZONE (IWMZ) - POTENTIAL CONTAMINANT SOURCE INVENTORY (PCSI) REPORT

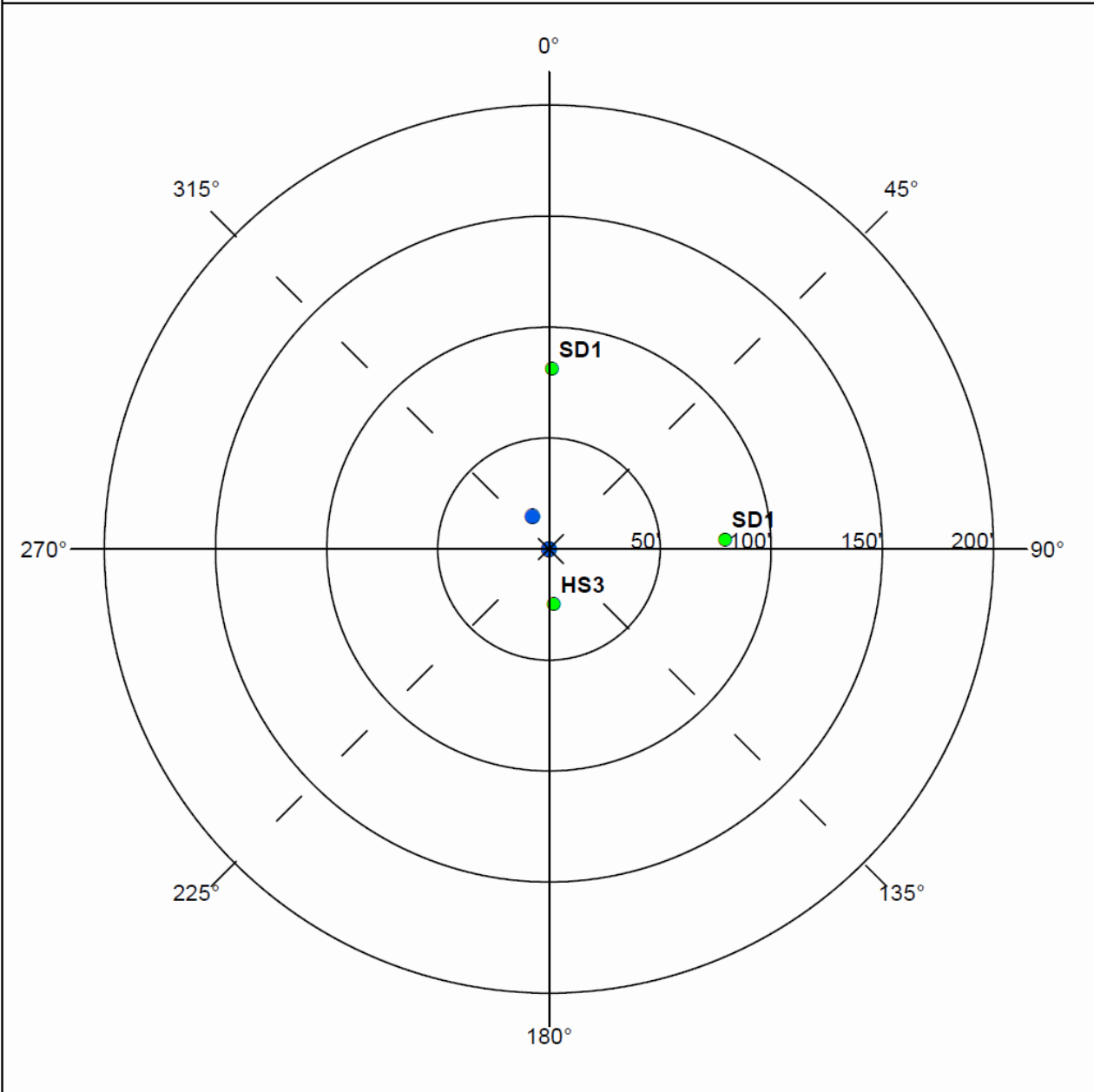
PUBLIC WATER SYSTEM INFORMATION							
PWS ID	1180011					COMMUNITY	
NAME	Cuyuna						
ADDRESS	Cuyuna Water Superintendent, 24151 Second Avenue, Deerwood, MN 56444						
FACILITY (WELL) INFORMATION							
NAME	Well #1					IS THERE A WELL LOG OR ADDITIONAL CONSTRUCTION INFORMATION AVAILABLE?	
FACILITY ID	S02					☐ YES (Please attach a copy)	
UNIQUE WELL NO.	198644					☐ NO ☐ UNDETERMINED	
COUNTY	Crow Wing						
PWS ID / FACILITY ID	1180011 S02		UNIQUE WELL NO.	198644			
PCSI CODE	ACTUAL OR POTENTIAL CONTAMINATION SOURCE	ISOLATION DISTANCES (FEET)				LOCATION	
		Minimum Community	Non- community	Sensitive Well'	Within 200 Ft. Y / N / U	Dist. from Well	Est. (?)
Agricultural Related							
*AC1	Agricultural chemical buried piping	50	50		N		
*AC2	Agricultural chemical multiple tanks or containers for residential retail sale or use, no single tank or container exceeding, but aggregate volume exceeding 56 gal. or 100 lbs. dry weight	50	50		N		
ACP	Agricultural chemical tank or container with 25 gal. or more or 100 lbs. or more dry weight, or equipment filling or cleaning area without safeguards	150	150		N		
ACS	Agricultural chemical storage or equipment filling or cleaning area with safeguards	100	100		N		
ACR	Agricultural chemical storage or equipment filling or cleaning area with safeguards and roofed	50	50		N		
ADW	Agricultural drainage well ² (Class V well - illegal ³)	50	50		N		
AAT	Anhydrous ammonia tank (stationary tank)	50	50		N		
AB1	Animal building, feedlot, confinement area, or kennel, 0.1 to 1.0 animal unit (stockyard)	50	20	100/40	N		
AB2	Animal building or poultry building, including a horse riding area, more than 1.0 animal unit	50	50	100	N		
ABS	Animal burial area, more than 1.0 animal unit	50	50		N		
FWP	Animal feeding or watering area within a pasture, more than 1.0 animal unit	50	50	100	N		
AF1	Animal feedlot, unroofed, 300 or more animal units (stockyard)	100	100	200	N		
AF2	Animal feedlot, more than 1.0, but less than 300 animal units (stockyard)	50	50	100	N		
AMA	Animal manure application	use discretion	use discretion		N		
REN	Animal rendering plant	50	50		N		
MS1	Manure (liquid) storage basin or lagoon, unpermitted or noncertified	300	300	600	N		
MS2	Manure (liquid) storage basin or lagoon, approved earthen liner	150	150	300	N		
MS3	Manure (liquid) storage basin or lagoon, approved concrete or composite liner	100	100	200	N		
MS4	Manure (solid) storage area, not covered with a roof	100	100	200	N		
OSC	Open storage for crops	use discretion	use discretion		N		
SSTS Related							
AA1	Absorption area of a soil dispersal system, average flow greater than 10,000 gal./day	300	300	600	N		
AA2	Absorption area of a soil dispersal system serving a facility handling infectious or pathological wastes, average flow 10,000 gal./day or less	150	150	300	N		
AA3	Absorption area of a soil dispersal system, average flow 10,000 gal./day or less	50	50	100	N		
AA4	Absorption area of a soil dispersal system serving multiple family residences or a non-residential facility and has the capacity to serve 20 or more persons per day (Class V well) ²	50/300/150 ⁴	50/300/150 ⁴	100/600/300 ⁴	N		
CSP	Cesspool	75	75	150	N		
AGG	Dry well, leaching pit, seepage pit	75	75	150	N		
*FD1	Floor drain, grate, or trough connected to a buried sewer	50	50		N		
*FD2	Floor drain, grate, or trough if buried sewer is air-tested, approved materials, serving one building, or two or less single-family residences	50	20		N		
*GW1	Gray-water dispersal area	50	50	100	N		
LC1	Large capacity cesspools (Class V well - illegal) ²	75	75	150	N		

PWS ID / FACILITY ID		1180011	S02	UNIQUE WELL NO.		198644		
PCSI CODE	ACTUAL OR POTENTIAL CONTAMINATION SOURCE	ISOLATION DISTANCES (FEET)				LOCATION		
		Minimum Distances		Sensitive Well'	Within 200 Ft. Y / N / U	Dist. from Well	Est. (?)	
		Community	Non-community					
MW	Motor vehicle waste disposal (Class V well - illegal) ²	illegal	illegal		N			
PR1	Privy, nonportable	50	50	100	N			
PR2	Portable (privy) or toilet	50	20		N			
*SF1	Watertight sand filter; peat filter; or constructed wetland	50	50		N			
SET	Septic tank	50	50		N			
HTK	Sewage holding tank, watertight	50	50		N			
SS1	Sewage sump capacity 100 gal. or more	50	50		N			
SS2	Sewage sump capacity less than 100 gal., tested, conforming to rule	50	20		N			
*ST1	Sewage treatment device, watertight	50	50		N			
SB1	Sewer, buried, approved materials, tested, serving one building, or two or less single-family residences	50	20		N			
SB2	Sewer, buried, collector, municipal, serving a facility handling infectious or pathological wastes, open-jointed or unapproved materials	50	50		N			
*WB1	Water treatment backwash holding basin, reclaim basin, or surge tank with a direct sewer connection	50	50		N			
*WB2	Water treatment backwash holding basin, reclaim basin, or surge tank with a backflow protected sewer connection	20	20		N			
Land Application								
SPT	Land spreading area for sewage, septage, or sludge	50	50	100	N			
Solid Waste Related								
COS	Commercial compost site	50	50		N			
CD1	Construction or demolition debris disposal area	50	50	100	N			
*HW1	Household solid waste disposal area, single residence	50	50	100	N			
LF1	Landfill, permitted demolition debris, dump, or mixed municipal solid waste from multiple persons	300	300	600	N			
SVY	Scrap yard	50	50		N			
SWT	Solid waste transfer station	50	50		N			
Storm Water Related								
SD1	Storm water drain pipe, 8 inches or greater in diameter	50	20		Y	81	N	
SD1	Storm water drain pipe, 8 inches or greater in diameter	50	20		Y	78	N	
SWI	Storm water drainage well ² (Class V well - illegal ³)	50	50		N			
SM1	Storm water pond greater than 5000 gal.	50	35		N			
Wells and Borings								
*EB1	Elevator boring, not conforming to rule	50	50		N			
*EB2	Elevator boring, conforming to rule	20	20		N			
MON	Monitoring well	record dist.	record dist.		Y	16		
WEL	Operating well	record dist.	record dist.		N			
UW	Unused, unsealed well or boring	50	50		N			
General								
*CR1	Cistern or reservoir, buried, nonpressurized water supply	20	20		N			
PLM	Contaminant plume	50	50		N			
*CW1	Cooling water pond, industrial	50	50	100	N			
DC1	Deicing chemicals, bulk road	50	50	100	N			
*ET1	Electrical transformer storage area, oil-filled	50	50		N			
GRV	Grave or mausoleum	50	50		N			
GP1	Gravel pocket or French drain for clear water drainage only	20	20		N			
*HS1	Hazardous substance buried piping	50	50		N			
HS2	Hazardous substance tank or container, above ground or underground, 56 gal. or more, or 100 lbs. or more dry weight, without safeguards	150	150		N			
HS3	Hazardous substance tank or container, above ground or underground, 56 gal. or more, or 100 lbs. or more dry weight with safeguards	100	100		Y	25	N	
HS4	Hazardous substance multiple storage tanks or containers for residential retail sale or use, no single tank or container exceeding 56 gal. or 100 lbs., but aggregate volume exceeding	50	50		N			
HWF	Highest water or flood level	50	N/A		N			
*HG1	Horizontal ground source closed loop heat exchanger buried piping	50	50		N			
*HG2	Horizontal ground source closed loop heat exchanger buried piping and horizontal piping, approved materials and heat transfer fluid	50	10		N			
IWD	Industrial waste disposal well (Class V well) ²	illegal ³	illegal ³		N			
IWS	Interceptor, including a flammable waste or sediment	50	50		N			

PWS ID / FACILITY ID	1180011 S02	UNIQUE WELL NO.	198644
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SETBACK DISTANCES	All potential contaminant sources must be noted on sketch.
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Record the distance and approximate compass bearing of each potential contaminant source from the well, and identify the source using the "Source Code". Unlabeled points on the map are unsealed wells.



Were the isolation distances maintained for the new sources of contamination?	Y	N	N/A
Is the system monitoring existing nonconforming sources of contamination?	Y	N	N/A
Reminder Question: Were the wellhead protection measure(s) implemented?			
INSPECTOR	Neiman, Dave		DATE 8 - 13 - 2012

For further information, please contact:

Minnesota Department of Health
Drinking Water Protection Section
Source Water Protection Unit
P.O. Box 64975
St. Paul, Minnesota 55164-0975

Section Receptionist: 651-201-4700
Division TDD: 651-201-5797 or MN Relay Service @ 1-800-627-3529 and ask for 651-201-5000

**INNER WELLHEAD MANAGEMENT ZONE (IWMZ) -
POTENTIAL CONTAMINANT SOURCE INVENTORY (PCSI) REPORT**

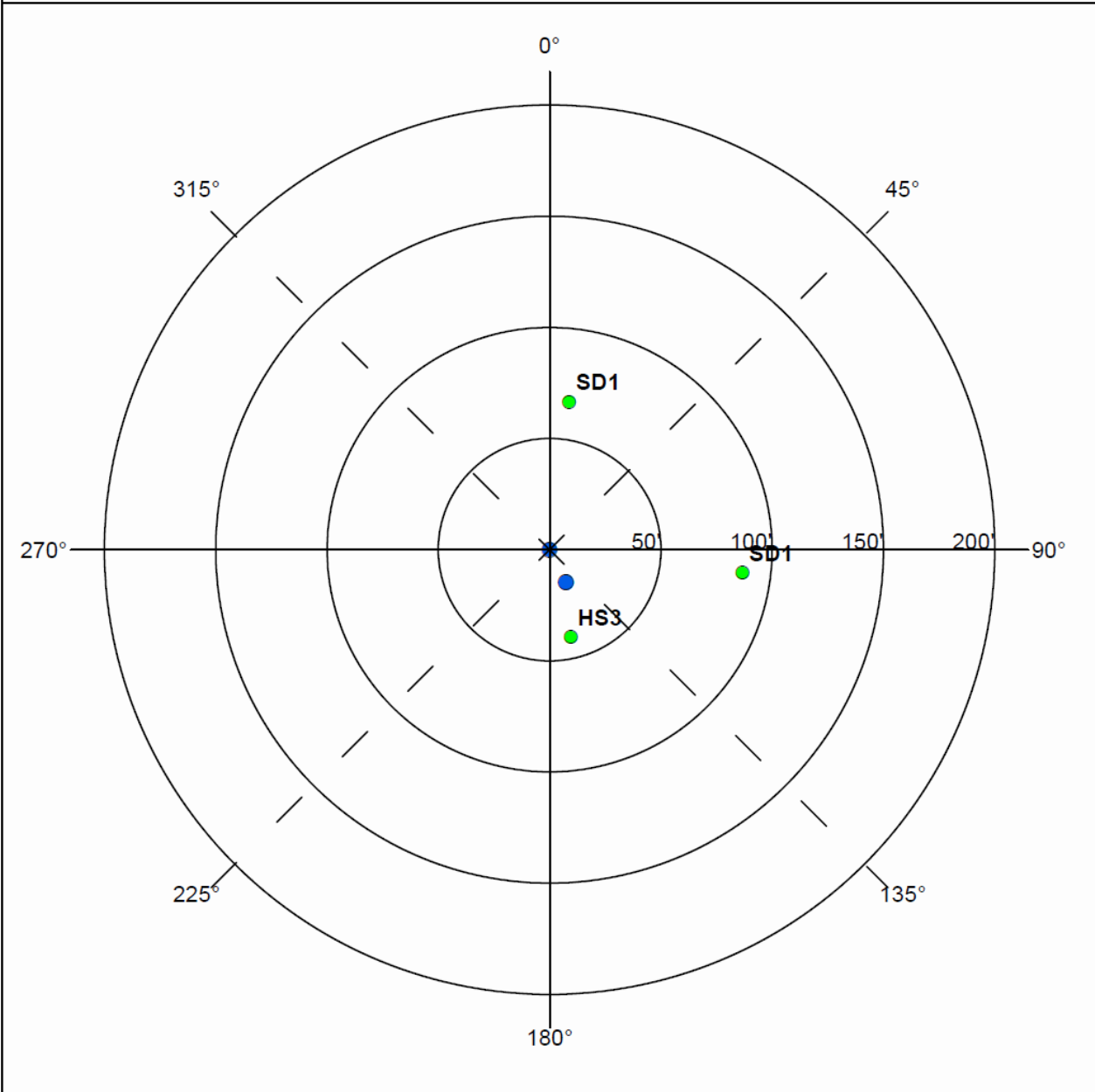
PUBLIC WATER SYSTEM INFORMATION							
PWS ID NAME ADDRESS							
FACILITY (WELL) INFORMATION							
NAME FACILITY ID UNIQUE WELL NO. COUNTY		CUYUNA TEST WELL 198645			IS THERE A WELL LOG OR ADDITIONAL CONSTRUCTION INFORMATION AVAILABLE? ☐ YES (Please attach a copy) ☐ NO ☐ UNDETERMINED		
PWS ID / FACILITY ID				UNIQUE WELL NO.		198645	
PCSI CODE	ACTUAL OR POTENTIAL CONTAMINATION SOURCE	ISOLATION DISTANCES (FEET)				LOCATION	
		Minimum Distances Community	Non- community	Sensitive Well ¹	Within 200 Ft. Y / N / U	Dist. from Well	Est. (?)
Agricultural Related							
*AC1	Agricultural chemical buried piping	50	50		N		
*AC2	Agricultural chemical multiple tanks or containers for residential retail sale or use, no single tank or container exceeding, but aggregate volume exceeding 56 gal. or 100 lbs. dry weight	50	50		N		
ACP	Agricultural chemical tank or container with 25 gal. or more or 100 lbs. or more dry weight, or equipment filling or cleaning area without safeguards	150	150		N		
ACS	Agricultural chemical storage or equipment filling or cleaning area with safeguards	100	100		N		
ACR	Agricultural chemical storage or equipment filling or cleaning area with safeguards and roofed	50	50		N		
ADW	Agricultural drainage well ² (Class V well - illegal ³)	50	50		N		
AAT	Anhydrous ammonia tank (stationary tank)	50	50		N		
AB1	Animal building, feedlot, confinement area, or kennel, 0.1 to 1.0 animal unit (stockyard)	50	20	100/40	N		
AB2	Animal building or poultry building, including a horse riding area, more than 1.0 animal unit	50	50	100	N		
ABS	Animal burial area, more than 1.0 animal unit	50	50		N		
FWP	Animal feeding or watering area within a pasture, more than 1.0 animal unit	50	50	100	N		
AF1	Animal feedlot, unroofed, 300 or more animal units (stockyard)	100	100	200	N		
AF2	Animal feedlot, more than 1.0, but less than 300 animal units (stockyard)	50	50	100	N		
AMA	Animal manure application	use discretion	use discretion		N		
REN	Animal rendering plant	50	50		N		
MS1	Manure (liquid) storage basin or lagoon, unpermitted or noncertified	300	300	600	N		
MS2	Manure (liquid) storage basin or lagoon, approved earthen liner	150	150	300	N		
MS3	Manure (liquid) storage basin or lagoon, approved concrete or composite liner	100	100	200	N		
MS4	Manure (solid) storage area, not covered with a roof	100	100	200	N		
OSC	Open storage for crops	use discretion	use discretion		N		
SSTS Related							
AA1	Absorption area of a soil dispersal system, average flow greater than 10,000 gal./day	300	300	600	N		
AA2	Absorption area of a soil dispersal system serving a facility handling infectious or pathological wastes, average flow 10,000 gal./day or less	150	150	300	N		
AA3	Absorption area of a soil dispersal system, average flow 10,000 gal./day or less	50	50	100	N		
AA4	Absorption area of a soil dispersal system serving multiple family residences or a non-residential facility and has the capacity to serve 20 or more persons per day (Class V well) ²	50/300/150 ⁴	50/300/150 ⁴	100/600/300 ⁴	N		
CSP	Cesspool	75	75	150	N		
AGG	Dry well, leaching pit, seepage pit	75	75	150	N		
*FD1	Floor drain, grate, or trough connected to a buried sewer	50	50		N		
*FD2	Floor drain, grate, or trough if buried sewer is air-tested, approved materials, serving one building, or two or less single-family residences	50	20		N		
*GW1	Gray-water dispersal area	50	50	100	N		
LC1	Large capacity cesspools (Class V well - illegal) ²	75	75	150	N		

PWS ID / FACILITY ID		UNIQUE WELL NO.		198645			
PCSI CODE	ACTUAL OR POTENTIAL CONTAMINATION SOURCE	ISOLATION DISTANCES (FEET)				LOCATION	
		Minimum Distances		Sensitive Well ¹	Within 200 Ft. Y / N / U	Dist. from Well	Est. (?)
		Community	Non-community				
MVW	Motor vehicle waste disposal (Class V well - illegal) ²	illegal	illegal		N		
PR1	Privy, nonportable	50	50	100	N		
PR2	Portable (privy) or toilet	50	20		N		
*SF1	Watertight sand filter; peat filter; or constructed wetland	50	50		N		
SET	Septic tank	50	50		N		
HTK	Sewage holding tank, watertight	50	50		N		
SS1	Sewage sump capacity 100 gal. or more	50	50		N		
SS2	Sewage sump capacity less than 100 gal., tested, conforming to rule	50	20		N		
*ST1	Sewage treatment device, watertight	50	50		N		
SB1	Sewer, buried, approved materials, tested, serving one building, or two or less single-family residences	50	20		N		
SB2	Sewer, buried, collector, municipal, serving a facility handling infectious or pathological wastes, open-jointed or unapproved materials	50	50		N		
*WB1	Water treatment backwash holding basin, reclaim basin, or surge tank with a direct sewer connection	50	50		N		
*WB2	Water treatment backwash holding basin, reclaim basin, or surge tank with a backflow protected sewer connection	20	20		N		
Land Application							
SPT	Land spreading area for sewage, septage, or sludge	50	50	100	N		
Solid Waste Related							
COS	Commercial compost site	50	50		N		
CD1	Construction or demolition debris disposal area	50	50	100	N		
*HW1	Household solid waste disposal area, single residence	50	50	100	N		
LF1	Landfill, permitted demolition debris, dump, or mixed municipal solid waste from multiple persons	300	300	600	N		
SVY	Scrap yard	50	50		N		
SWT	Solid waste transfer station	50	50		N		
Storm Water Related							
SD1	Storm water drain pipe, 8 inches or greater in diameter	50	20		Y	67	N**
SD1	Storm water drain pipe, 8 inches or greater in diameter	50	20		Y	87	N**
SWI	Storm water drainage well ³ (Class V well - illegal ³)	50	50		N		
SM1	Storm water pond greater than 5000 gal.	50	35		N		
Wells and Borings							
*EB1	Elevator boring, not conforming to rule	50	50		N		
*EB2	Elevator boring, conforming to rule	20	20		N		
MON	Monitoring well	record dist.	record dist.		N		
WEL	Operating well	record dist.	record dist.		Y	16	
UUW	Unused, unsealed well or boring	50	50		N		
General							
*CR1	Cistern or reservoir, buried, nonpressurized water supply	20	20		N		
PLM	Contaminant plume	50	50		N		
*CW1	Cooling water pond, industrial	50	50	100	N		
DC1	Deicing chemicals, bulk road	50	50	100	N		
*ET1	Electrical transformer storage area, oil-filled	50	50		N		
GRV	Grave or mausoleum	50	50		N		
GP1	Gravel pocket or French drain for clear water drainage only	20	20		N		
*HS1	Hazardous substance buried piping	50	50		N		
HS2	Hazardous substance tank or container, above ground or underground, 56 gal. or more, or 100 lbs. or more dry weight, without safeguards	150	150		N		
HS3	Hazardous substance tank or container, above ground or underground, 56 gal. or more, or 100 lbs. or more dry weight with safeguards	100	100		Y	41	N**
HS4	Hazardous substance multiple storage tanks or containers for residential retail sale or use, no single tank or container exceeding 56 gal. or 100 lbs., but aggregate volume exceeding	50	50		N		
HWF	Highest water or flood level	50	N/A		N		
*HG1	Horizontal ground source closed loop heat exchanger buried piping	50	50		N		
*HG2	Horizontal ground source closed loop heat exchanger buried piping and horizontal piping, approved materials and heat transfer fluid	50	10		N		
IWD	Industrial waste disposal well (Class V well) ²	illegal ³	illegal ³		N		
IWS	Interceptor, including a flammable waste or sediment	50	50		N		

PWS ID / FACILITY ID		UNIQUE WELL NO.	198645
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SETBACK DISTANCES	All potential contaminant sources must be noted on sketch.
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Record the distance and approximate compass bearing of each potential contaminant source from the well, and identify the source using the "Source Code". Unlabeled points on the map are unsealed wells.



Were the isolation distances maintained for the new sources of contamination?	Y	N	N/A
Is the system monitoring existing nonconforming sources of contamination?	Y	N	N/A
Reminder Question: Were the wellhead protection measure(s) implemented?			
INSPECTOR	Neiman, Dave	DATE	8 - 13 - 2012

For further information, please contact:

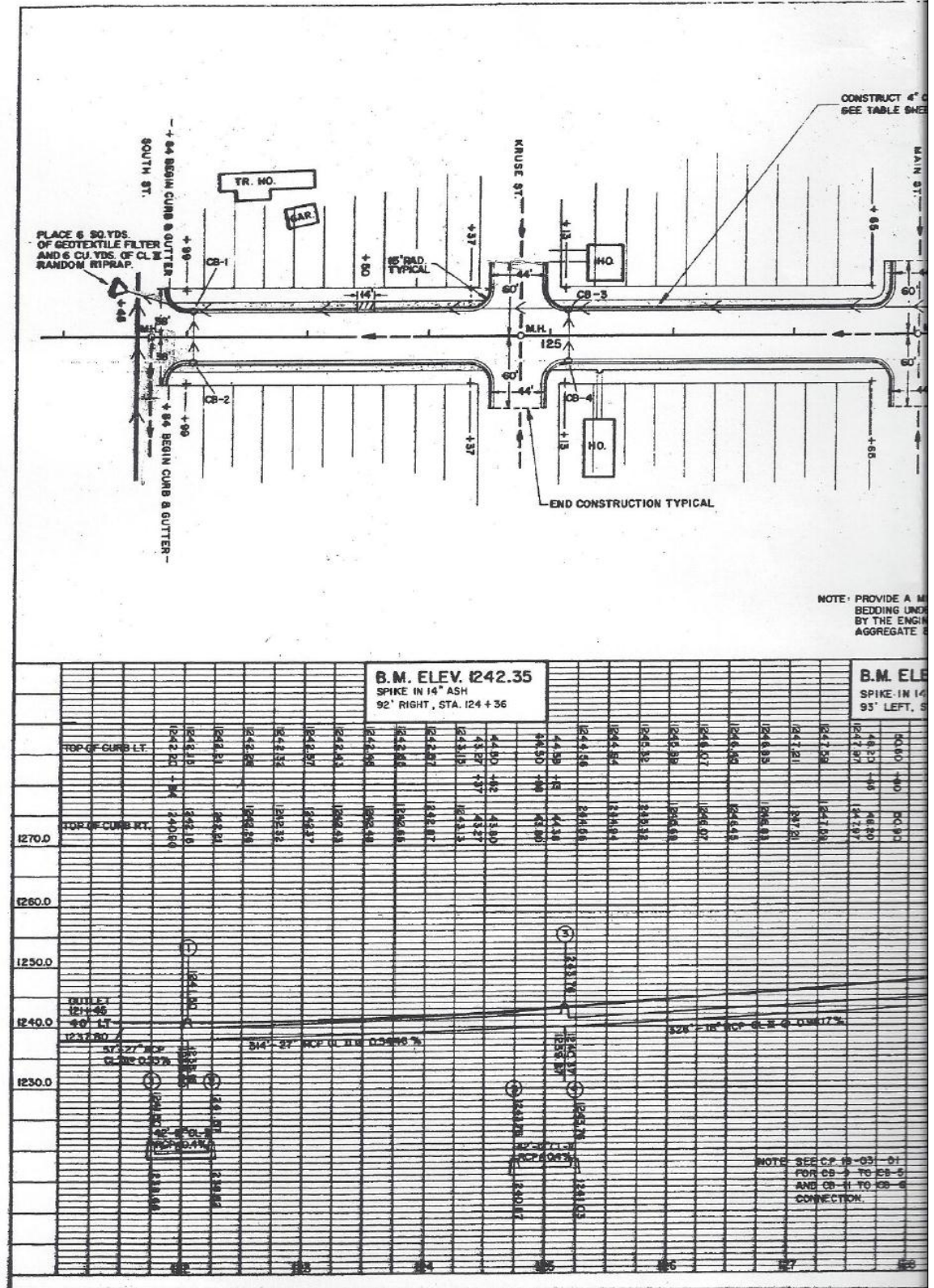
Minnesota Department of Health
Drinking Water Protection Section
Source Water Protection Unit
P.O. Box 64975
St. Paul, Minnesota 55164-0975

Section Receptionist: 651-201-4700
Division TDD: 651-201-5797 or MN Relay Service @ 1-800-627-3529 and ask for 651-201-5000

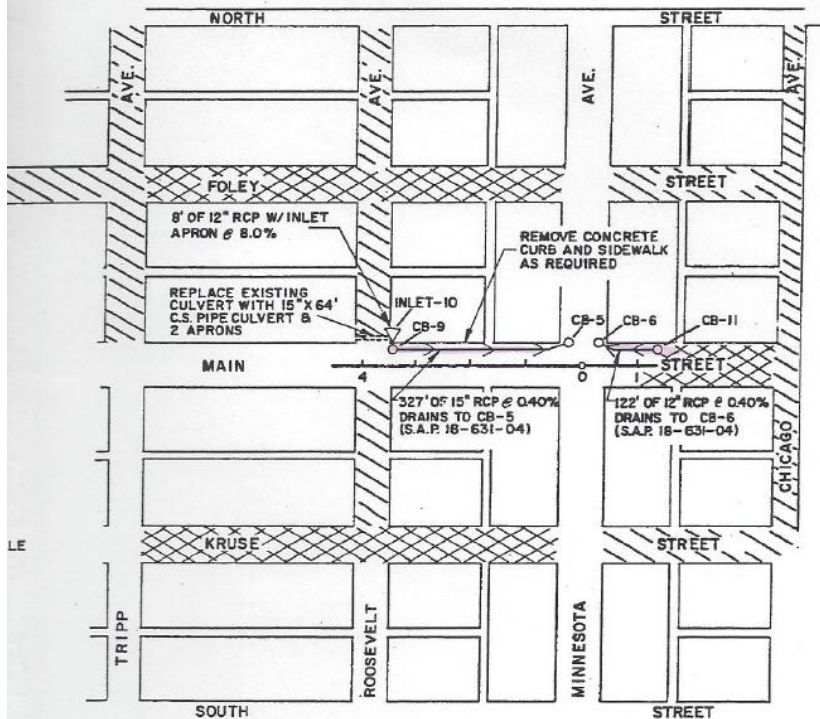
City of Cuyuna (PWSID 1180011, Crow Wing County)

Well Sequence Number (in record)	Well Name	Unique #	Casing Diameter	Well Depth	Depth Cased	Year Constructed	Well Type	Year Out of Service	Sealing Record	Location
1	Dug Well	None	None	Between 25-35 feet	Not Cased	Pre-1924	Dug	No record of sealing.	None	3/4 of a mile west of the village, near Rabbit Lake, on low ground.
2	Well 1	198644	8 inches	75 feet	60 feet	1983	Drilled	Still in use.		Township 47, Range 28W, Section 31. (ABDBAD)
3	Test Well	198645	4 inches	71 feet	67 feet	1983	Drilled		None found	Township 47, Range 28W, Section 31. (ABDBAA)
Data Bases Searched: CWI MDH DWP Microfiche MDH DWP MNDWIS MDH Well Management Data Base										

OLD MUNICIPAL WELL INFORMATION



STORM SEWER AND RESURFACING DETAIL



COST SHARE LEGEND

- 100% CITY OF CUYUNA
- 50% CITY OF CUYUNA
- 50% CROW WING COUNTY

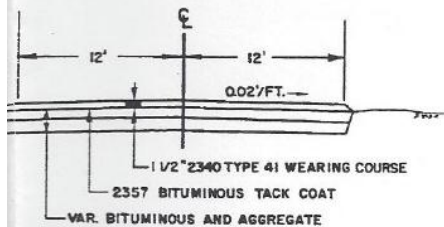
NOTE: MINNESOTA AVE., FROM SOUTH STREET TO NORTH STREET, TRIPP AVE., FROM SOUTH STREET TO MAIN STREET AND MAIN STREET FROM TRIPP AVE. TO MINNESOTA AVE. ARE TO BE SURFACED UNDER S.A.P. 18-631-04.

STORM SEWER

LOC.	REMARKS	TYPE	DES.	LNFT	TOP OF CASTING	INLET	OUTLET	DRAINS TO	12" RCP CL. II	1 1/2" 12" ELBOW	15" RCP CL. II	1 1/2" 15" ELBOW	APRON
FRT	* *	CB	Cor 6	2.8	1248.50	1246.00	1244.60	CB-5			327'	1	
FRT	TIED JOINTS	INL				1246.96		CB-9	8				1
DLT	* *	CB	Cor 6	2.3	1247.83		1245.50	CB-6	126	2			
TOTALS					4.9				134	* 2 (12")	327	* 1 (15")	1 (12")

* FOR ELBOWS TO BE INCLUDED WITH R.C. PIPE SEWER, LIN. FT. CASTING, 720 GRATE

TYPICAL SURFACING SECTION



* SOME AREAS WILL REQUIRE SUBGRADE PREPARATION AND 4" OF CL-5 BASE PRIOR TO BITUMINOUS SURFACING. SEE NOTE > FOR LOCATIONS.

BASIS FOR PLAN QUANTITIES

2211 CLASS -5 AGGREGATE BASE
COMPACTED DENSITY - 140 LBS./CU. FT. (ORDINARY COMPACTION)

2340 TYPE 41 WEARING COURSE MIXTURE
COMPACTED DENSITY - 110 LBS./SQ.YD. PER INCH OF DEPTH

2357 BITUMINOUS MATERIAL FOR TACK COAT
0.05 GALLON PER SQ.YD.

1990

CUYUNA Storm Sewer I RIR MAIN -

C.P. 18-031-01 (CSAH-31) SHEET 2 OF 2 SHEETS

