

Part I Wellhead Protection Plan Update

City of Edina, Minnesota

SEH No. EDINA 110899

June 2011

City of Edina, Minnesota
DRAFT Part I Wellhead Protection Plan Update

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June 20, 2011

I hereby certify that this report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Geologist under the laws of the State of Minnesota.



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DRAFT Part I Wellhead Protection Plan Update

City of Edina, Minnesota

Prepared by SEH/Source Water Solutions, LLC

1.0 Public Water Supply Profile

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2.0 Introduction

Short Elliott Hendrickson Inc. (SEH) was retained by the City of Edina (City) (Public Water Supplier identification #1270011) to complete an update of the City's Wellhead Protection Plan (WHPP). A WHPP was previously completed for the City in January 2000 (SEH). Since the completion of the 2000 Edina WHPP, a better understanding of the Prairie du Chien-Jordan Aquifer and the aquifer's vulnerability has been gained. The purpose of this work is to build a new model based on the "Twin Cities Metropolitan Area Regional Groundwater Flow Model Version 2.00" (MetroModel 2.0), created for the Metropolitan Council (October 2009).

The existing MetroModel 2.0 was used as the base model and was scaled down and refined for use as Edina's updated wellhead protection delineation model. The Metro Model 2.0 was created using the MODFLOW finite-difference flow model and was used to calculate the subsurface capture area for the primary water supply wells used by the

City of Edina. Municipal well details are provided in **Table 1**. Discussion of the WHPA delineation is presented in Section 2 of this appendix.

The DWSMA boundaries (**Figure 1**) were determined using geographic features, such as roads, fence lines, or property boundaries that the public can visualize. The actual features that were used and the process for defining the DWSMA boundaries are discussed in Section 3 of this appendix.

The wells used by the Public Water Supplier were assessed for their intrinsic vulnerability. The methodology for conducting the well vulnerability assessments is presented in Section 4 of this appendix, as is the methodology that was used to determine the DWSMA vulnerability.

2.1 Data Elements

In accordance with Minnesota Rule Chapter 4720.5400 and the December 21, 2009 Minnesota Department of Health (MDH) Scoping Decision Notice No. 1 (**Appendix A**), the following section discusses the required data elements for this Plan. In summary, the required data elements included information relating to precipitation, geology, soils, water resources, land use, public utility services, surface water quantity/quality, and groundwater quantity/quality.

2.1.1 Precipitation

The average annual precipitation for the area around the Public Water Supplier during the five-year period from 2005-2009 was obtained from Minnesota Climatology Working Group, which is a joint effort between the University of Minnesota and the Minnesota Department of Natural Resources (DNR).

Table 2 Precipitation Data

Year	Precipitation (inches)
2009	15.91
2008	17.09
2007	22.37
2006	20.29
2005	26.99
Average	20.53

Note:

Source: State Climatology Office Website -

<http://www.climate.umn.edu/hidenannual/HIDENannual.asp>

EDINA MOSQ located at Township 116N Range 21W Section 7

Data as received and digitized on or before 4/26/2010.

No precipitation reported for months of October through March for all record years

The average precipitation amount was used in conjunction with the interpretation of subsurface geological conditions and water chemistry data to assign recharge to the aquifer that is used by the Public Water Supplier. A recent United States Geological Survey (USGS) report (Delin 2009) regarding infiltration/recharge was also reviewed and used to guide the calculation of recharge rates to the sand and gravel aquifer as well as the till material.

2.1.2 Soils

Soils information was obtained from the Natural Resources Conservation Service (NRCS) Soil Survey Geographic (SSURGO) Database database. Soils information was used to refine the understanding of the surficial geology and used in conjunction with other geologic and groundwater quality data to define the DWSMA vulnerability. Soils data is provided in **Figure 5**.

2.1.3 Geological Information

The local and regional geologic and hydrogeologic conditions influence the delineation of the WHPAs for the public water supply wells. By characterizing these conditions, the geometry, location and magnitude of groundwater recharge and discharge areas, and the groundwater flow direction of the source water aquifer could be determined or estimated.

Existing geological maps, reports, and studies that were used are listed in the References section of the plan. Through the use of public-domain well records and local and regional geologic studies and publications, the geology and hydrogeology of the area have been evaluated and reviewed to aid in the WHPA delineations and vulnerability assessments. These resources were provided by the City, the MDH, the Minnesota Geological Survey (MGS), and the USGS.

These resources provided the basis for defining local geologic and hydrologic conditions but this interpretation was refined using soils data, exposures of geological materials, and the records of wells, borings, exploration test holes, and excavations. The City has no additional geologic information from logs or borehole geophysical records of wells, borings, or exploration test holes, nor additional information from surface geophysical studies. A surficial geology map is presented as **Figure 2** and a bedrock geologic map is presented as **Figure 3**.

All of this geological information was used to define hydrogeologic boundaries that were incorporated into the delineation of the WHPA and used to assess DWSMA vulnerability. Also, the construction information about the public water supply wells was used in conjunction with groundwater quality data to assess well vulnerability.

2.1.4 Water Resources Information

The regional influence on the source water aquifer of major rivers in the area (e.g. the Mississippi River and Minnesota River) has been accounted for in the groundwater flow modeling when delineating the WHPAs.

The City of Edina and its municipal water wells are located within the Lower Minnesota River and Mississippi River-Twin Cities major watersheds. The City's wells lie within two minor watersheds: Minnehaha Creek and Ninemile Creek watersheds. The Lower Minnesota River and Mississippi River-Twin Cities watersheds are large, covering approximately 1,174,350 acres and 644,320 acres respectively (DNR). The minor watersheds in which the City of Edina's wells are located consist of:

- Minnehaha Creek 14,374 acres and
- Ninemile Creek combined (3) watersheds 31,555 acres.

Several secondary small lakes, ponds, and streams surrounding Edina are not assumed to directly influence the WHPAs and DWSMAs of the municipal wells. These features were assumed to be hydraulically independent of the bedrock aquifers as they are located

in areas that likely have little hydraulic interaction with the bedrock aquifers below. Therefore, these secondary water bodies were not reviewed and studied as part of the WHPA and DWSMA delineations and vulnerability assessments.

2.1.5 Land Use Information

Parcel boundaries and fence lines, political boundaries, U.S. Public Land Survey coordinates, the center lines of highways, streets, roads, public drainage ditches, or railroad rights-of-way, as well as, public utility service lines were used to define the boundaries of the DWSMA.

Figures have been included in this Plan showing parcel and political boundaries, as well as public land surveys including township, range, and section boundaries. This information was primarily used to delineate the DWSMA and determine whether the limits of the DWSMA cross political boundaries. Specific land uses and zoning within and adjacent to the DWSMA will be reviewed, evaluated, assessed, and presented in Part II of the Plan.

Figures have been included in this Plan depicting the major transportation routes and corridors within and surrounding the City of Edina. However, sanitary and storm sewer coverage and presence of large-scale pipelines within the DWSMA will be examined in Part II of the Plan. Existing landuse data is provided in **Figure 4**.

2.1.6 Water Quantity Information

Since other wells in the Edina area influence the groundwater flow field of the source water aquifer, high capacity private and public wells were evaluated and assessed in detail during the delineations of the WHPAs for the City's public water supply wells. In addition, specific information related to the construction, maintenance, and use of the municipal wells has been compiled, utilized, and presented in the Plan (**Table 3**). This information was also used in delineating the WHPAs and completing the vulnerability assessments.

Groundwater pumping information from high capacity wells was obtained from the State Water Use Data System (SWUDS) that is maintained by the DNR. The annual pumping reported by the Public Water Supplier was used in determining the daily volume of water that is discussed in Section 2 of this appendix (**Table 4**). Furthermore, SWUDS data, combined with well construction records in CWI, was used to identify other high capacity wells that needed to be included in delineating the WHPA because they constitute a flow boundary (**Table 3**).

The City of Edina public water supply system currently uses and relies upon three source water aquifers – the Prairie du Chien, Jordan, and Mt. Simon aquifers. Municipal Wells 2, 3, 4, 5, 8, 15, 16, and 20 are open to the Prairie du Chien aquifer. Wells 6, 7, 11, 13, 14, 17, 18, and 19 are open to the Jordan aquifer and Wells 9, 10 and 12 are open to the Mt. Simon aquifer. Wells 9 and 14 are classified as emergency wells. Well 14 is no longer part of the drinking water system. Well logs are included as **Appendix B**. The existing wells appear adequate to meet the City's current and future water demand. The City has no immediate plans to replace or add municipal wells, or utilize any other source of water supply.

The City has provided the 2005-2009 water use and pumping volume records presented in this Plan to determine an appropriate discharge rate for the wells in delineating the

WHPAs. In addition, the City has estimated is projected increase in groundwater use for 2015.

Currently, there are no known, significant, groundwater-use conflicts between the City and other parties.

2.1.7 Water Quality Information

Available groundwater quality information was used to characterize the rate of recharge to the aquifer used by the Public Water Supplier, the degree of hydraulic connection between it and surface hydrologic features, and to assess DWSMA vulnerability. It is suggested that this information in conjunction with surface water quality data be utilized when updating the City's WHPP. Also, groundwater and surface water quality information will be able to be used to update well vulnerability.

The quality of the groundwater in the source water aquifers, and in the Edina area specifically, must be evaluated and assessed for this Plan. Groundwater contamination and undesirable groundwater quality will directly impact the public water supply system. Certain naturally-occurring constituents in the groundwater also provide information that can be used to determine the vulnerability of the source water aquifer. The City publishes an annual consumer confidence report that contains water quality data collected over the course of the year.

The overall quality of groundwater in Edina is good and quite similar for all the aquifers. No contaminants were detected at levels that violated federal drinking water standards. Some were detected in trace amounts that were below legal limits. The City of Edina's 2010 Consumer Confidence Report is available on the City's website at: http://cityofedina.com/Departments/engineering/water_reports/pdfs/2010.pdf

Well #7 Contamination

Edina's Well No. 7 (Unique No. 206474), located in Sherwood Park, is a seasonal well that has tested above the Maximum Contaminant Level (MCL) set by the Environmental Protection Agency (EPA) for vinyl chloride. The well was shut down in October 2003. The source of the contaminant in Well No. 7 has not yet been determined, however, the City is working with the MDH and MPCA to determine the best way to treat the well.

In 2002, as reported in that year's Consumer Confidence Report, the average level of vinyl chloride in Well No. 7 was 2.3 ppb. Four quarterly samples are required to determine an average compliance value for this contaminant. Two more samples were collected by MDH in 2003 and levels of vinyl chloride exceeded the MCL of 2.0 ppb. Well No. 7 was shut down in early October 2003.

The City has kept the well shut down while working with a local engineering firm to treat Well No. 7 water to reduce the levels of vinyl chloride. Design phase for a new water treatment plant has been completed and it is expected to be online sometime in 2012.

2.2 Geological Setting

The Public Water Supplier is located in Hennepin County within the Mississippi and Minnesota River watersheds. The physiographic and geological conditions of the area impact the yield and vulnerability of the aquifer used by the Public Water Supplier.

Soils

Soil in the Edina area were not classified in the 1974 Hennepin County Soil Survey. The SSURGO GIS database currently does not have complete classification of soils in and around the City of Edina.

Surficial Geology

The Quaternary glacial deposits in the Edina area consist of Des Moines Lobe and Grantsburg Sublobe till deposits (MGS 1989). Till deposits cover the majority of the City. The thickness of the deposits range from less than 50 feet to 250 feet. There are five different surficial deposits mapped in Edina. Three of the deposits are of glacial origin: a loamy till, a sandy till, and outwash deposits; and two types of post-glacial deposits: floodplain alluvium and organic deposits. Most of the surficial material consists of glacial deposits.

Bedrock Geology

The bedrock geology underlying Edina was defined in the original Wellhead Protection Plan (SEH 1998). However since the completion of the Wellhead Protection Plan in 1998 the nomenclature for some of the lithologic units proposed. The Franconia Formation has been revised to the Tunnel City Group.

The conceptual understanding of the Prairie du Chien aquifer has also been revised. Although there is no distinctly defined confining unit between the Prairie du Chien and Jordan, the basal unit of the Prairie du Chien, the Oneota Dolomite, effectively acts as a confining unit in some areas (MGS 1989).

Precipitation

The average annual precipitation for the area around the Public Water Supplier during the five-year period from 2004 to 2008 was obtained from Minnesota Climatology Working Group, which is a joint effort between the University of Minnesota and the DNR. The average annual precipitation of 20.5 inches for this time period was calculated from observations recorded at a weather station that is located near Edina's Municipal Well #13 (Unique No. 200913)(**Table 2**).

2.3 Hydrogeologic Setting

Municipal well information including location, construction information, and aquifer is presented in **Table 1**. Wells utilized by the City are completed in the Jordan, Prairie du Chien and Jordan, or Mt. Simon.

Four aquifers exist in the Edina area: the water table system, the Prairie du Chien-Jordan, the Franconia-Ironton-Galesville, and the Mount Simon-Hinckley.

The uppermost aquifer, the water-table system exists in many different types of geologic materials. Some of these may yield water to wells, such as sands and gravels, but others, such as till, do not.

The other three aquifers are bedrock aquifers. The uppermost bedrock aquifer, the Prairie du Chien-Jordan, is present throughout the City and is the most heavily used aquifer in Hennepin County. The Prairie du Chien Group is up to 150 thick in some areas and groundwater flow is controlled by fractures, joints, and solution cavities within the dolomite. The Jordan Sandstone consists of fairly uniform quartzose sandstone and is highly permeable. The groundwater flow through this sandstone is primarily

intergranular. Since there is no confining unit between the Prairie du Chien Group and the Jordan Sandstone, they act as a single aquifer. Potential yield values range from 1000 to 2000 gallons per minute and groundwater flow direction is east and southeastward.

The Franconia-Ironton-Galesville (FIG) exists beneath the Prairie du Chien-Jordan aquifer. The St. Lawrence Formation, a dolomitic shale and siltstone ranging in thickness from 30 to 75 feet, acts as the confining unit between the two aquifers. The FIG is present beneath all of Edina and is comprised of three parts. The upper 105 to 190 feet consists of the Franconia Formation, a glauconitic sandstone with some shale and dolomite, The next 25 to 30 feet consists of the Ironton Sandstone, and the lower 30 to 35 feet consist of the Galesville Sandstone. All three units are hydraulically connected. The groundwater flow in this area is southeast, and the potential yield ranges from 400 to 800 gallons per minute.

The deepest bedrock aquifer is the Mount Simon-Hinckley. It is located beneath the Eau Claire Formation - a 60 to 125 foot thick siltstone, shale, and silty sandstone, which acts as a confining unit between the Mount Simon-Hinckley aquifer and the FIG aquifer. The Mount Simon-Hinckley aquifer consists of the Mount Simon Sandstone which ranges from 125 to 270 feet in thickness, and the Hinckley Sandstone which is absent in many localities. Where present, the Hinckley Sandstone is several tens of feet thick. In general, the Mount Simon-Hinckley is hydraulically isolated from the shallow groundwater systems and surface waters above it. Therefore, most of its recharge comes from leakage. The potential yield of this aquifer is greater than 1500 gpm. According to the Hennepin County Geologic Atlas, the groundwater flow direction is likely northeast toward a cone of depression located in the City of Minneapolis. However, based upon groundwater elevation targets exported from the MetroModel 2.0, groundwater flow in the Mt. Simon appears to be to the southwest.

3.0 Delineation of the Wellhead Protection Area

3.1 Criteria Used to Delineate with Wellhead Protection Area

The criteria for delineating the WHPA, as required in Minnesota Rules 4720.5510, were addressed as follows.

Time of Travel

A 10-year time of travel was used to characterize groundwater movement in the aquifer that is used by the community water supply wells. Also, a one-year time of travel was used to define the emergency response area, as specified under Minnesota Rules 4720.5250. The 1- and 10-year capture zone boundaries are shown in **Figure 1**.

Daily Volume of Water Pumped

Information provided by the Public Water Supplier was used to determine the maximum discharge from each well. The results presented in **Table 3** reflect the total number of gallons pumped annually by each well and reported to the DNR under Groundwater Appropriations Permit No.1989-3101 for the years 2005 to 2009.

The historical (2005-2009) and projected (2015) pumping volumes for each of the public water supply wells are summarized in **Table 3**. The historical data was provided by the City, and the projected volumes were based on City estimates and historical water use trends. A projected water use volume of 2,820 million gallons per year was defined in the City of Edina Water Supply Plan section of the City's Comprehensive Plan (Edina 2008) This total volume was proportioned for each of the wells based on the 2009 pumping

ratio of each well to the 2009 total. These volumes were converted to pumping rates and used in the groundwater flow modeling and fixed radius calculations to delineate the WHPAs.

The maximum annual volume pumped by each well over the time period from 2005 to 2009 or the projected 2014 amount, whichever was greater, was used to calculate the daily volume of discharge that was used in the groundwater flow model. The greatest annual pumping volume was divided by 365 days to calculate daily discharge. Gallons were converted to cubic meters to reflect groundwater model input requirements.

Groundwater Flow Field

Generally, in the Prairie du Chien and Jordan aquifers, groundwater flows toward the city wells from the northwest with hydraulic gradients of 0.0033 and 0.0028 respectively. Geologic boundaries between the aquifer and surrounding geologic materials affect the orientation of the flow field and the corresponding subsurface capture area for the city wells. This interpretation of the flow field as well as the elevation targets used to create the flow field, were used to calibrate the flow field that was calculated using the MODFLOW groundwater flow model.

The flow field for the Mt. Simon aquifer, based upon the interpolation of groundwater elevations in the existing MetroModel 2.0 shows a groundwater flow field flowing to the east-southeast with a hydraulic gradient of 0.0016.

The information provided and presented in the Hennepin County Geologic Atlas (DNR 1998), prepared by the Minnesota Geological Survey, CWI data, and Metro Model 2.0 data was relied upon to define the local and regional groundwater flow field of the bedrock aquifers. **Figures 7-1 through 7-3** depict the groundwater flow field interpolated from groundwater elevations taken from the CWI and Metro Model 2.0 for each aquifer.

Flow Boundaries

Most flow boundaries for his model were predetermined in the MetroModel 2.0 and accounted for by the MDH during initial refinement to the County scale. These boundaries were not changed significantly for the WHPA and DWSMA delineations within the City of Edina. The Mississippi River and Minnesota Rivers act as local discharges for the Prairie du Chien.

Aquifer Transmissivity

Aquifer pump tests were identified for each of the aquifers used by the City's wells. The test was performed in accordance with the Minnesota Wellhead Protection Rules (MN Rules Chapter 4720.5320 and 4720.5520), and the *Aquifer Test Plan* submitted to the Minnesota Department of Health (MDH) staff in November 2010. The aquifer pumping test reports for the each aquifer tests are provided in **Appendix C**.

The aquifer transmissivities and hydraulic conductivity values derived from these tests were utilized in refining the groundwater flow model used to delineate the WHPAs for each of the City's source water aquifers. The regional aquifer pumping test results are presented in **Table 5**. The representative, transmissivity values for the aquifers near the Edina wells are estimated to be:

Prairie du Chien 14,818 ft²/day

Jordan 2,400 ft²/day

Mt. Simon 2,187 ft²/day

A polygon encompassing the wells completed in the appropriate aquifer was added to the existing calibrated MetroModel 2.0 to add additional detail to the existing County-wide model. The hydraulic conductivity value assigned to the polygon was calculated based upon the transmissivity from the aquifer pump test and the thickness of the aquifer in the area of the City's wells.

3.2 Methods Used to Delineate the Wellhead Protection Area

Due to the fact that a number of Edina's municipal wells are completed in both the Jordan and the Prairie du Chien aquifers, two methods of delineation were required to delineate the City's wellhead protection area. First, a porous media delineation model was used to delineate the WHPA for the wells completed in the Mt. Simon-Hinckley and the Jordan. MODFLOW was used for this delineation. A second delineation technique was required to calculate the WHPA for wells open to the fractured Prairie du Chien aquifer. An ArcGIS tool created by the MDH was used to calculate the fracture flow delineation WHPA for the City's Prairie du Chien wells. Both techniques are described below.

3.2.1 Porous Media Delineation

The existing computer-generated, steady state, MetroModel 2.0 groundwater flow model was modified and updated to delineate the WHPA for the City's bedrock aquifer wells. The nine-layer model represented the geology of the Metro Basin. The following sections describe in detail the refinement, calibration, and results of the Edina groundwater flow model.

The MDH provided the City of Edina with a MODFLOW groundwater model of Hennepin County to update and use for the delineation of the City's WHPA. The model had been extracted from the existing MetroModel 2.0 and the grid spacing refined to provide detail near the municipal wells. Groundwater Vistas modeling software was used to update model properties, boundary conditions, and analytic elements (wells, particles, etc.). The general conceptual framework for this model consisted of a nine layer model. The layers included in the model are assigned as follows:

Layer 1 – Quaternary deposits, Decorah Shale, Platteville Formation,
and Glenwood Formation

Layer 2 – St. Peter Sandstone

Layer 3 – Prairie du Chien Group

Layer 4 – Jordan Sandstone

Layer 5 – St. Lawrence Formation

Layer 6 – Franconia Formation

Layer 7 – Ironton and Galesville Sandstone

Layer 8 – Eau Claire Formation

Layer 9 – Mt. Simon and Hinckley Sandstone

Figures 6-1 through 6-3 show the layout of boundary conditions and model property zones used to represent natural features in the model. Model files are provided as **Appendix D**.

Global model attributes can be found in the MetroModel 2.0 documentation. Existing layer thicknesses and boundaries were used from the MetroModel 2.0. The calibrated hydraulic conductivity zones as well as the porosity values for each layer were also used. A new hydraulic conductivity zone/polygon was created around the City's well using the aquifer test analysis values for each layer. Recharge rates were imported using a USGS shapefile (Delin 2007) for the model domain. Recharge rates as well as hydraulic conductivity values vary spatially, however the shapefiles are all included in **Appendix E**.

The City's wells were represented by analytic elements with a negative flow based upon the average daily pumping volume calculated as described in Section 3.1. There were 447 existing high capacity wells in the Hennepin County model. The discharge values were not changed from the original Hennepin County model values. Names, locations, and discharges for the other high capacity wells can be found in the wells.shp file included in **Appendix E**. High capacity wells within 2 miles of the City's wells are included in **Table 4**.

3.2.2 Fracture Flow Delineation

The MDH has produced a guidance document and ArcGIS tool to assist in the delineation of the wellhead capture zone in fractured bedrock aquifers. Ten of Edina's 19 wells are completed at least partially in the fractured Prairie du Chien aquifer. Guidance also requires the assessment of wells completed solely in porous media aquifers that are hydraulically connected to a fractured bedrock aquifer. The City has wells that are completed only in the Jordan, so these wells were assessed for fracture flow delineation.

The analysis comparing the pumping volume generated by the MODFLOW model to the volume of water pumped by the wells completed in the Jordan aquifer met the 10% contribution threshold indicating that there is a highly leaking setting. The fractured aquifer is a major source of recharge to the Jordan aquifer and fracture flow delineation was completed for the City's Jordan wells.

Groundwater Vistas allocated flow from each aquifer based upon the elevations of the well's open interval in the model. Pumping volumes were extracted from the MODFLOW model for wells completed in the Prairie du Chien aquifer for the layer that represents the Prairie du Chien (Layer 3). This value along with the open interval thickness was input into the MDH ArcGIS delineation tool to determine if there was any overlap of capture zones. If there was overlap, and in many of the City's wells there was, another ArcGIS tool was to be utilized to allocate for the additional volume of water required for the overlapping area. The fracture flow capture zones were added to the area defined by the MODFLOW model and a composite delineation was created. The City's well capture zones can be found on **Figure 1** and the shapefiles can be found in **Appendix E**.

3.3 Results of Model Calibration and Sensitivity Analysis

Model calibration is a procedure that compares the results of a model that are based on estimated input values to measured or "known" values. It is used to define model validity over a range of input values, or the confidence with which model results may be used. As a matter of practice, groundwater flow models are usually calibrated using water elevation or flux.

The Hennepin County-wide MODFLOW model was previously calibrated prior to extraction from the MetroModel 2.0. Hydraulic conductivity value zones were

calibrated during the MetroModel's PEST auto-calibration. The model was calibrated to known head values in each model layer. Although recharge was refined using the USGS shapefile (Delin 2007), the model still calibrated within acceptable error.

The calibration results for this model are presented in **Figure 9** and the resulting potentiometric surface depicts groundwater flow direction and gradient.

Model sensitivity is the amount of change in model results caused by the variation of a specific input parameter while keeping the other parameters constant. Using computer models to simulate groundwater flow involves representing a complicated natural system in a more simplified manner. Local geologic conditions likely vary within the capture area of the wells, but existing information for the area around the Public Water Supplier is not sufficiently detailed to define this. As a result, the Edina WHPP model cannot represent the natural flow system exactly, but the results are valid when they are based upon a reasonable variation of input parameters. This is accomplished by performing an uncertainty analysis to evaluate uncertainties in the hydrogeologic data that may affect the size and shape of the capture zone for each well.

The following discussion identifies the model input parameters that have the most significant impacts on the well capture zone analyses direction and extent of the modeled capture zone may be sensitive to any of the input parameters but 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.

Results - The pumping rate is defined by WHP rule requirements and is based on the results presented in **Table 3**. Therefore, it is not a variable that will influence the delineation of the WHPA.

The direction of groundwater flow determines the orientation of the capture zone. 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 contributing water to the well.

Results - The potentiometric map that is produced by the Edina WHPP model closely matches that generated by contouring static water level data. Therefore, the direction of groundwater flow should not have a significant effect on the WHPA delineation given the current knowledge of hydraulic head distribution in the aquifer.

A 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 downgradient focal point. The hydraulic gradient was determined by using water level elevations that were taken from wells that have verified locations and contoured in Groundwater Vistas with an interpolation tool. These computer contoured elevations have been compared to and generally reflected groundwater elevations provided in the Hennepin County Geologic Atlas for the Prairie du Chien and Mt. Simon aquifers. Generally, the accuracy of the hydraulic gradients determination is directly proportional to the availability of water level observations that are used to define the flow field.

Results –The difference between the calculated and Hennepin County gradients is not sufficient to affect the WHPA delineation.

Aquifer transmissivity has a significant impact on the WHPA delineation because existing data indicate that local variability in aquifer composition may cause it to vary by as much as a factor of 10.

Results –To account for this possible variability, a sensitivity analysis was performed by varying the transmissivity over a range of plus and minus a factor of 10 of the calibrated value. As expected, the capture zone is sensitive to changes in hydraulic conductivity with larger values producing more elongated capture zones than lower values.

Recharge doesn't have a direct impact on the WHPA delineations because the aquifers exhibit confined hydraulic conditions and are not susceptible to rapid changes in saturated thickness caused by variability in precipitation.

Results –Varying recharge to the model did not affect the length and shape of the capture zone.

The porosity of the aquifer has substantial influence over the size and shape of the capture zone. This is especially true for the influence of secondary porosity in the fractured Prairie du Chien aquifer.

Results – A fracture flow delineation was completed for the wells completed in the Prairie du Chien and a composite delineation of the porous media and fracture flow delineations was completed. Porosity values assigned in the MetroModel 2.0 were used for each aquifer. Because porosity values are well established and accepted for the bedrock aquifers, it is not a variable that will influence the delineation of the WHPA.

Addressing Model Sensitivity - A fracture flow delineation was completed for the wells completed in the Prairie du Chien and a composite delineation of the porous media and fracture flow delineations was completed. Porosity values assigned in the MetroModel 2.0 were used for each aquifer. This provides a conservative approach to addressing model sensitivity and produces capture zones that will most likely be most protective of public health.

4.0 Delineation of the Drinking Water Supply Management Area

Figure 1 illustrates the Drinking Water Supply Management Area (DWSMA), which is the area surrounding the capture zones, and can be identified by recognizable landmarks. The boundaries of the DWSMA were determined with the assistance of the public water supplier and use:

- Center-lines of highways, streets, roads, or railroad rights-of-ways;
- Public Land Survey coordinates;
- Property or fence lines;
- Center-lines of public drainage systems;
- Public utility service lines,
- Surface water bodies that interact with groundwater, and
- Political boundaries.

GIS shapefiles of the DWSMA are provided in **Appendix E**.

5.0 Vulnerability Assessments

The vulnerability assessments for the public water supply wells and the DWSMA are used to determine the scope of the inventory of potential contamination sources and to assign priorities for managing potential contamination sources within the DWSMA.

Generally, the information provided on the MDH scoring sheets appears accurate and the City does not have additional or updated information to challenge the scoring. There is no indication from the well construction records to suggest that the Edina municipal wells were not properly constructed and grouted.

5.1 Assessment of Well Vulnerability

Minnesota Rule 4720.5210 requires a vulnerability assessment of the wells used by the public water supplier. The protocol for determining well vulnerability is described in the MDH document entitled Methodology for Phasing Wells into Minnesota's Wellhead Protection Program (1993), which was approved by the US Environmental Protection Agency (EPA) as part of its review of Minnesota's wellhead protection program description. The MDH uses the protocol to maintain a database defining the potential vulnerability of community and non-community public water supply wells. A score is calculated for each well using 1) construction criteria defined in the State Well Code, 2) geologic sensitivity, and 3) the results of water quality monitoring conducted by the MDH. A numeric score is assigned to each well based on the results of the three areas of evaluation. A cutoff score is used to define wells that are most likely to be vulnerable based on their construction, geologic setting, and sampling history. The printouts of the vulnerability ratings for the wells used by the Public Water Supplier is presented in **Appendix F**.

The DNR has developed a procedure for determining geologic sensitivity that is based on an "L" score. The "L" score increases 1 point for every 10 feet of clay overlying the aquifer. If the "L score" is 0 and the static water level is 20 feet or less, the geologic sensitivity is very high and vertical recharge to the aquifer likely occurs within hours to months. If the "L score" is 0 and the static water level is greater than 20 feet, the geologic sensitivity is high and vertical recharge is likely to occur within weeks to years. If the "L score is 0, but there are 20 or more feet of silty or sandy shale or silty or sandy clay overlying the aquifer, the geologic sensitivity is moderate and vertical recharge is likely to occur within years to decades. An "L" score of 1 to 4 indicates that the aquifer exhibits a low geologic sensitivity vertical recharge likely occurs over decades to a century. An "L" score of 5 or greater indicates that the aquifer exhibits a very low geologic sensitivity and vertical recharge likely takes over a century to occur.

Results of the well vulnerability analysis – Most of the wells used by the Public Water Supplier are considered to be vulnerable. The aquifers used by the City to provide water have geologic sensitivity ratings of low to very low with the exception of Well #18. Well #18 lacks the protection of the Glenwood and basal St. Peter Sandstone. This portion of the Glenwood and St. Peter Sandstone formations act as a confining layer and found at each of the other City well locations.

The wells completed in the Mt. Simon aquifer are considered to be not vulnerable. They receive an L score of at least 5 due to the presence of at least 50 feet of Eau Claire

Formation confining layer in each of the wells. A well vulnerability summary is provided as **Table 6**.

5.2 Vulnerability Assessment for Drinking Water Supply Management Area

Portions of the DWSMA for the City’s municipal wells are assigned low, moderate, and high vulnerability ratings. Based on the DNR geologic sensitivity rating, and the bedrock geologic maps, the aquifers mostly exhibit low to very low geologic sensitivity to contamination, with the exception of the Jordan aquifer near Well #18 as described above, where the basal St. Peter and Glenwood Formations are not present.

Plate 2 from the Hennepin County Geologic Atlas entitled Bedrock Geology was used as a starting point to delineate aquifer vulnerability zones. The DNR geologic sensitivity rating for the Prairie du Chien aquifer is based, in part, upon the presence of the the Glenwood Formation and the basal St. Peter. Where the Glenwood Formation is present, the areas were delineated and a low vulnerability was assigned. The areas where the St. Peter Sandstone is the first encountered bedrock, a moderate vulnerability was assigned. Where both formations were absent and the Prairie du Chien is in direct contact with surficial sediments (in the southern portions of the DWSMA), the areas were delineated and assigned a high vulnerability.

These delineations were then updated with new well information collected since the Geologic Atlas was published in 1989. A shapefile, provided by the MDH, containing L scores calculated based upon County Well Index boring logs, was used to refine the vulnerability delineation. This shapefile was updated and boring logs were reviewed to verify the L-scores assigned. Where L-scores contradicted what the bedrock geology assessment provided, boring logs were reviewed and the boring location was either re-classified or the boundary of the vulnerability delineation based on bedrock analysis was revised. For example, if at least two feet of the Glenwood Formation was present, a low vulnerability was assigned.

If at least two feet of the Glenwood Formation was present, a low vulnerability was assigned. However due to the presence of contaminants in some of the wells in areas originally assigned a low vulnerability, these areas were re-assigned a moderate vulnerability. When analytical data was readily available, it was used to modify the DWSMA vulnerability. Figure 12 shows the DWSMA vulnerability delineation.

Due to the fact that there is extensive separation between the ground surface and the aquifers used by the City, a conjunctive delineation of potential surface contribution was not necessary.

6.0 Recommendations

SEH makes the following recommendations for plan implementation action items that the Public Water Supplier should consider. Each recommendation is referenced to the plan implementation category under which it can be incorporated. Each recommendation will be further evaluated during the preparation of the Part II WHP Plan Update.

Plan Implementation Category –Stakeholder Cooperation

Item 1 - Work Cooperatively with Neighboring Municipalities Regarding Wellhead Protection

The DWSMA that was delineated as part of this project extends beyond the Edina municipal boundaries. While developing and implementing Part II of the City's WHPP, it is recommended that collaboration and cooperation with municipalities in which the City's DWSMA extends to. As the City cannot dictate landuse activities outside of its jurisdiction, it can work closely with surrounding municipalities as landuses change and decisions are made that may impact land within the City's DWSMA boundary.

Item 2 - Work Cooperatively with Neighboring Stakeholder Groups and Local Governmental Units

There are many stakeholders and local governmental units (LGUs) that may be found within the City's DWSMA boundary. It is recommended that as the City and/or LGUs plan to make changes that may affect landuse within the DWSMA boundary, that attempts be made to work collaboratively together to meet each of their needs and/or goals.

Plan Implementation Category – Contingency Planning

Item 3 - Addressing the potential movement of contamination toward the community wells.

Due to the presence of contaminated sites within the DWSMA, the MDH recommends that if contaminants are detected, the Public Water Supplier contact the MDH hydrologist so that the MDH can perform an evaluation of whether to continue pumping the impacted well. Turning off a well may alter the movement of contamination to other pumping wells and compound the problem. Therefore, it is very important to include this recommendation in the Part II contingency plan.

Plan Implementation Category – Contaminant Source Management

Item 4 - Assessing the risks that leaking fuel tank sites and existing hazardous waste generators may present to the community water supply.

There are several sites where underground fuel storage tanks have leaked and the presence of hazardous waste generators may present a risk to the community's drinking water. It is recommended that the reports of investigation for above mentioned sites be reviewed to identify whether remaining fuel or fuel breakdown products may move toward the City wells. SEH staff can assist the Public Water Supplier with this evaluation and it should be performed by the third year of plan implementation. The results of the evaluation will identify whether additional investigation of any site is warranted by the Minnesota Pollution Control Agency to address uncertainty about contaminant movement toward the community wells.

7.0 Standard of Care

The interpretations presented in this report are based on local data collected during this study and previous studies, such as current and historical pumping tests and regional data collected from governmental agencies. Data collected and analyzed by others and used in this report may not be precise or accurate. This Plan does not account for any variations that may occur between points of exploration; geologic and hydrogeologic conditions

likely differ across the study area. Also, it must be noted that seasonal and cyclical fluctuations in the hydrogeologic characteristics and properties of the aquifers will occur.

The scope of this report and the corresponding groundwater flow model and calculations is limited to the delineation of capture zones for the City of Edina municipal wells. Use of the groundwater flow model by other parties or for other purposes is not advised. Use or modification of the model for purposes other than the delineation of capture zones must be done with caution and a full understanding of the inherent assumptions and limitations of the data.

This Plan represents our understanding of the significant aspects of the local geologic and hydrogeologic conditions; the conclusions are based on our hydrogeologic and engineering judgement, understanding and perspective, and represent our professional opinions. These opinions were arrived at in accordance with the currently accepted standard of care for geologic and engineering practices at this time and location. No warranty is implied or intended.

8.0 References

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**Table 1
Municipal Well Details
City of Edina**

Local Well Name	Unique Number	Use/ Status	XUTM	YUTM	Casing Diameter (inches)	Casing Depth (feet)	Well Depth (feet)	Aquifer	Aquifer Thickness (ft)*	Well Elevation	Static Water Level**	Static Water Elevation (ft msl)
Well 2	208399	Primary	473055	4973236	20x16x12	266	448	OPCJ	188	882	80	802
Well 3	240630	Seasonal	473877	4972740	12	265	496	OPCJ	231	875	72	803
Well 4	200561	Primary	472735	4971840	24x16	266	500	OPCJ	234	895	80	815
Well 5	206377	Seasonal	474068	4969468	24x20x16	257	443	OPCJ	206	869	78	791
Well 6	200564	Primary	472527	4971541	24x16	316	503	CDJN	215	902	90	812
Well 7	206474	Seasonal	471863	4972656	24x16	350	547	CDJN	221	951	112	839
Well 8	204884	Seasonal	471630	4970067	24x16	232	472	OPCJ	225	869	49	820
Well 9	206588	Emergency	471483	4971517	16x16x10	1010	1130	Mt. Simon	260	928	325	603
Well 10	206184	Primary	473176	4968046	24x20x16	881	1001	Mt. Simon	271	826	144	682
Well 11	206183	Primary	473197	4968034	24x16	321	403	CJDN	98	826	22	804
Well 12	203614	Primary	468781	4974160	24x16	955	1080	Mt. Simon	248	941	252	689
Well 13	203613	Primary	468781	4974160	24x16	429	495	CJDN	82	944	97	847
Well 14	200913	Emergency	469878	4968167	16	325	420	CJDN	99	869	38	831
Well 15	207674	Seasonal	470874	4973231	30x24x20	275	475	OPCJ	210	902	112	790
Well 16	203101	Seasonal	469482	4970571	30x20	265	381	OPCJ	126	895	66	829
Well 17	200914	Primary	473561	4971433	30x24	373	461	CJDN	98	869	59	810
Well 18	200918	Seasonal	474656	4968640	30x24x16	365	446	CJDN	93	859	61	798
Well 19	505626	Seasonal	470092	4969770	30x24x18	440	521	CJDN	93	944	163	781
Well 20	686286	Seasonal	469502	4970896	30x24x18	265	467	OPCJ	212	881	90	791

**Table 3
Annual Municipal Well Pumping (Gallons)
City of Edina**

City Well Number	Unique Number	Use/Status	2005	2006	2007	2008	2009	Projected 2015 Withdrawal (gal/yr)*	Daily Withdrawal Used in DWSMA Delineation (gal/day)
2	208399	Primary	79,360,000	57,977,000	328,509,000	342,970,000	258,348,000	262,761,650	939,644
3	240630	Seasonal	7,628,200	10,357,700	6,199,400	1,873,000	174,612,000	177,595,094	486,562
4	200561	Primary	29,810,000	189,537,000	73,946,000	207,748,000	314,537,000	319,910,590	876,467
5	206377	Seasonal	138,231,000	208,457,000	239,437,000	106,592,000	111,763,000	113,672,373	655,992
6	200564	Primary	450,226,000	358,823,000	313,860,000	325,793,000	226,807,000	230,681,800	1,233,496
7	206474	Seasonal	0	0	0	0	0	0	0
8	204884	Seasonal	110,232,003	62,763,000	49,290,000	22,157,000	10,195,000	10,369,173	302,005
9	206588	Emergency	0	819,500	7,895,000	514,000	811,000	824,855	21,630
10	206184	Primary	190,072,000	171,027,000	134,115,000	245,086,000	267,980,000	272,558,205	734,192
11	206183	Primary	504,545,000	360,927,000	259,012,000	459,227,000	479,046,000	487,230,083	1,382,315
12	203614	Primary	284,940,000	143,612,000	118,211,000	246,539,000	128,405,000	130,598,687	780,658
13	203613	Primary	325,691,000	250,095,000	459,942,000	382,873,000	323,542,000	329,069,433	1,260,115
14	200913	Emergency	86,809,000	79,039,000	3,804,000	0	0	0	237,833
15	207674	Seasonal	54,884,000	51,542,000	77,669,000	20,795,000	11,828,000	12,030,071	212,792
16	203101	Seasonal	120,836,000	276,573,000	166,981,000	94,392,000	57,843,000	58,831,197	757,734
17	200914	Primary	26,105,000	8,253,000	10,778,000	20,688,000	55,172,000	56,114,566	153,739
18	200918	Seasonal	121,643,000	252,311,000	181,868,000	74,164,000	57,761,000	58,747,796	691,263
19	505626	Seasonal	73,526,000	299,278,000	259,116,000	140,924,000	138,456,000	140,821,400	819,940
20	686286	Seasonal	0	0	0	0	155,526,000	158,183,026	433,378
Totals			2,604,538,203	2,781,391,200	2,690,632,400	2,692,335,000	2,772,632,000	2,820,000,000	

All volumes are reported in gallons per year

Shaded box indicates the greatest annual pumping volume in the past five years.

Well 20 installed in 2008

* Projected volume of 2,820 million gallons per year was taken from the City of Edina Water Supply Plan. This number was divided at the same ratio as the 2009 volume per well.

**10 year time period assuming a pumping rate per yr equal to the 2015 projection per well

Table 4
Permitted High-Capacity Wells Within 2.0 miles
DNR State Water Use Database System (SWUDS)
City of Edina

DNR Permit	Name	Well Number	Permittee	Use	Aquifer	XUTM	YUTM	Permit Volume	2008 Use	2007 Use	2006 Use	2005 Use	2004 Use
1960-0231	1	222905	INDIANHEAD LAKE IMPROVEMENT ASSOC	Basin/Lake Level Maintenance	OSTPCJDN	469413	4969978	10.0	3.2	4.1	1	2.6	2.4
1966-1167	1	204072	OAK RIDGE COUNTRY CLUB	Golf Course Irrigation	OPDCCJDN	467936	4975969	50.0	23	18.9	17.8	16.6	20.3
1969-0490	1		INTERLACHEN COUNTRY CLUB	Golf Course Irrigation	OPCJ	470429	4973886	53.0	1.4	1.3	1.3	1	0.5
1969-0490	3		INTERLACHEN COUNTRY CLUB	Golf Course Irrigation	OPCJ	470429	4973886	53.0	11.1	14.7	14.4	9.3	1.8
1969-0490	4	453805	INTERLACHEN COUNTRY CLUB	Golf Course Irrigation	OPCJ	470429	4973886	53.0	15.5	15.9	15.1	9.5	14.8
1970-0815	1	236635	HENNEPIN COUNTY PARKS	Camgrounds/Waysides/Rest Areas	QBAAOPDC	470181	4967184	10.0	0.3	0.7	1.8	3.1	0
1972-1231	2	161443	EDINA COUNTRY CLUB	Golf Course Irrigation	OPDCCJDN	472699	4973190	45.0	12.7	27.4	0	0	20.3
1972-1231	3	161443	EDINA COUNTRY CLUB	Golf Course Irrigation	OPDCCJDN	472689	4972593	45.0	9.7	9.8	11.2	16.8	0
1973-1007	4	200542	ST LOUIS PARK, CITY OF	Municipal Waterworks	OPDCCJDN	473173	4975143	2,500.0	483.4	491.4	400.9	442.2	478.5
1973-1007	6	206457	ST LOUIS PARK, CITY OF	Municipal Waterworks	OPDCCJDN	472079	4974431	2,500.0	0.2	0.2	1.3	0.2	16.3
1973-1007	12	206456	ST LOUIS PARK, CITY OF	Municipal Waterworks	CMTS	472079	4974431	2,500.0	357.6	320.2	358.5	348.5	449.2
1973-1007	17	147459	ST LOUIS PARK, CITY OF	Municipal Waterworks	CMTS	469607	4976552	2,500.0	0	0	0	0	0
1975-6245	1	204573	HOPKINS, CITY OF	Municipal Waterworks	OPDCCJGL	467408	4974128	1,000.0	0	0	0	0	0
1975-6245	4	204068	HOPKINS, CITY OF	Municipal Waterworks	OPDCCJDN	466990	4975893	1,000.0	429.9	771.4	949.9	915.9	937.1
1975-6245	5	204570	HOPKINS, CITY OF	Municipal Waterworks	OPDCCJDN	467294	4975820	1,000.0	4.7	22.5	3.4	3.2	2.3
1975-6245	6	112228	HOPKINS, CITY OF	Municipal Waterworks	OPDCCJDN	467675	4975792	1,000.0	407.2	127	1.6	0.1	1.8
1975-6248	1	200534	MINIKAHDA CLUB	Golf Course Irrigation	OPCJ	474717	4976726	49.0	21.3	23.7	21.2	15.1	18.2
1975-6248	2	161436	MINIKAHDA CLUB	Golf Course Irrigation	OPDCCJDN	474567	4976776	49.0	7.3	8.9	5.8	4.4	4.2
1975-6260	2	119302	DUKE REALTY LTD PARTNERSHIP	Landscaping/Athletic Fields	OPDC	471837	4967227	1.6	0.1	0.1	0.1	0.1	0.1
1975-6269	5	433288	SOUTHDALE LTD PARTNERSHIP	Once-through heating or A/C	OPCJ	474274	4969823	210.0	32.4	41.1	36	37.8	39.8
1981-6197	1	147864	OXMOOR LAKE ASSOCIATION	Basin/Lake Level Maintenance	OPCJ	469363	4970031	4.0	3.1	2.5	2.7	2.6	2.9
1984-6234	1	206454	FLAME METALS PROCESSING	Metal Processing	OPDC	470491	4975748	2.0	0.1	0.1	0	0.1	0.1
1985-6073	1	206373	FAIRVIEW SOUTHDALE HOSPITAL	Commercial/Institutional Waterworks	OPDC	474275	4970322	7.2	0	0	0	0	0
1985-6073	1	206373	FAIRVIEW SOUTHDALE HOSPITAL	Other Power Generation	OPDC	474275	4970322	7.2	0	0	0	0	0
1985-6073	1	206373	FAIRVIEW SOUTHDALE HOSPITAL	Once-through heating or A/C	OPDC	474275	4970322	7.2	0	0	0	0	0
1985-6073	1	206373	FAIRVIEW SOUTHDALE HOSPITAL	Landscaping/Athletic Fields	OPDC	474275	4970322	7.2	2.9	2.5	2.8	3.2	3.4
1986-6125	1		MINNEAPOLIS PARK & REC BOARD	Golf Course Irrigation	MEADOWBROOK	471228	4974483	30.0	16.6	22.1	9.5	6.3	9.1
1987-6212	W420	434045	ST LOUIS PARK, CITY OF	Pollution Containment	QBAA	471043	4976098	77.0	8.6	22.6	18	17.5	17.7
1987-6212	W421	434044	ST LOUIS PARK, CITY OF	Pollution Containment	OPVL	471043	4976098	77.0	5.2	13.1	15.4	15.6	14.3
1987-6212	W422	434043	ST LOUIS PARK, CITY OF	Pollution Containment	QBAA	471439	4975896	77.0	0	0	0	0	0
1988-6212	W105	200979	ST LOUIS PARK, CITY OF	Pollution Containment	CIGL	470245	4976301	13.2	0	0	0	0	0
1988-6213	W23	216050	ST LOUIS PARK, CITY OF	Pollution Containment	OPCJ	470245	4976301	32.0	25.6	28.1	27.9	24.4	24.5
1990-6036	W410	434042	ST LOUIS PARK, CITY OF	Pollution Containment	OSTP	471439	4975896	53.0	11.5	30.1	36.4	44.7	27.2
1992-6099	1		THERMOTEC	Industrial Process Cooling Once-through	OPDC	467200	4973727	224.0	75.5	101.1	138.7	150.8	192.1
1992-6099	2		THERMOTEC	Industrial Process Cooling Once-through	OPDC	467002	4973725	224.0	0	0	0	1.2	2.1
1993-6208	1		DEWEY HILL III TOWNHOMES	Temporary Pollution Containment	DEWEY HILL III	470461	4968085	50.0	0	0	0	0	0
1993-6208	1		DEWEY HILL III TOWNHOMES	Basin/Lake Level Maintenance	DEWEY HILL III	470461	4968085	50.0	1.9	1.5	3.6	3.6	3.6
1995-6047	1	538134	ST LOUIS PARK, CITY OF	Pollution Containment	QWTA	471042	4976296	30.0	10.5	24.6	29	25.6	23.3
1998-6029	1		EDINA, CITY OF	Basin/Lake Level Maintenance	INDIANHEAD LAKE	469378	4969409	5.0	0	0	0	0	0
1998-6041	1		EDINA, CITY OF	Basin/Lake Level Maintenance	ARROWHEAD LAKE	468560	4970465	5.0	8	0	0	0	0
1998-6105	1		ST LOUIS PARK, CITY OF	Basin/Lake Level Maintenance	WOLFE LAKE	473025	4975895	80.0	0	0	0	0	0
1999-6058	1	617378	FILMTEC CORPORATION	Other Industrial Processing	CJDN	471808	4968830	100.0	54.3	53.9	55.1	62.3	61
2003-3049	1	112250	EDINA, CITY OF	Golf Course Irrigation	OPDCCJDN	469633	4968247	72.0	10.5	12.5	8.2	5.4	3.4
2003-3049	2	112249	EDINA, CITY OF	Golf Course Irrigation	OPDCCJDN	469233	4968557	72.0	29.1	34.2	32.6	19.1	25.2
2005-3101	1	718192	FILMTEC CORPORATION	Other Industrial Processing	CJDN	471444	4968534	177.0	107.7	93.9	59.5	4.9	0

**Table 5
Regional Aquifer Pumping Test Results
City of Edina**

Test Location	Year	Executor	Aquifer	Transmissivity (ft ² /day)	Storativity (S)	Specific Storage (Ss)	Porosity	Hydraulic Conductivity (ft/d)	Hydraulic Conductivity (m/d)
City of Minnetonka Well #6A (208021)	1994	MDH	Jordan	2,400	0.000015	1.59574E-07	0.2	25.5*	7.8
City of Edina Well #3 (240630)	1949	MDH	ODPC	14,818	0.00003	1.25523E-07	0.056	62**	18.9
City of Edina Well #10 (206184)	1995	MDH	Mt. Simon	2,187	NA	NA	0.2	8.1***	2.5

Notes: *Assuming an aquifer thickness of 94 feet

** Assuming an aquifer thickness of 239 feet

*** Assuming an aquifer thickness of 271 feet

gpd/ft = gallons per day per foot

ft²/d = square feet per day

Table 6
Vulnerability Assessment Summary Table
City of Edina

Local Well Name	Unique Number	Aquifer	SWP Vulnerability	DNR L Score	DNR Geologic Sensitivity Rating	Basis for SWP Vulnerability
Well 2	208399	OPCJ	Vulnerable	0	Very low	Detection of Nitrates
Well 3	240630	OPCJ	Vulnerable	0	Low	Detection of Nitrates and Tritium data from other wells
Well 4	200561	OPCJ	Vulnerable	0	Very low	Detection of Nitrates
Well 5	206377	OPCJ	Not Vulnerable	5	Very low	Presence of confining layer
Well 6	200564	CDJN	Vulnerable	0	Very low	Detection of Nitrates
Well 7	206474	CDJN	Vulnerable	4	Very low	Detection of VOCs
Well 8	204884	OPCJ	Vulnerable	11	Very low	Detection of Nitrates
Well 9	206588	Mt. Simon	Not Vulnerable	9	Very low	Presence of confining layers
Well 10	206184	Mt. Simon	Not Vulnerable	13	Very low	Presence of confining layers
Well 11	206183	CJDN	Vulnerable	10	Very low	Based on tritium data from other city wells
Well 12	203614	Mt. Simon	Not Vulnerable	14	Very low	Presence of confining layers
Well 13	203613	CJDN	Vulnerable	0	Very low	Based on tritium data from other city wells
Well 14	200913	CJDN	Vulnerable	8	Very low	Detection of Nitrates
Well 15	207674	OPCJ	Vulnerable	0	Very low	Based on Tritium Data from other City Wells and low level VOCs from 1997-2001
Well 16	203101	OPCJ	Vulnerable	8	Very low	Based on Tritium Data from other City Wells
Well 17	200914	CJDN	Vulnerable	12	Very low	Based on Tritium Data from other City Wells
Well 18	200918	CJDN	Vulnerable	0	High	DNR Classification of High
Well 19	505626	CJDN	Vulnerable	17	Very low	Based on Tritium Data from other City Wells
Well 20	686286	OPCJ	Vulnerable	0	High	DNR Classification of High

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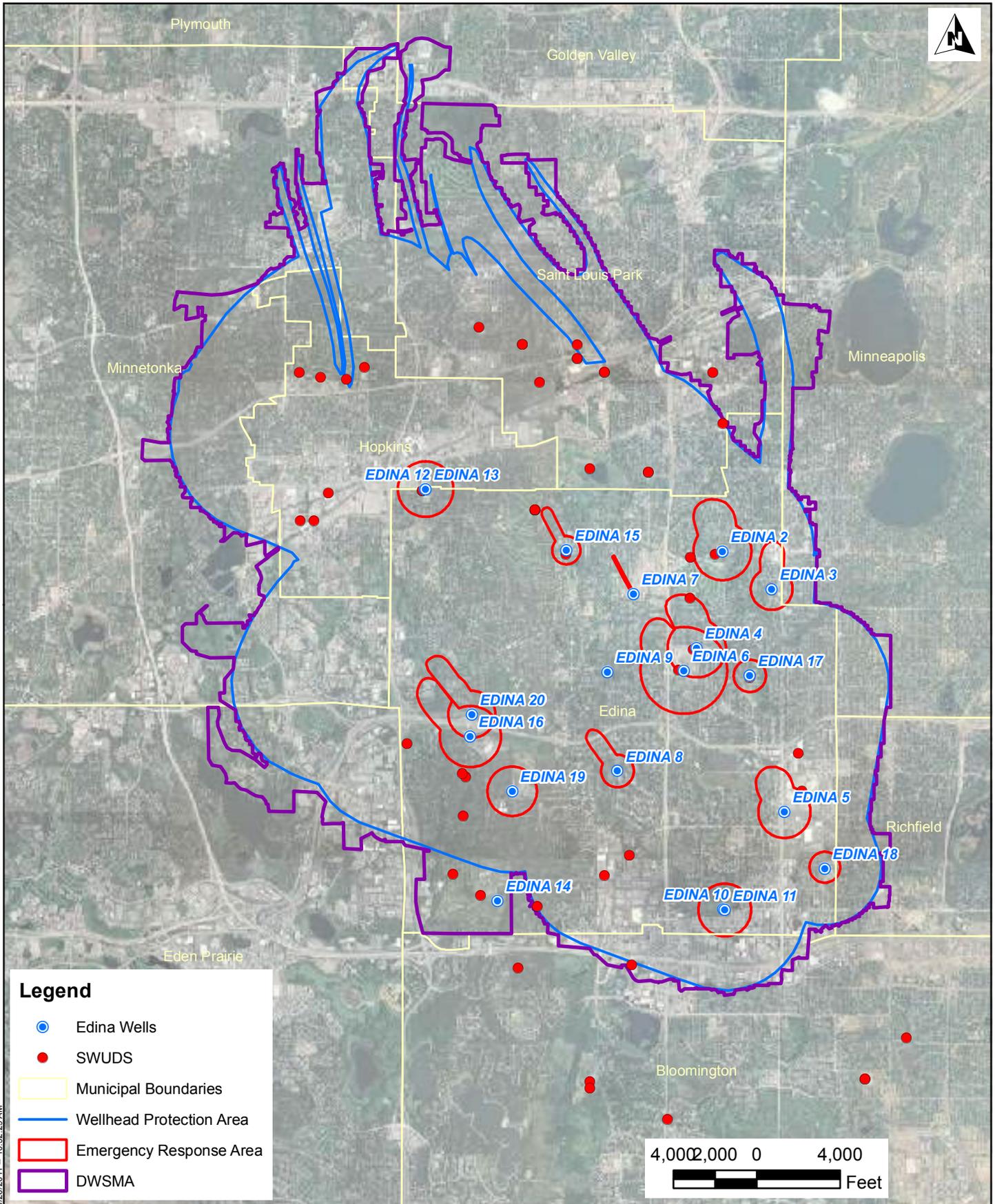
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Legend

- Edina Wells
- SWUDS
- Municipal Boundaries
- Wellhead Protection Area
- Emergency Response Area
- DWSMA



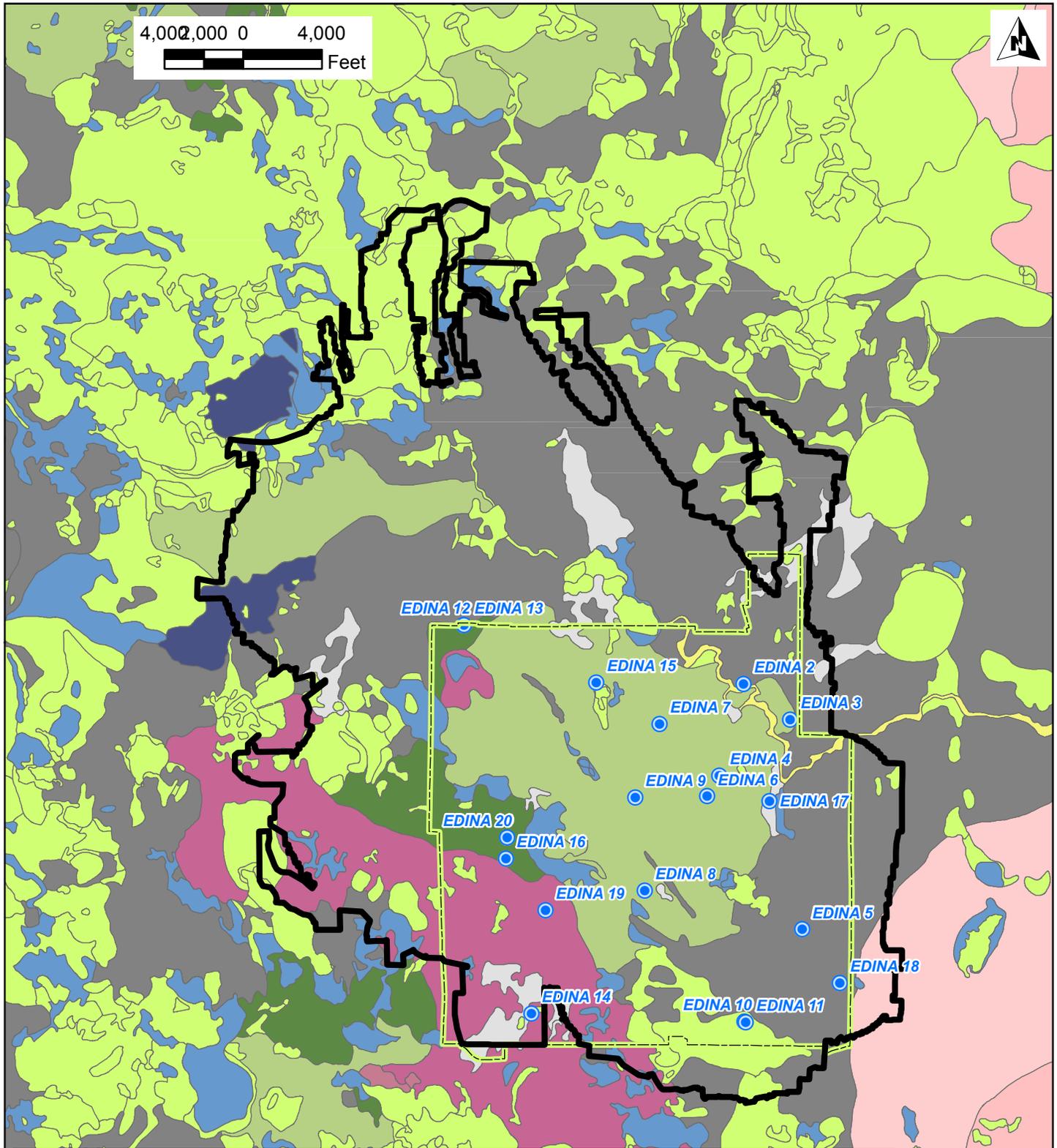
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WHPA and DWSMA
Edina Wellhead Protection Plan Update
Edina, Minnesota

Figure
1

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Legend

- | | | | | |
|--------------------|--------------------------------------|----------------------------|---------------------------------|---------------------------|
| Edina Wells | Surficial Geology | Middle Terrace | Ice-Contact Stratified Deposits | Till of Mixed Composition |
| Municipal Boundary | Description Missing | Upper Terrace | Glacial Till | Outwash |
| Railroads | Organic Deposits | Lacustrine Clay and Silt | Sandy Till | Silt to Sand |
| DWSMA | Organic Deposits, Drained and Filled | Lacustrine Sand and Gravel | Loamy Till | |
| | Floodplain Alluvium (Sandy) | | | |

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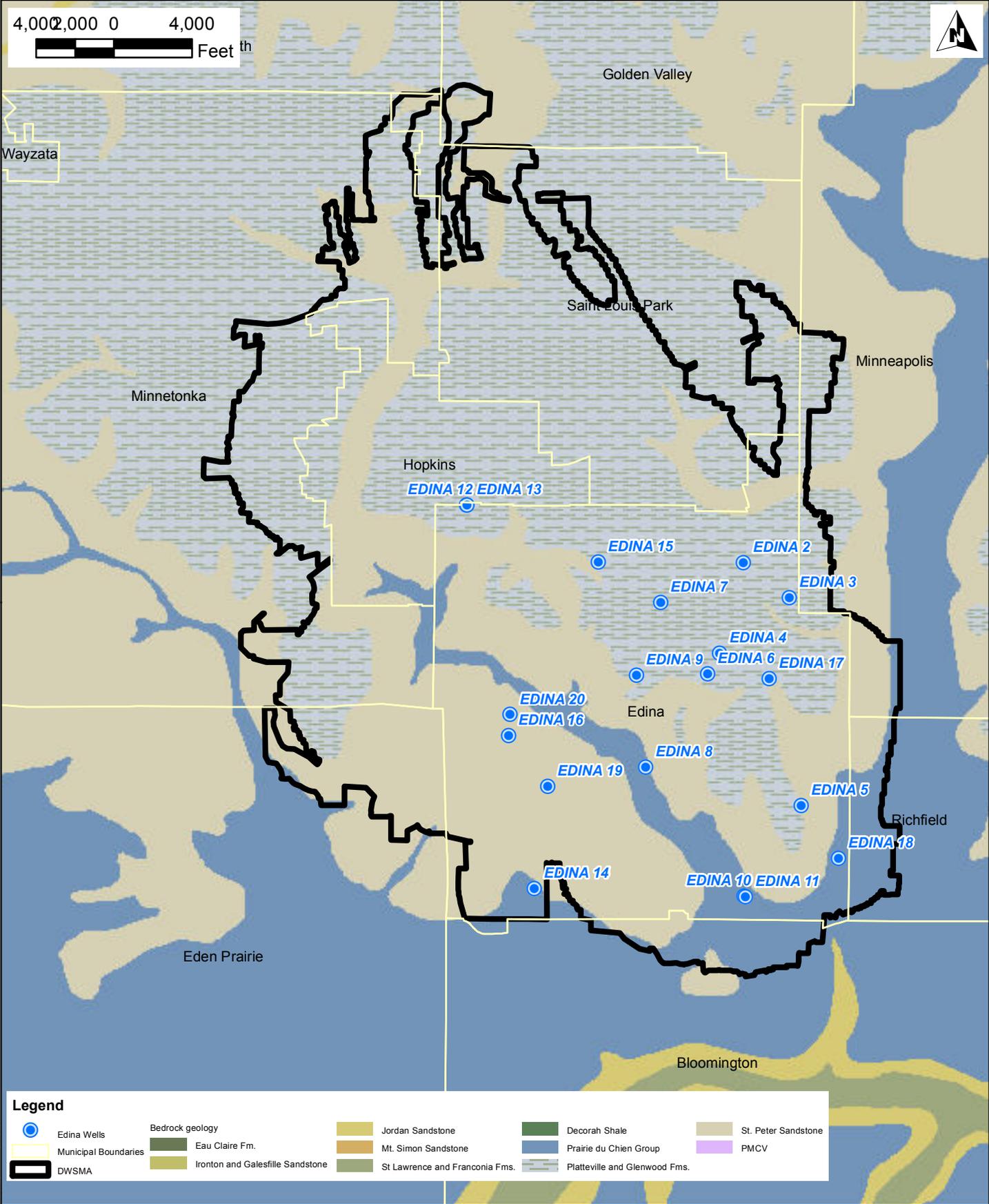
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SURFICIAL GEOLOGY
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Figure 2

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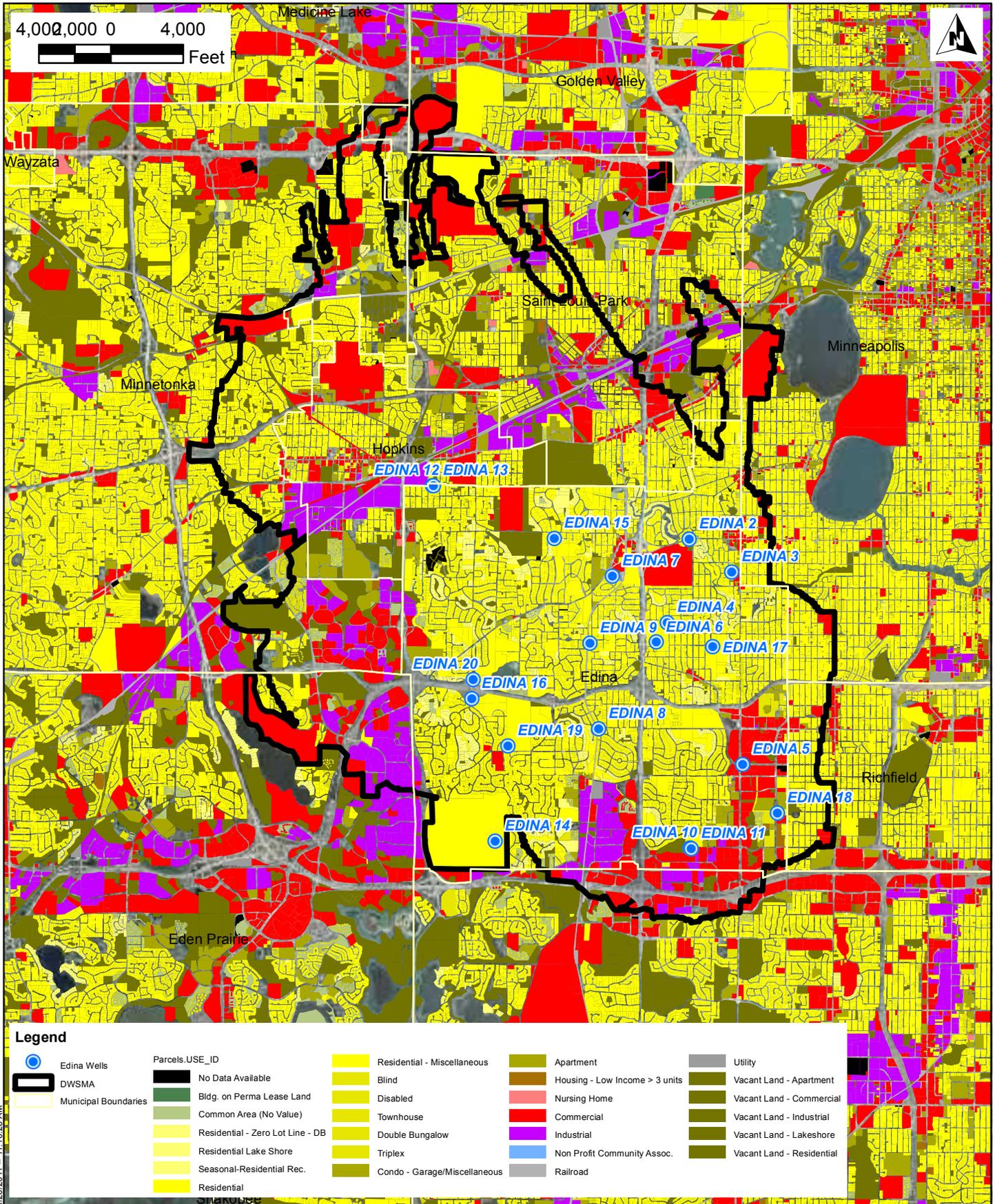
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BEDROCK GEOLOGY
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Figure
 3

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Legend

	Edina Wells		DWWSMA		Municipal Boundaries
	Residential - Miscellaneous		Apartment		Utility
	Blind		Housing - Low Income > 3 units		Vacant Land - Apartment
	Disabled		Nursing Home		Vacant Land - Commercial
	Townhouse		Commercial		Vacant Land - Industrial
	Double Bungalow		Industrial		Vacant Land - Lakeshore
	Triplex		Non Profit Community Assoc.		Vacant Land - Residential
	Condo - Garage/Miscellaneous		Railroad		
	Residential Lake Shore				
	Seasonal-Residential Rec.				
	Residential				
	Common Area (No Value)				
	Residential - Zero Lot Line - DB				
	Bldg. on Perma Lease Land				
	No Data Available				

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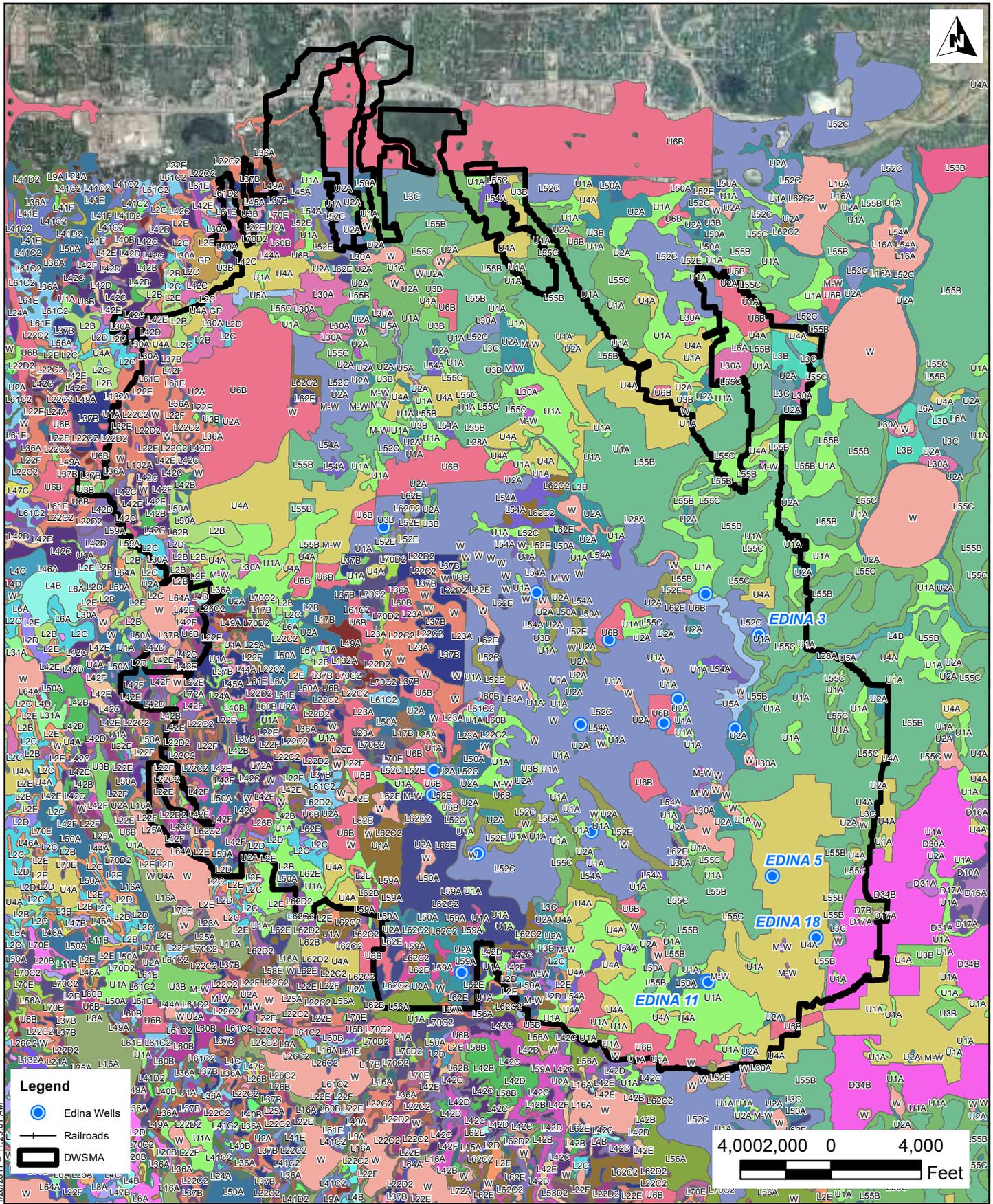
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EXISTING LAND USE
Edina Wellhead Protection Plan Update
Edina, Minnesota

Figure 4

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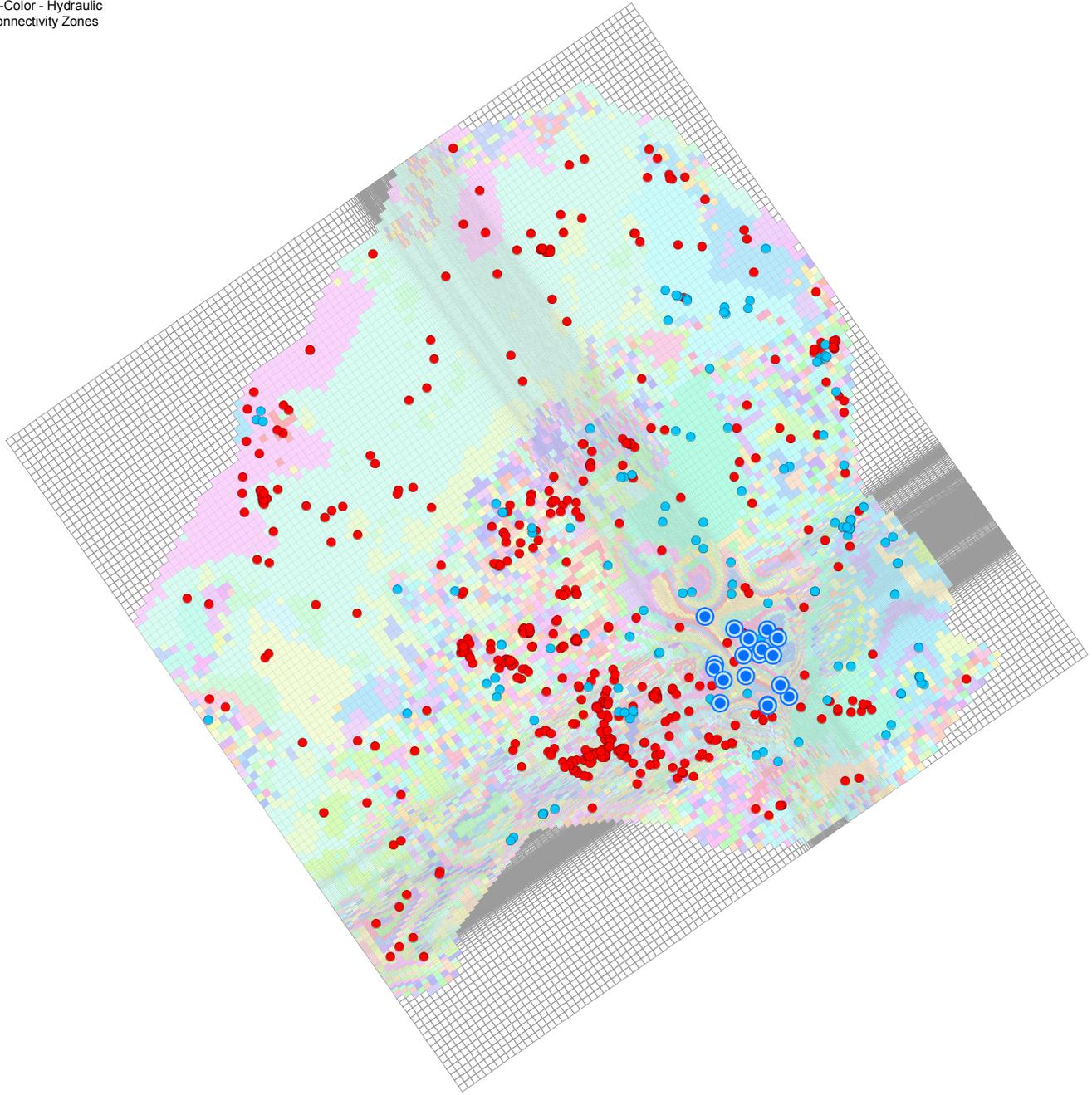
	3535 VADNAIS CENTER DR. ST. PAUL, MN 55110 PHONE: (651) 490-2000 FAX: (651) 490-2150 WATTS: 800-325-2055 www.sehinc.com	Project: EDINA 110899 Print Date: 05/31/2011	SSURGO Soils Edina Wellhead Protection Plan Update Edina, Minnesota	Figure 5
	Map by: SRH/ejt Projection: UTM, Zone 15, NAD 83, m Source: USGS 7.5 Min. Topo, MnDOT, and SEH Inc.			

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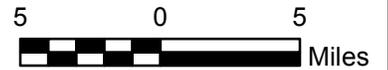
Legend

-  Edina Wells
-  Reference Wells
-  Layer Targets
-  Inactive Cells

Multi-Color - Hydraulic
Connectivity Zones



Map Document: (S:\AE\Edina\110899\GIS\Maps\Phase1\Fig06-1_Layer3_GWFlowModel\Feat.mxd)
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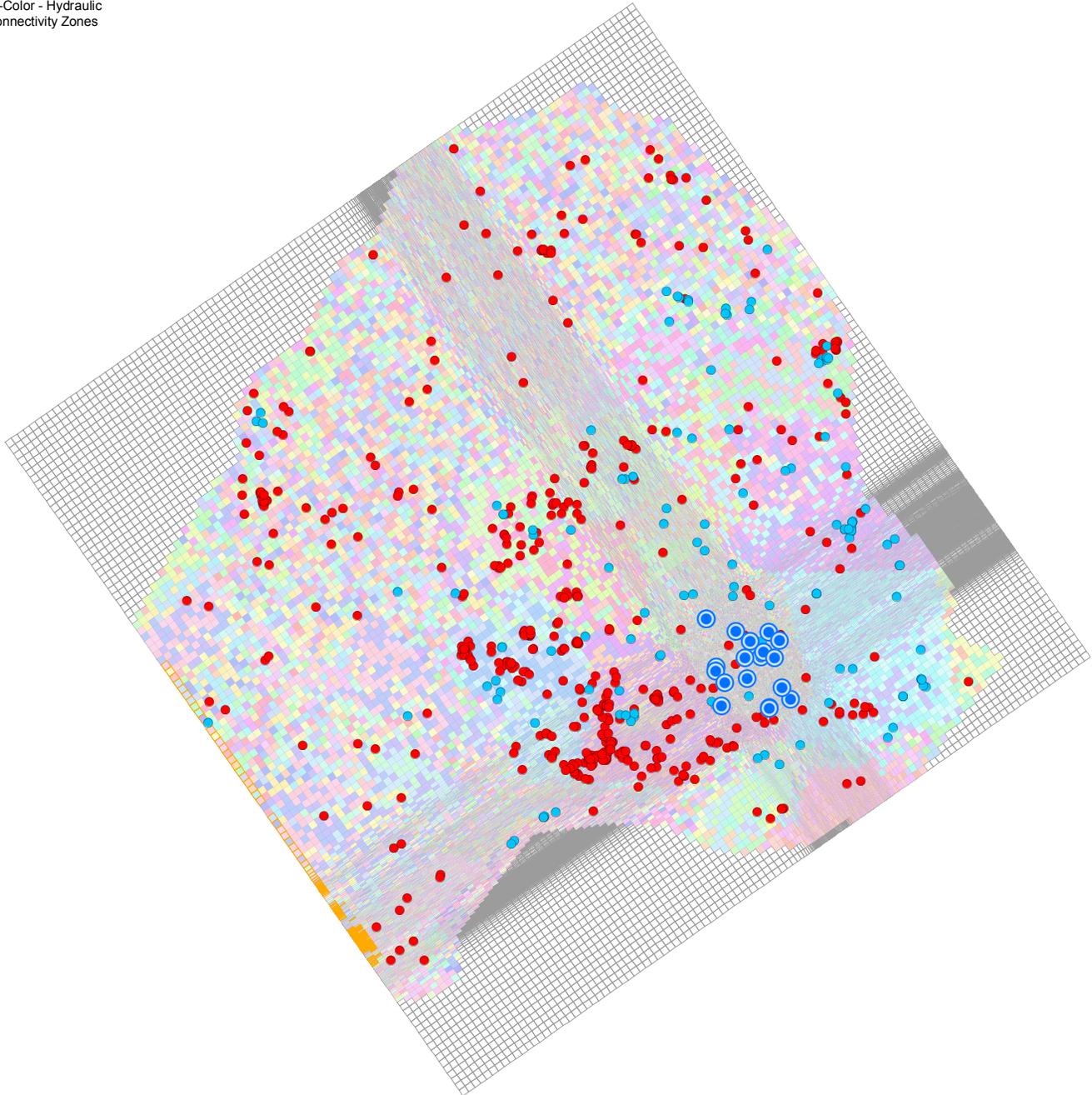
**Layer 3 Groundwater Flow
Model Features**
Edina Wellhead Protection Plan Update
Edina, Minnesota

Figure
6-1

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Legend

-  Edina Wells
-  Reference Wells
-  Layer Targets
-  Constant Head
-  Inactive Cells
- Multi-Color - Hydraulic Connectivity Zones



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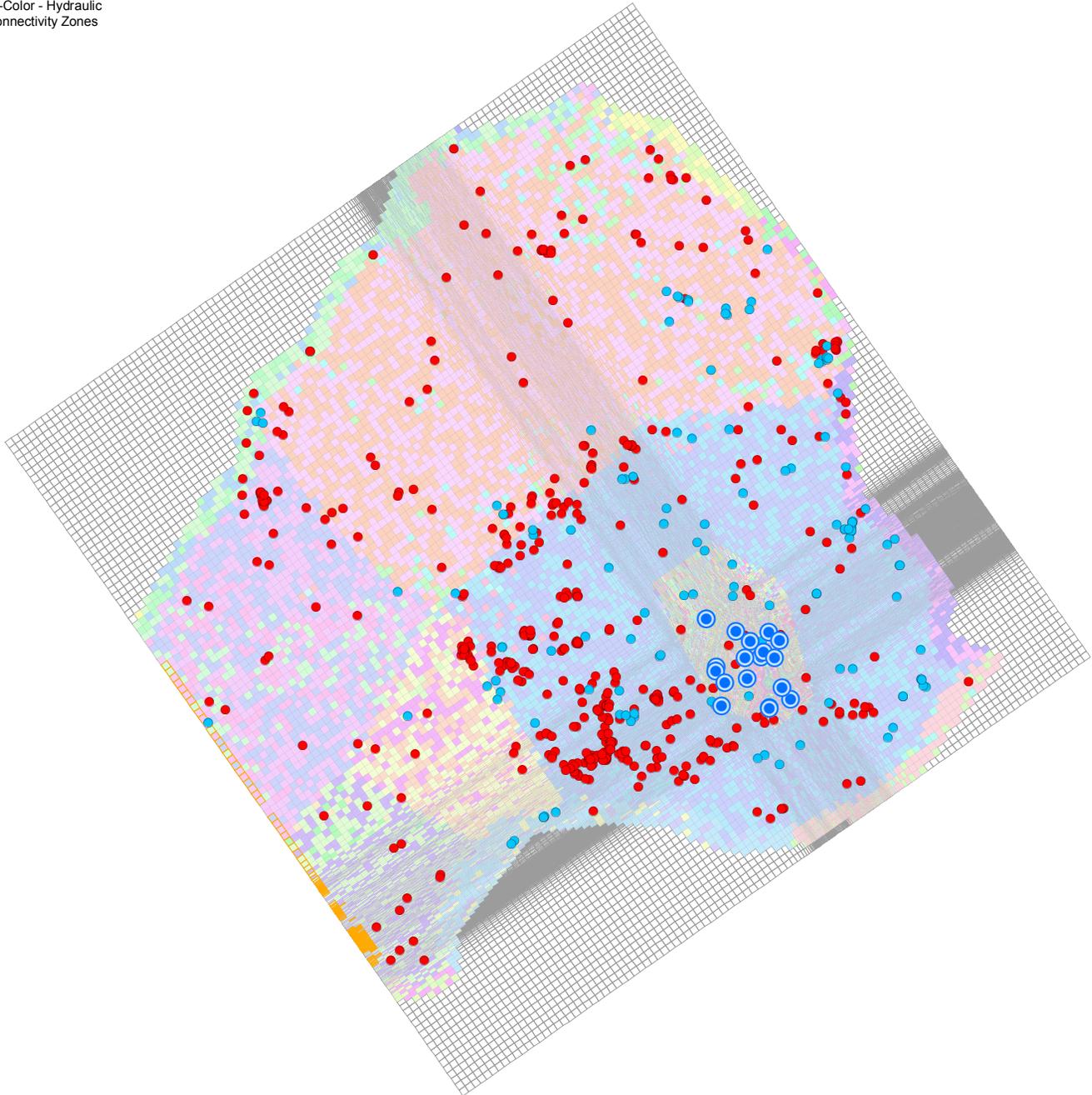
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Model Features**
Edina Wellhead Protection Plan Update
Edina, Minnesota

Figure
6-2

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Legend

-  Edina Wells
-  Reference Wells
-  Layer Targets
-  Constant Head
-  Inactive Cells
- Multi-Color - Hydraulic Connectivity Zones



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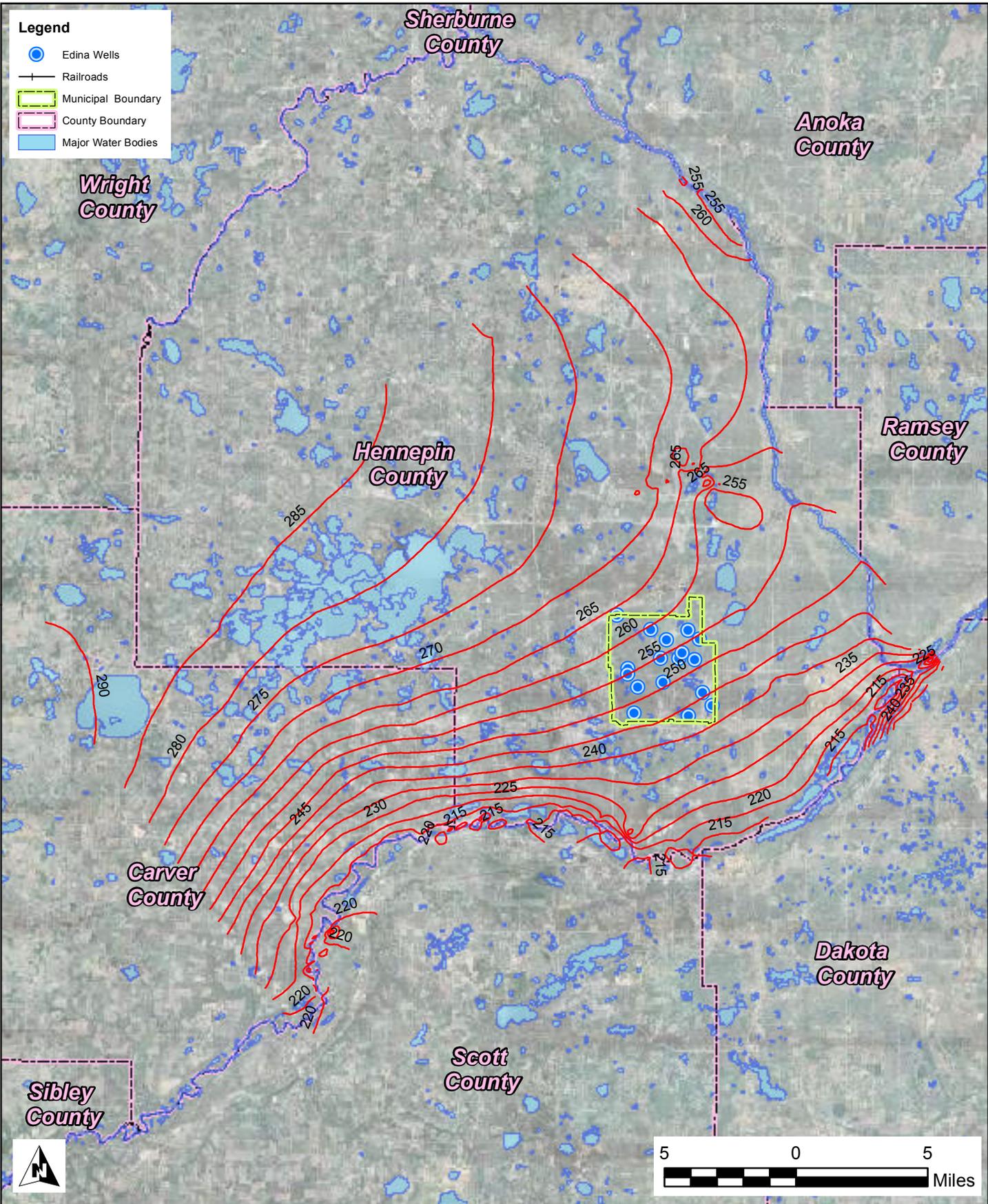
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**Layer 9 Groundwater Flow
Model Features**
Edina Wellhead Protection Plan Update
Edina, Minnesota

Figure
6-3

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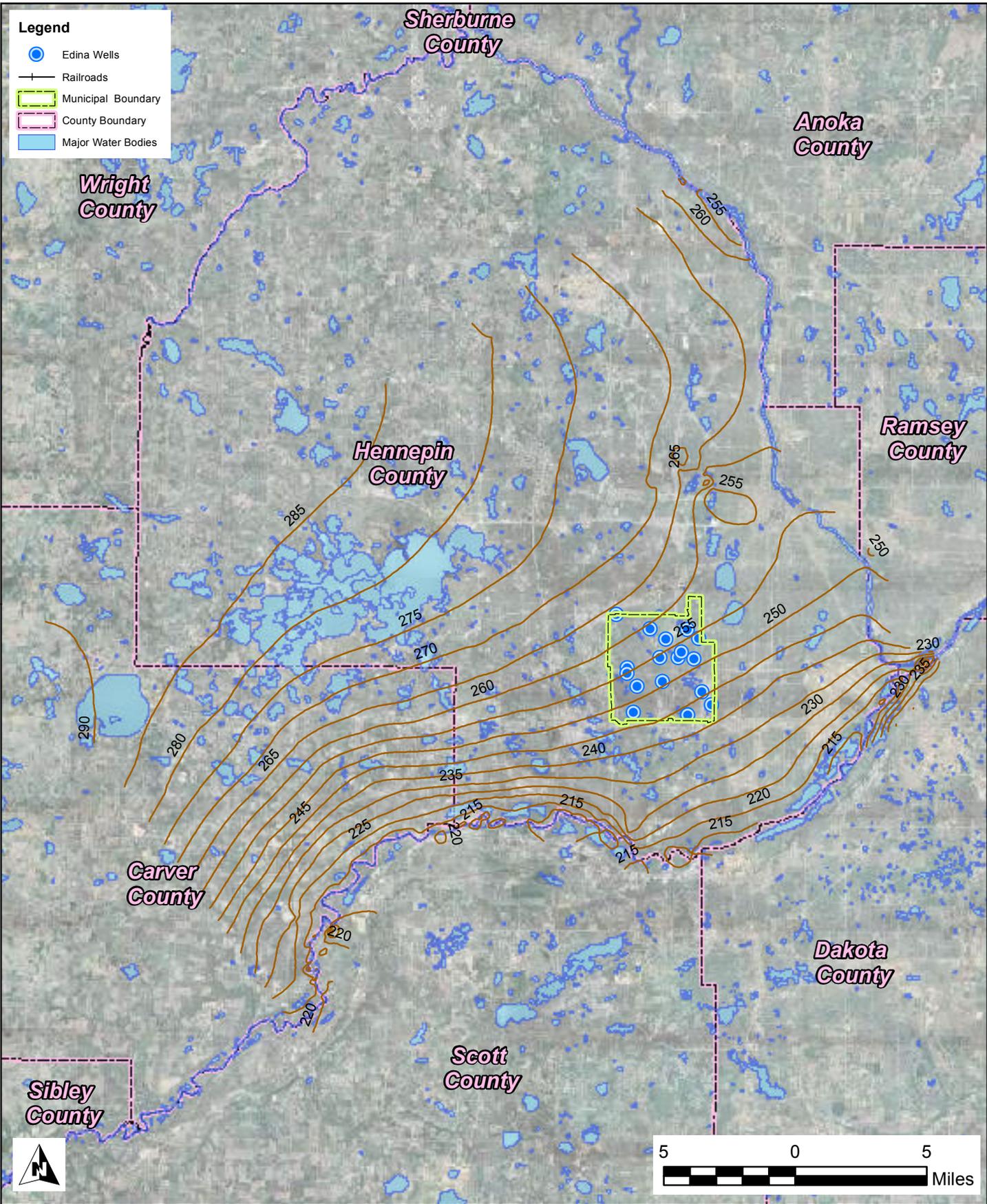
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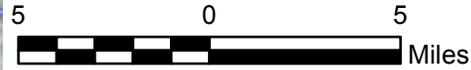
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 Edina Wellhead Protection Plan Update
 Edina, Minnesota

Figure
 7-1

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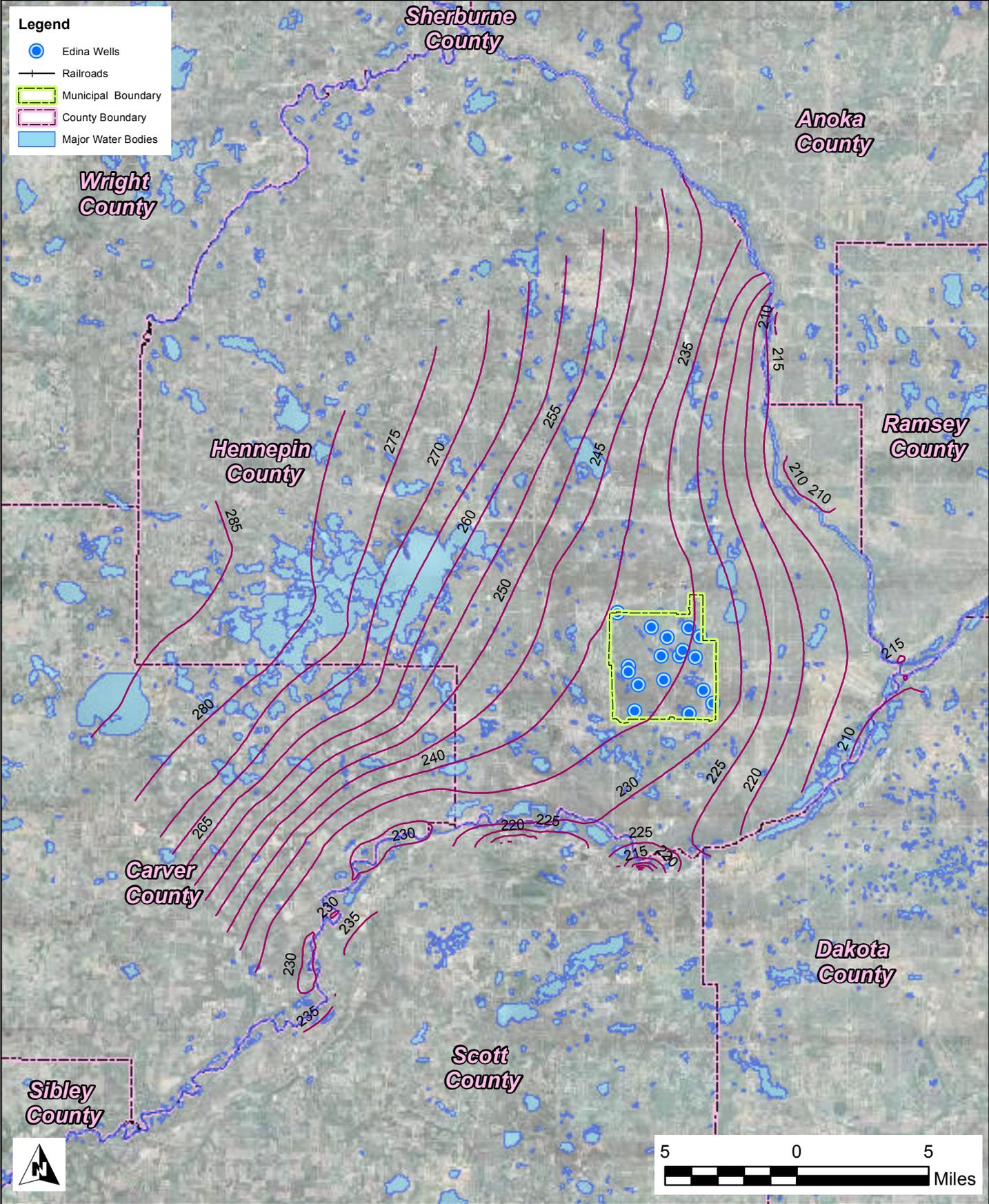
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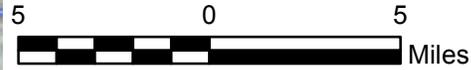
Layer 4 Groundwater Flow Field
Edina Wellhead Protection Plan Update
Edina, Minnesota

Figure
7-2

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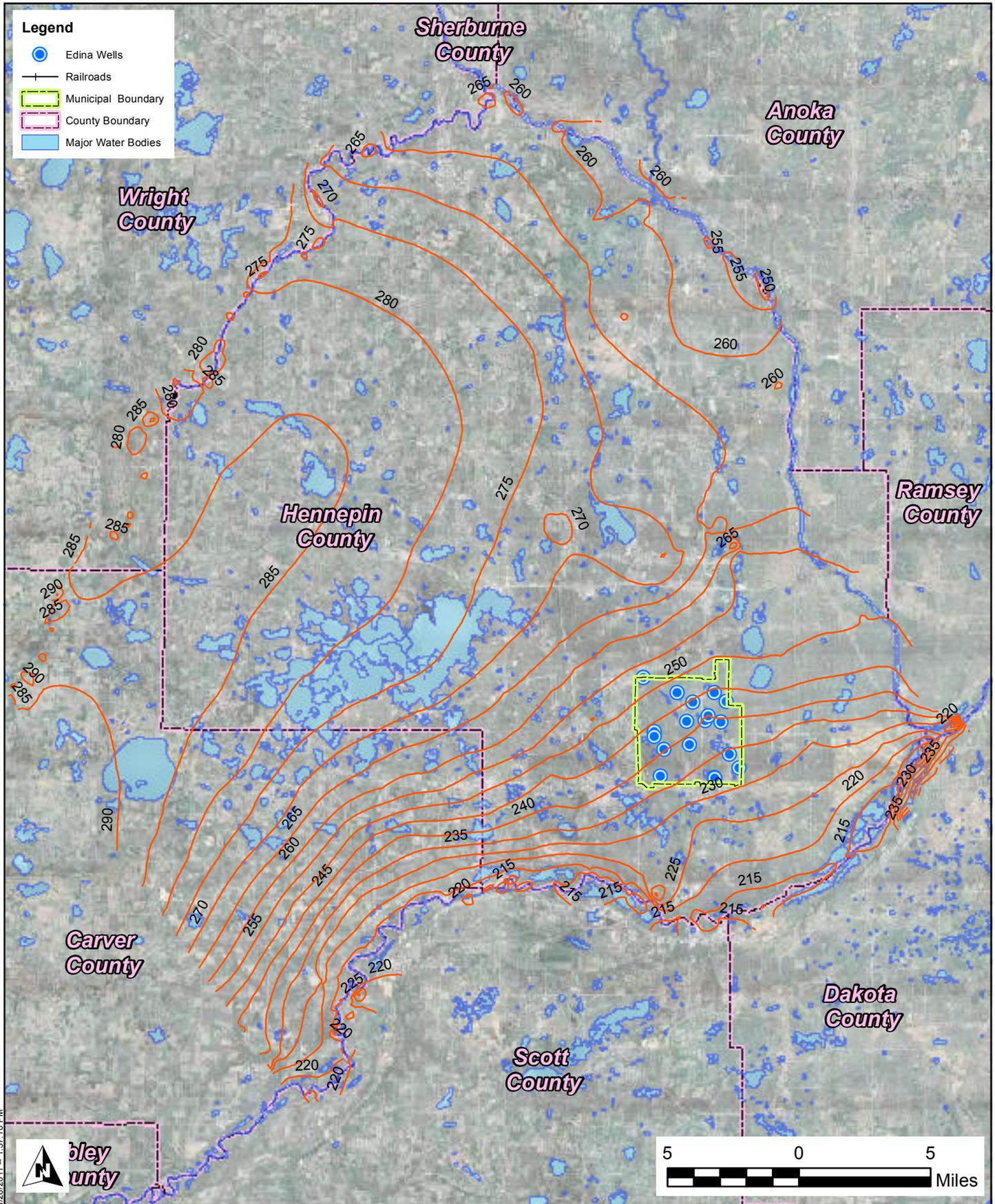
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Layer 9 Groundwater Flow Field
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 Edina, Minnesota

Figure
 7-3

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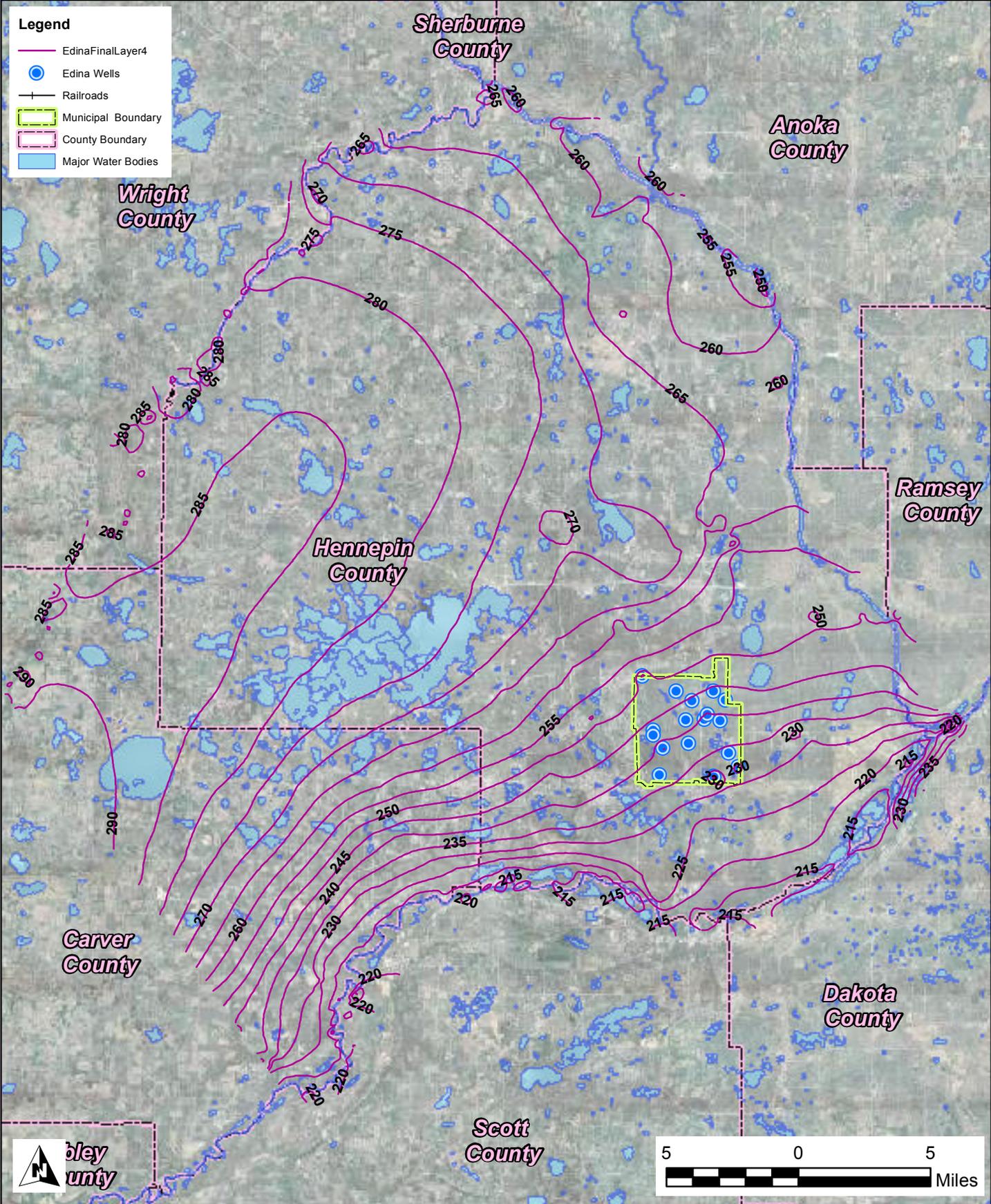
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**Layer 3 Calculated Groundwater
Flow Model Head**
Edina Wellhead Protection Plan Update
Edina, Minnesota

**Figure
8-1**

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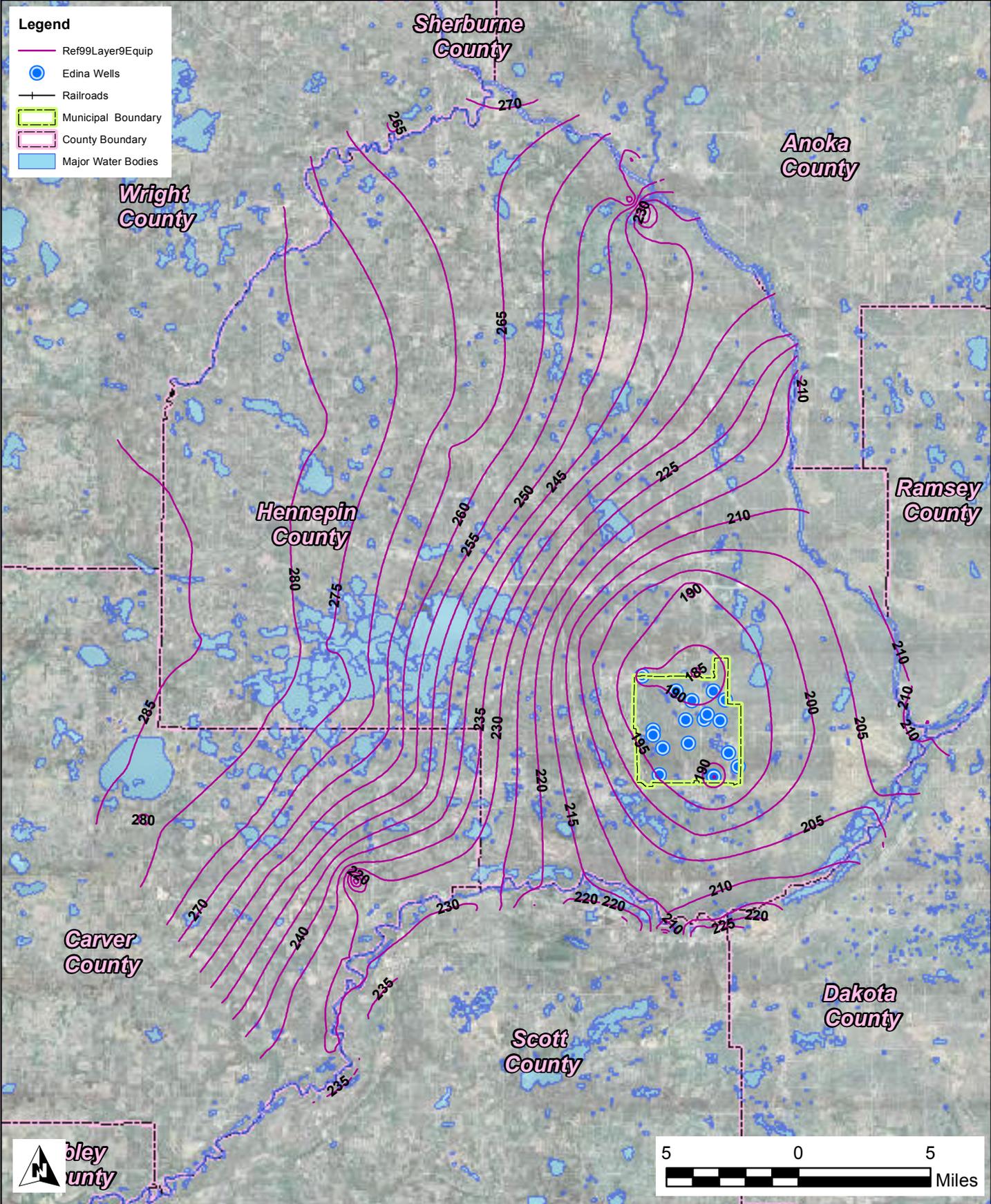
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**Layer 4 Calculated Groundwater
 Flow Model Head**
 Edina Wellhead Protection Plan Update
 Edina, Minnesota

Figure
 8-2

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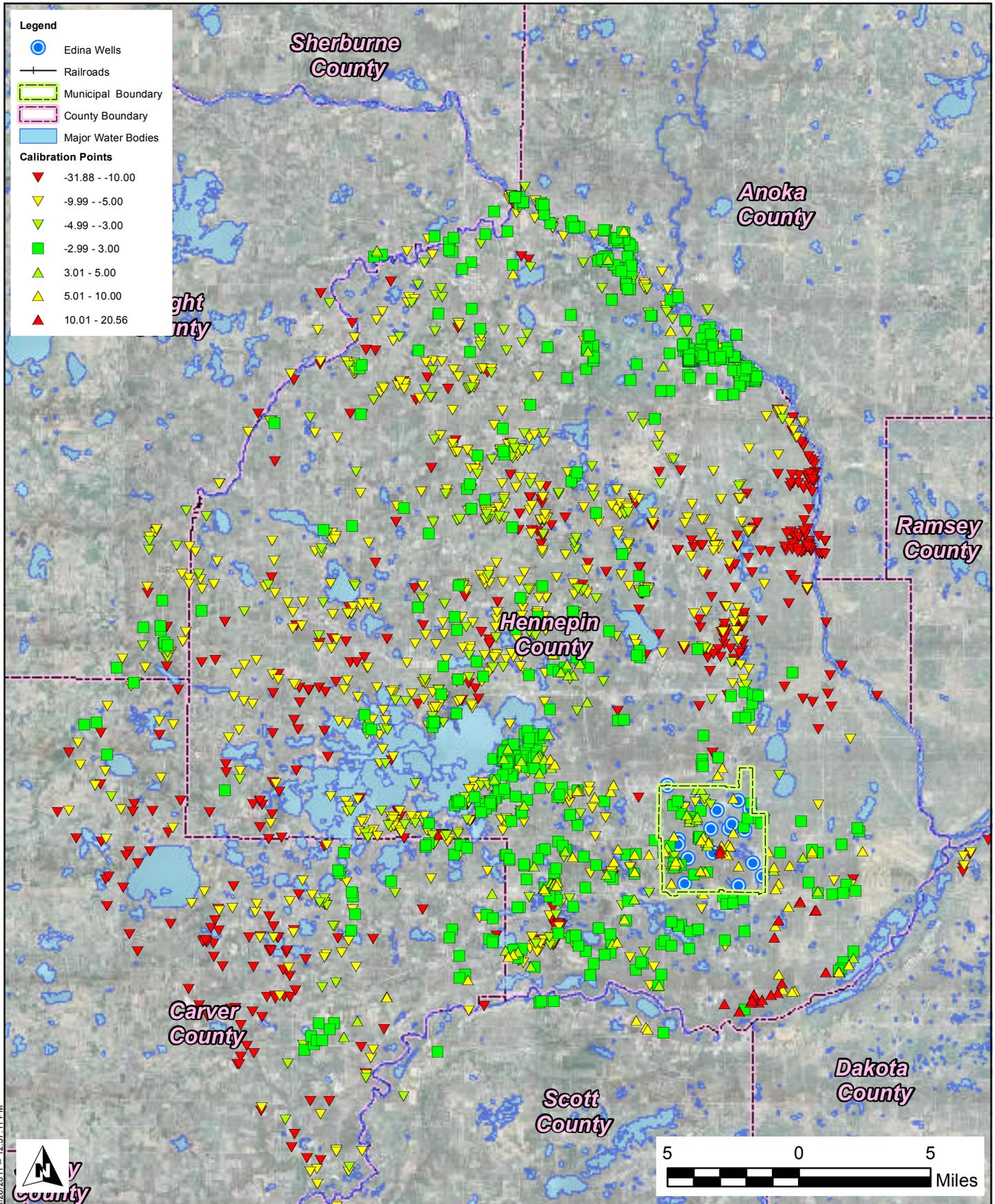
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 Projection: UTM, Zone 15, NAD 83, m
 Source: USGS 7.5 Min. Topo, MnDOT, and SEH Inc.

**Layer 9 Calculated Groundwater
 Flow Model Head**
 Edina Wellhead Protection Plan Update
 Edina, Minnesota

Figure
 8-3

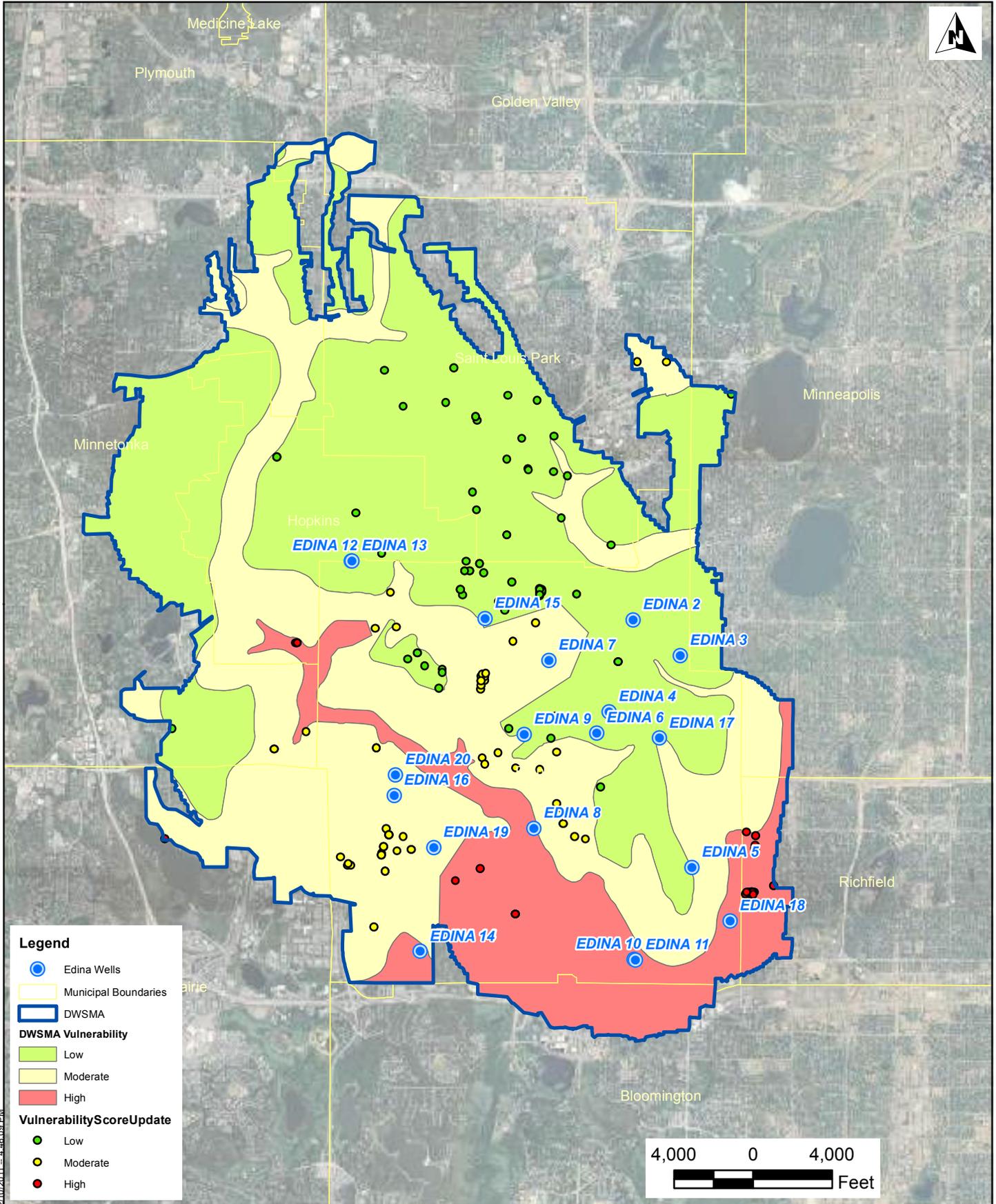
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	3535 VADNAIS CENTER DR. ST. PAUL, MN 55110 PHONE: (651) 490-2000 FAX: (651) 490-2150 WATTS: 800-325-2055 www.sehinc.com	Project: EDINA 110899 Print Date: 05/31/2011 Map by: SrH/ejt Projection: UTM, Zone 15, NAD 83, m Source: USGS 7.5 Min. Topo, MnDOT, and SEH Inc.	<h2 style="text-align: center;">Calibration Points</h2> <h3 style="text-align: center;">Edina Wellhead Protection Plan Update</h3> <p style="text-align: center;">Edina, Minnesota</p>	<h2 style="text-align: center;">Figure 9</h2>
	<p style="font-size: small;">This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.</p>			



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Legend

- Edina Wells
- Municipal Boundaries
- DWSMA
- DWSMA Vulnerability**
- Low
- Moderate
- High
- VulnerabilityScoreUpdate**
- Low
- Moderate
- High



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Project: EDINA 110899
Print Date: 06/11/2011
Map by: SrH/ejt
Projection: UTM, Zone 15, NAD 83, m
Source: USGS 7.5 Min. Topo, MnDOT, and SEH Inc.

DWSMA VULNERABILITY
Edina Wellhead Protection Plan Update
Edina, Minnesota

Figure
10

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.

Appendix A

Scoping Decision Notice



Protecting, maintaining and improving the health of all Minnesotans

January 20, 2010

Mr. Jesse Struve
Utility Engineer - City of Edina
4801 West 50th Street
Edina, Minnesota 55524

Dear Mr. Struve:

Subject: Scoping Decision Notice No. 1 for the City of Edina, PWSID 1270011

This letter provides notice of the results of the Scoping 1 meeting that we held with you, Wayne Houle (City of Edina), Dave Goergen (City of Edina), Roger Glanzer (City of Edina), Erik Tomlinson (Short Elliott Hendrickson, Inc.), and Terry Bovee (Minnesota Department of Health) on December 21, 2009. During the meeting, we discussed the preparation of Part I of the amended Wellhead Protection Plan that will document the 1) delineation of a wellhead protection area, 2) delineation of a drinking water supply management area, and 3) assessments of well and aquifer vulnerability related to these areas for the primary and seasonal public water supply wells used by the City of Edina. The wellhead protection area is the surface and subsurface area surrounding your public water supply wells through which contaminants are likely to move and affect your drinking water supply. The drinking water supply management area (DWSMA) is the area delineated using identifiable landmarks that reflect the wellhead protection area boundaries as closely as possible.

According to the state wellhead protection rule, the city will have until May 25, 2011, to amend its entire Wellhead Protection Plan, Part I and Part II. As we discussed, the rule describes the criteria used for determining the time period for completion of the Wellhead Protection Plan (Minnesota Rules, part 4720.5130). Once Part I has been approved by the Minnesota Department of Health and a Scoping 2 meeting held with the city, a Scoping 2 letter and decision notice will be sent to the city and will include the revised completion date.

At our meeting, we discussed rule requirements and the types of information needed to prepare the Part I report. The Wellhead Protection Plan must be prepared in accordance with Minnesota Rules, parts 4720.5100 to 4720.5590. General wellhead protection requirements, criteria for delineating the wellhead protection area, and data reporting are presented in Minnesota Rules, parts 4720.5500 to 4720.5510.

The enclosed Scoping Decision Notice No. 1 formally identifies the information the city must provide to the Minnesota Department of Health (MDH) to meet rule requirements for preparing Part I of the Wellhead Protection Plan. The wellhead rule refers to the existing information required for wellhead planning as data elements. Much of this information is available in the

Mr. Jesse Struve
Page 3
January 20, 2010

Finally, it is our understanding that you will serve officially as the wellhead protection manager on behalf of the city. You are responsible for providing written notice to local units of government of the city's intent to develop a Wellhead Protection Plan, as required by the wellhead protection rule (part 4720.5300, subpart 3). A copy of this notice should be forwarded to MDH and must include a list of the city wells, their unique well numbers, and contact information for the Wellhead Protection Plan manager. It is my understanding that Terry Bovee, Source Water Protection Unit Planner, has provided you with a template of the notification of intent.

In closing, we look forward to working with you on completion of your Wellhead Protection Plan. If you have any questions regarding our comments, please contact me at 651/201-4577 or at amal.djerrari@state.mn.us.

Sincerely,



Amal M. Djerrari, Hydrologist
Source Water Protection Unit
Environmental Health Division
P.O. Box 64975
St. Paul, Minnesota 55164-0975

AMD:kmc

Enclosures: Scoping Decision Notice No. 1, Summary of Data Requested, Map of Well Locations, Table 1 - Public Water Supply Well Information, Table 2 - Annual Volume of Water Pumped From PWS Wells, Table 3 - Permitted High-Capacity Wells

cc: Terry Bovee, Planner, Source Water Protection Unit, Mankato District Office
Wayne Houle, Public Works Director, City of Edina
Erik Tomlinson, Short Elliott Hendrickson, Inc.

SCOPING DECISION NOTICE No. 1 (Vulnerable Setting)

The purpose for the first Scoping Meeting, as required by Minnesota Rule 4720.5310, is to discuss the information necessary for preparing the Part I Report of a Wellhead Protection Plan. The Part I Report identifies the area that provides the source of drinking water for the public water supply (PWS) so that the PWS can develop land use or management practices to protect their groundwater resource from contamination. Specifically, the Part I Report documents the delineation of the wellhead protection area (WHPA), the delineation of the drinking water supply management area (DWSMA), and assesses the vulnerability of the PWS wells and DWSMA.

The wellhead rule (Minnesota Rule 4720.5310) refers to the information required for wellhead planning as data elements. This form lists the data elements that are stated in Minnesota Rule 4750.5400. The Minnesota Department of Health (MDH) uses this form to designate which data elements are needed to prepare the Part I Report, based on the hydrogeological setting, vulnerability of the wells, and aquifer information known at the time of the Scoping 1 Meeting.

Name of Public Water Supply City of Edina (PWSID = 1270011)		Date January 20, 2010
Name of the Wellhead Protection Manager Mr. Jesse Struve, Utility Engineer		
Address City of Edina 4801 West 50th Street	City Edina	Zip 55524
Unique Well Numbers		Phone
208399 (Well 2 - P)	206588 (Well 9 - E)	207674 (Well 15 - S)
240630 (Well 3 - S)	206184 (Well 10 - P)	203101 (Well 16 - S)
200561 (Well 4 - P)	206183 (Well 11 - P)	200914 (Well 17 - P)
206377 (Well 5 - S)	203614 (Well 12 - P)	200918 (Well 18 - S)
200564 (Well 6 - P)	203613 (Well 13 - P)	505626 (Well 19 - S)
206474 (Well 7 - S)	200913 (Well 14 - E)	686286 (Well 20 - S)
204884 (Well 8 - S)		
		952-903-5713

Note: P = Primary, E = Emergency, S = Seasonal

Instructions for Completing the Scoping No. 1 Form

N	D	V	S	N = If this box is checked with an "X," this data element is NOT necessary for the Part I Report of your Wellhead Protection Plan. This data element may be identified later at the Scoping 2 Meeting and used for the Part 2 Report. Please go to the next data element.
X				

N	D	V	S	D = If this box is checked with an "X," the preparer of the Part I Report is required to use this information for the DELINEATION of the WHPA or the DWSMA. If there is no check in the "S" box, this information is available in the public domain or is on-file at MDH.
	X			

N	D	V	S	V = If this box is checked with an "X," the preparer of the Part I Report is required to use this information for the VULNERABILITY assessment of the PWS well(s) or the DWSMA. If there is no check in the "S" box, this information is available in the public domain or is on-file at MDH.
		X		

N	D	V	S	S = If this box is checked with an "X," the PWS must SUBMIT the information to the MDH.
			X	

DATA ELEMENTS ABOUT THE PHYSICAL ENVIRONMENT

A. PRECIPITATION				
N	D	V	S	A.1: An existing map or list of local precipitation gauging stations.
	X			
<p>Technical Assistance Comments: Precipitation values can be used to determine the local recharge in the groundwater model. The map can be used to determine the closest gauging station. The locations of the gauging stations are available in the public domain.</p>				
N	D	V	S	A.2: An existing table showing the average monthly and annual precipitation, in inches, for the preceding five years.
	X		X	
<p>Technical Assistance Comments: This information may be used for determining local recharge for the groundwater model. This information may be available in the public domain if there is a local gauging station, or may be obtained from the local wastewater treatment plant.</p>				
B. GEOLOGY				
N	D	V	S	B.1: 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	X	X	
<p>Technical Assistance Comments: Information of this type is required to characterize the geologic and hydrogeologic setting of the PWS well field(s). This information is used to define aquifer geometry, location and magnitude of the recharge and discharge areas, and groundwater flow information. Aquifer tests or alternatives listed in MN Rules 4720.5510, subpart 6, can be used to help characterize flow in the aquifer. Reference all information used to develop the conceptual model of the geologic setting and submit to MDH only the information that is not available in the public domain.</p>				
N	D	V	S	B.2: Existing records of the geologic materials penetrated by wells, borings, exploration test holes, or excavations, including those submitted to the department.
	X	X	X	
<p>Technical Assistance Comments: Information of this type may be useful to refine the understanding of the geologic and hydrogeologic setting on a local basis. Submit only if the PWS or city has information of test drilling or site investigations conducted by the city that is not available in the public domain.</p>				
N	D	V	S	B.3: Existing borehole geophysical records from wells, borings, and exploration test holes.
	X	X	X	
<p>Technical Assistance Comments: Information from geophysical records may provide additional information about aquifer thickness, well construction, and water level information at a local level. Submit only if the information is not available in the public domain.</p>				
N	D	V	S	B.4: Existing surface geophysical studies.
	X	X	X	
<p>Technical Assistance Comments: Information from geophysical studies may be useful to refine the understanding of the geology on a local basis. Submit only if the information is not available in the public domain.</p>				
C. SOILS				
N	D	V	S	C.1: Existing maps of the soils and a description of soil infiltration characteristics.
	X	X		
<p>Technical Assistance Comments: This information is in the public domain and can be used to delineate the WHPA and assess the vulnerability of the DWSMA because it indicates the underlying geology.</p>				
N	D	V	S	C.2: A description or an existing map of known eroding lands that are causing sedimentation problems.
X				
<p>Technical Assistance Comments:</p>				

D. WATER RESOURCES				
N	D	V	S	D.1: An existing map of the boundaries and flow directions of major watershed units and minor watershed units.
	X			
Technical Assistance Comments: This information is in the public domain and may be used to delineate the surface water contribution area of the WHPA.				
N	D	V	S	D.2: An existing map and a list of public waters as defined in Minnesota Statutes, section 103G.005, subdivision 15, and public drainage ditches.
	X	X		
Technical Assistance Comments: This information is in the public domain and may be used to delineate the surface water contribution area of the WHPA and determine the vulnerability of the DWSMA.				
N	D	V	S	D.3: The shoreland classifications of the public waters listed under sub-item (2), pursuant to part 6120.3000 and Minnesota Statutes, sections 103F.201 to 103F.221.
X				
Technical Assistance Comments:				
N	D	V	S	D.4: An existing map of wetlands regulated under Chapter 8420 and Minnesota Statutes, section 103G.221 to 103G.2373.
X				
Technical Assistance Comments:				
N	D	V	S	D.5: An existing map showing those areas delineated as floodplain by existing local ordinances.
X				
Technical Assistance Comments:				

DATA ELEMENTS ABOUT THE LAND USE

E. LAND USE				
N	D	V	S	E.1: An existing map of parcel boundaries.
	X		X	
Technical Assistance Comments: This information may be helpful in delineating the DWSMA, if available. If this information is provided, identification numbers must be provided for each parcel. An electronic format for the map is preferable.				
N	D	V	S	E.2: An existing map of political boundaries.
	X		X	
Technical Assistance Comments: Please provide this information if the boundaries have been updated/changed. This information may be helpful in delineating the DWSMA. An electronic format for the map is preferable.				
N	D	V	S	E.3: An existing map of public land surveys, including township, range, and section.
	X			
Technical Assistance Comments: This information is available in the public domain and may be helpful in delineating the DWSMA.				
N	D	V	S	E.4: A map and an inventory of the current and historical agricultural, residential, commercial, industrial, recreational, and institutional land uses and potential contaminant sources.
X				
Technical Assistance Comments:				

N	D	V	S	E.5: An existing, comprehensive land-use map.
X				
Technical Assistance Comments:				
N	D	V	S	E.6: Existing zoning map.
X				
Technical Assistance Comments:				
F. PUBLIC UTILITY SERVICES				
N	D	V	S	F.1: An existing map of transportation routes or corridors.
	X			
Technical Assistance Comments: This information is available in the public domain and may be helpful in delineating the DWSMA.				
N	D	V	S	F.2: An existing map of storm sewers, sanitary sewers, and the public water supply systems.
	X			
Technical Assistance Comments: Do not submit a map of the storm sewers and sanitary sewers. Describe the difference in how much water is pumped and how much is sold. The difference is the leakage that may be used as recharge in the groundwater model.				
N	D	V	S	F.3: An existing map of gas and oil pipelines used by gas and oil suppliers.
X				
Technical Assistance Comments:				
N	D	V	S	F.4: An existing map or list of public drainage systems.
	X	X		
Technical Assistance Comments: This information is available in the public domain and may be helpful in delineating the DWSMA.				
N	D	V	S	F.5: An existing record of construction, maintenance, and use of the public water supply well(s) and other wells within the DWSMA.
	X	X	X	
Technical Assistance Comments: Please provide 1) the pumping rates for the current and previous years, and the projected annual pumping rates for the next five years for each well in the PWS; and 2) well record(s) for the PWS well(s) if the information is different than that on-file with MDH. Information about the PWS well(s) may affect the vulnerability assessment due to rehabilitation/reconstruction of a well or changes in pumping rates.				

DATA ELEMENTS ABOUT WATER QUANTITY

G. SURFACE WATER QUANTITY				
N	D	V	S	G.1: An existing description of high, mean, and low flows on streams.
	X	X		
Technical Assistance Comments: This information is available in the public domain and may be used to determine hydraulic connections between surface water bodies and the aquifer(s) of concern.				
N	D	V	S	G.2: An existing list of lakes where the state has established ordinary high water marks.
	X			
Technical Assistance Comments: This information is available in the public domain. The information may be used to determine the WHPA.				
N	D	V	S	G.3: An existing list of permitted withdrawals from lakes and streams, including source, use, and amounts withdrawn.
	X	X	X	
Technical Assistance Comments: Only required if different from the DNR database. Surface water bodies may be in direct hydraulic connection with the aquifer(s) of concern and withdrawals may affect water levels in both the surface water and adjacent groundwater systems.				
N	D	V	S	G.4: An existing list of lakes and streams for which state protected levels or flows have been established.
	X			
Technical Assistance Comments: This information is available in the public domain and may be used to determine hydraulic connections between surface water bodies and the aquifer(s) of concern.				
N	D	V	S	G.5: An existing description of known water-use conflicts, including those caused by groundwater pumping.
	X	X	X	
Technical Assistance Comments: Please notify MDH of surface water/well interference problems of which the PWS is aware. Conflicts between use of groundwater resources and surface water bodies would indicate a hydrologic boundary that would need to be considered in delineating the WHPA.				
H. GROUNDWATER QUANTITY				
N	D	V	S	H.1: An existing list of wells covered by state appropriation permits, including amounts of water appropriated, type of use, and aquifer source.
	X	X	X	
Technical Assistance Comments: Please submit this information for wells that are not permitted by the DNR because this information may be useful in identifying the hydrologic boundary conditions that could affect the size and shape of the WHPA boundaries.				
N	D	V	S	H.2: An existing description of known well interference problems and water-use conflicts.
	X	X	X	
Technical Assistance Comments: Please notify MDH of well interference problems of which the PWS is aware. Interference problems with other wells, if present, likely indicate a hydrologic boundary that would need to be considered in making the WHPA delineation.				
N	D	V	S	H.3: An existing list of state environmental boreholes, including unique well number, aquifer measured, years of record, and average monthly levels.
	X	X	X	
Technical Assistance Comments: Only submit monthly water level measurements (with unique well numbers and dates) that are not in the public domain.				

DATA ELEMENTS ABOUT WATER QUALITY

I. SURFACE WATER QUALITY				
N	D	V	S	I.1: An existing map or list of the state water quality management classification for each stream and lake.
X				
Technical Assistance Comments:				
N	D	V	S	I.2: An existing summary of lake and stream water quality monitoring data, including: 1. bacteriological contamination indicators; 4. sedimentation; 2. inorganic chemicals; 5. dissolved oxygen; and 3. organic chemicals; 6. excessive growth or deficiency of aquatic plants.
		X	X	
Technical Assistance Comments: This information can be used to evaluate surface water/groundwater interactions and aquifer water quality. Submit if the PWS has information that is not available in the public domain.				
J. GROUNDWATER QUALITY				
N	D	V	S	J.1: An existing summary of water quality data, including: 1) bacteriological contamination indicators; 2) inorganic chemicals; and 3) organic chemicals.
	X	X	X	
Technical Assistance Comments: Submit if the PWS has information that is not available in the public domain because the information may help explain groundwater flow paths.				
N	D	V	S	J.2: An existing list of water chemistry and isotopic data from wells, springs, or other groundwater sampling points.
	X	X	X	
Technical Assistance Comments: Submit if the PWS has information that is not available in the public domain because the information may help explain groundwater flow paths.				
N	D	V	S	J.3: An existing report of groundwater tracer studies.
	X	X	X	
Technical Assistance Comments: Submit if the PWS has information that is not available in the public domain because the information may help explain groundwater flow paths.				
N	D	V	S	J.4: An existing site study and well water analysis of known areas of groundwater contamination.
		X	X	
Technical Assistance Comments: Submit if the PWS has information on contaminant sources not available in the public domain because these reports may contain additional geologic or hydrogeologic information.				
N	D	V	S	J.5: An existing property audit identifying contamination.
X				
Technical Assistance Comments:				
N	D	V	S	J.6: An existing report to the Minnesota Department of Agriculture and the Minnesota Pollution Control Agency of contaminant spills and releases.
	X	X		
Technical Assistance Comments: Notify MDH of reports on spills or contaminant releases that are on-file with the PWS or city but are not in the public domain. These reports do not need to be submitted but MDH staff would like to review reports.				

Summary of Data Request
Specific Data to be Provided to MDH by PWS
Amendment of the WHP Plan

As discussed during the first Scoping Meeting on December 21, 2009, the City of Edina will supply the following information for Part I of their amended Wellhead Protection Plan to the Minnesota Department of Health. The number of the data element that refers to the information needed to prepare the Part I Report is listed in the parenthesis at the end of each request.

- 1) Municipal well information: Use Tables 1 and 2, the well records for the public water supply (PWS) wells, and a map showing the locations of all the PWS wells, to review the accuracy of 1) all PWS well construction, 2) well locations, and 3) pumping information. (F.5)

Table 1 lists well use and construction for each of the PWS wells. Have you reconstructed any wells? Are there well records for reconstructed wells?

The enclosed map shows the locations of the primary, seasonal, and emergency public water supply wells. Please let us know if you feel the wells are not correctly located. These locations must be used to delineate your wellhead protection areas.

Table 2 shows the available pumping information and indicates what information the PWS needs to provide for the delineation of the capture zone. Please provide 1) the pumping data for the last two years that was sent to the Minnesota Department of Natural Resources, 2) whether this rate was measured or estimated, and 3) the projected annual pumping amounts for the next five years.

- 2) Please provide a copy of any aquifer test or specific capacity information for the PWS wells that was obtained during well construction, maintenance, or repair. (B.1)
- 3) Is there an existing map of parcel and/or political boundaries that could be used for defining the Drinking Water Supply Management Area (DWSMA)? If you wish to use parcel lines, please provide the parcel identification number for each parcel boundary along with the map. Have the city boundaries changed? If the city boundaries have changed, please provide the new boundaries. The boundaries of the DWSMA may be larger if political boundaries are used instead of the parcel boundaries. (E.1 and E.2)
- 4) If there are private well records, soil boring reports, geophysical studies, or water level measurements in your files that MDH staff did not identify at the scoping meeting and that would be available for MDH staff to review and copy, please notify MDH. (B.2, B.3, B.4, and H.3)
- 5) Please identify reports that you have on-file relating to leaks/contamination sites that may be a concern to your drinking water supply that MDH may review and copy. (J.4)
- 6) If your files contain water chemistry data, such as bacteria, virus, inorganic, organic, or isotopic results from wells or other groundwater sampling points, that is not currently available to MDH that MDH may review and copy, please notify MDH. (J.1 and J.2)
- 7) Please identify reports that you have in your files relating to groundwater tracer studies that have been conducted. (J.3)

Summary of Data Request

Page 2

- 8) Please provide information about other high-capacity wells in your area that may not be permitted and are not listed on the attached Table 3. (H.1)
- 9) Please describe any conflicts over water use that the PWS has been involved with, such as
1) private wells that went dry (or well interference) or 2) springs or wetlands that were affected.
Was the Department of Natural Resources involved in resolving the conflict? (G.5 and H.2)
- 10) Please describe the annual amount of water that is lost due to leaks in the distribution system. Can you identify specific parts of the distribution system where this loss occurs? (F.2)
- 11) If local precipitation information is not available in the public domain within a couple of miles and in the same geomorphic setting, please provide average monthly precipitation values from the wastewater treatment facility during the preceding five years. (A.2)
- 12) Please identify any other reports about surface water withdrawals or surface water monitoring data from lakes, streams, or wetlands that are not in the public domain that MDH staff could review and copy. (G.3 and I.2)

**Table 1
Water Supply Well Information
City of Edina**

Local Well Name	Unique Number	Use/Status	Casing Diameter (inches)	Casing Depth (feet)	Well Depth (feet)	Date Constructed/Reconstructed	Well Vulnerability	Aquifer Vulnerability	Aquifer
Well 2	208399	Primary	20x16x12	266	448	1935/2007	Not Susceptible	Vulnerable	Bedrock OPCJ
Well 3	240630	Seasonal	12	265	496	1946/1949	Susceptible	Vulnerable	Bedrock OPCJ
Well 4	200561	Primary	24x16	266	500	1950	Not Susceptible	Vulnerable	Bedrock OPCJ
Well 5	206377	Seasonal	24x20x16	257	443	1950/2002	Not Susceptible	Not Vulnerable	Bedrock OPCJ
Well 6	200564	Primary	24x16	316	503	7/7/1954	Not Susceptible	Vulnerable	Bedrock OPCJ
Well 7	206474	Seasonal	24x16	350	547	1955/2003	Not Susceptible	Vulnerable	Bedrock OPCJ
Well 8	204884	Seasonal	24x16	232	472	1953	Not Susceptible	Vulnerable	Bedrock OPCJ
Well 9	206588	Emergency	16x16x10	1010	1130	9/30/1957	Not Susceptible	Not Vulnerable	Bedrock Mt. Simon
Well 10	206184	Primary	24x20x16	881	1001	6/17/1963	Susceptible	Not Vulnerable	Bedrock Mt. Simon
Well 11	206183	Primary	24x16	321	403	4/16/1963	Not Susceptible	Vulnerable	Bedrock CJDN
Well 12	203614	Primary	24x16	955	1080	5/1964	Not Susceptible	Not Vulnerable	Bedrock Mt. Simon
Well 13	203613	Primary	24x16	429	495	5/1964	Not Susceptible	Vulnerable	Bedrock CJDN
Well 14	200913	Emergency	16	325	420	1963/1964	Not Susceptible	Vulnerable	Bedrock CJDN
Well 15	207674	Seasonal	30x24x20	275	475	1967/2002	Not Susceptible	Vulnerable	Bedrock OPCJ
Well 16	203101	Seasonal	30x20	265	381	11/10/1967	Not Susceptible	Vulnerable	Bedrock OPCJ
Well 17	200914	Primary	30x24	373	461	11/17/1970	Not Susceptible	Vulnerable	Bedrock CJDN
Well 18	200918	Seasonal	30x24x16	365	446	10/16/1973	Not Susceptible	Vulnerable	Bedrock CJDN
Well 19	505626	Seasonal	30x24x18	440	521	1988/1989	Not Susceptible	Vulnerable	Bedrock CJDN
Well 20	686286	Seasonal	30x24x18	265	467	6/30/2008	Not Susceptible	Vulnerable	Bedrock OPCJ

Table 3
Permitted High-Capacity Wells Within 2.0 miles of City of Edina
DNR State Water Use Database System (SWUDS)

Unique Number	Well Name	Permittee	DNR Permit Number	Ressource Type	Aquifer	Use	Average Withdrawal (1997,2007) gallons/year (gal/yr)
222905	1	INDIANHEAD LAKE IMPROVEMENT ASSOC	1960-0231	Groundwater	OSTPCJDN	Basin (lake) level	2,181,818
204942	1	THREE RIVERS PARK DISTRICT	1965-1082	Groundwater	OPDCCJDN	Snow making	17,954,545
	2	THREE RIVERS PARK DISTRICT	1965-1082	Groundwater		Snow making	11,863,636
204072	1	OAK RIDGE COUNTRY CLUB	1966-1167	Groundwater	OPDCCJDN	Golf course	19,245,455
	1	INTERLACHEN COUNTRY CLUB	1969-0490	Groundwater	OPCJ	Golf course	3,854,545
	3	INTERLACHEN COUNTRY CLUB	1969-0490	Groundwater		Golf course	4,963,636
453805	4	INTERLACHEN COUNTRY CLUB	1969-0490	Groundwater	OPCJ	Golf course	15,636,364
236635	1	HENNEPIN COUNTY PARKS	1970-0815	Groundwater	QBAAOPDC	Campgrounds, waysides, highway rest areas	1,300,000
161443	2	EDINA COUNTRY CLUB	1972-1231	Groundwater	OPDCCJDN	Golf course	8,327,273
161443	3	EDINA COUNTRY CLUB	1972-1231	Groundwater	OPDCCJDN	Golf course	14,754,545
206456	12	ST LOUIS PARK, CITY OF	1973-1007	Groundwater	CMTS	Municipal	336,118,182
147459	17	ST LOUIS PARK, CITY OF	1973-1007	Groundwater	CMTS	Municipal	0
200542	4	ST LOUIS PARK, CITY OF	1973-1007	Groundwater	OPDCCJDN	Municipal	465,472,727
206457	6	ST LOUIS PARK, CITY OF	1973-1007	Groundwater	OPDCCJDN	Municipal	20,418,182
222912	3	BLOOMINGTON, CITY OF	1973-1429	Groundwater	CFRNCMTS	Municipal	467,881,818
204573	1	HOPKINS, CITY OF	1975-6245	Groundwater	OPDCCIGL	Municipal	0
204068	4	HOPKINS, CITY OF	1975-6245	Groundwater	OPDCCJDN	Municipal	736,100,000
204570	5	HOPKINS, CITY OF	1975-6245	Groundwater	OPDCCJDN	Municipal	53,200,000
112228	6	HOPKINS, CITY OF	1975-6245	Groundwater	OPDCCJDN	Municipal	126,463,636
119302	2	DUKE REALTY LTD PARTNERSHIP	1975-6260	Groundwater	OPDC	Landscaping	400,000
433288	5	CONCORDIA PROPERTIES LLC	1975-6269	Groundwater	OPCJ	Once-through heating or A/C	46,254,545
224648	1	BLOOMINGTON, CITY OF	1975-6273	Groundwater	QWTA	Basin (lake) level	62,481,818
147864	1	OXMOOR LAKE ASSOCIATION	1981-6197	Groundwater	OPCJ	Basin (lake) level	2,027,273
206454	1	FLAME METALS PROCESSING	1984-6234	Groundwater	OPDC	Metal processing	445,455
251279	1	WOODLAWN TERRACE	1985-6054	Groundwater	OPDC	Private waterworks	2,990,909

Table 3 - Continued

Unique Number	Well Name	Permittee	DNR Permit Number	Resource Type	Aquifer	Use	Average Withdrawal (1997,2007) gallons/year (gal/yr)
206373	1	FAIRVIEW SOUTHDAL HOSPITAL	1985-6073	Groundwater	OPDC	Landscaping	3,190,909
	1	MINNEAPOLIS PARK & REC BOARD	1986-6125	Groundwater	MEADOWBROOK	Golf course	11,600,000
434045	W420	ST LOUIS PARK, CITY OF	1987-6212	Groundwater	QBAA	Pollution containment	17,400,000
434044	W421	ST LOUIS PARK, CITY OF	1987-6212	Groundwater	OPVL	Pollution containment	14,236,364
434043	W422	ST LOUIS PARK, CITY OF	1987-6212	Groundwater	QBAA	Pollution containment	11,418,182
200979	W105	ST LOUIS PARK, CITY OF	1988-6212	Groundwater	CIGL	Pollution containment	0
216050	W23	ST LOUIS PARK, CITY OF	1988-6213	Groundwater	OPCJ	Pollution containment	25,536,364
434042	W410	ST LOUIS PARK, CITY OF	1990-6036	Groundwater		Pollution containment	36,136,364
	1	THERMOTEC	1992-6099	Groundwater		Industrial process cooling once-through	109,263,636
	2	THERMOTEC	1992-6099	Groundwater		Industrial process cooling once-through	41,081,818
	1	DEWEY HILL III TOWNHOMES	1993-6208	Groundwater	DEWEY HILL III	Basin (lake) level	2,663,636
538134	1	ST LOUIS PARK, CITY OF	1995-6047	Groundwater	QWTA	Pollution containment	26,136,364
205226	1	GENERAL DYNAMICS ADV INFO SYS INC	1997-6116	Groundwater	CJDN	Landscaping	2,218,182
222918	2	GENERAL DYNAMICS ADV INFO SYS INC	1997-6116	Groundwater	OPDCCJDN	Landscaping	1,054,545
	1	EDINA, CITY OF	1998-6029	Groundwater	INDIANHEAD LAKE	Basin (lake) level	445,455
	1	EDINA, CITY OF	1998-6041	Groundwater	ARROWHEAD LAKE	Basin (lake) level	418,182
	1	ST LOUIS PARK, CITY OF	1998-6105	Groundwater	WOLFE LAKE	Basin (lake) level	345,455
617378	1	FILMTEC CORPORATION	1999-6058	Groundwater	CJDN	Industrial processing	42,663,636
112250	1	EDINA, CITY OF	2003-3049	Groundwater	OPDCCJDN	Golf course	6,427,273
112249	2	EDINA, CITY OF	2003-3049	Groundwater	OPDCCJDN	Golf course	24,200,000
718192	1	FILMTEC CORPORATION	2005-3101	Groundwater	CJDN	Industrial processing	14,390,909
204884	8	EDINA, CITY OF	1973-1119	Groundwater	OPDCCJDN	Municipal	30,854,545
206588	9	EDINA, CITY OF	1973-1119	Groundwater	PMHNPFL	Municipal	118,054,545
222912	3	BLOOMINGTON, CITY OF	1973-1429	Groundwater	CFRNCMTS	Municipal	467,881,818
204573	1	HOPKINS, CITY OF	1975-6245	Groundwater	OPDCCIGL	Municipal	0
204068	4	HOPKINS, CITY OF	1975-6245	Groundwater	OPDCCJDN	Municipal	736,100,000
204570	5	HOPKINS, CITY OF	1975-6245	Groundwater	OPDCCJDN	Municipal	53,200,000
112228	6	HOPKINS, CITY OF	1975-6245	Groundwater	OPDCCJDN	Municipal	126,463,636

Table 3 - Continued

Unique Number	Well Name	Permittee	DNR Permit Number	Resource Type	Aquifer	Use	Average Withdrawal (1997,2007) gallons/year (gal/yr)
119302	2	DUKE REALTY LTD PARTNERSHIP	1975-6260	Groundwater	OPDC	Landscaping	400,000
433288	5	CONCORDIA PROPERTIES LLC	1975-6269	Groundwater	OPCJ	Once-through heating or A/C	46,254,545
224648	1	BLOOMINGTON, CITY OF	1975-6273	Groundwater	QWTA	Basin (lake) level	62,481,818
147864	1	OXMOOR LAKE ASSOCIATION	1981-6197	Groundwater	OPCJ	Basin (lake) level	2,027,273
206454	1	FLAME METALS PROCESSING	1984-6234	Groundwater	OPDC	Metal processing	445,455
251279	1	WOODLAWN TERRACE	1985-6054	Groundwater	OPDC	Private waterworks	2,990,909
206373	1	FAIRVIEW SOUTHDAL HOSPITAL	1985-6073	Groundwater	OPDC	Landscaping	3,190,909
434045	W420	MINNEAPOLIS PARK & REC BOARD	1986-6125	Groundwater	MEADOWBROOK	Golf course	11,600,000
434044	W421	ST LOUIS PARK, CITY OF	1987-6212	Groundwater	QBAA	Pollution containment	17,400,000
434043	W422	ST LOUIS PARK, CITY OF	1987-6212	Groundwater	OPVL	Pollution containment	14,236,364
200979	W105	ST LOUIS PARK, CITY OF	1987-6212	Groundwater	QBAA	Pollution containment	11,418,182
216050	W23	ST LOUIS PARK, CITY OF	1988-6212	Groundwater	CIGL	Pollution containment	0
434042	W410	ST LOUIS PARK, CITY OF	1988-6213	Groundwater	OPCJ	Pollution containment	25,536,364
	1	THERMOTEC	1990-6036	Groundwater		Pollution containment	36,136,364
	2	THERMOTEC	1992-6099	Groundwater		Industrial process cooling once-through	109,263,636
	1	DEWEY HILL III TOWNHOMES	1992-6099	Groundwater		Industrial process cooling once-through	41,081,818
538134	1	ST LOUIS PARK, CITY OF	1993-6208	Groundwater	DEWEY HILL III	Basin (lake) level	2,663,636
205226	1	GENERAL DYNAMICS ADV INFO SYS INC	1995-6047	Groundwater	QWTA	Pollution containment	26,136,364
222918	2	GENERAL DYNAMICS ADV INFO SYS INC	1997-6116	Groundwater	C-JDN	Landscaping	2,218,182
	1	EDINA, CITY OF	1997-6116	Groundwater	OPDCCJDN	Landscaping	1,054,545
	1	EDINA, CITY OF	1998-6029	Groundwater	INDIANHEAD LAKE	Basin (lake) level	445,455
	1	EDINA, CITY OF	1998-6041	Groundwater	ARROWHEAD LAKE	Basin (lake) level	418,182
617378	1	ST LOUIS PARK, CITY OF	1998-6105	Groundwater	WOLFE LAKE	Basin (lake) level	345,455
112250	1	FILMTEC CORPORATION	1999-6058	Groundwater	CJDN	Industrial processing	42,663,636
112249	2	EDINA, CITY OF	2003-3049	Groundwater	OPDCC-JDN	Golf course	6,427,273
718192	1	FILMTEC CORPORATION	2003-3049	Groundwater	OPDCCJDN	Golf course	24,200,000
	1	FILMTEC CORPORATION	2005-3101	Groundwater	C-JDN	Industrial processing	14,390,909

Appendix B

Well Logs

Wellname EDINA 10 Township Range Dir Section Subsection Field Located MGS 28 24 W 31 CDAADB Elevation 826.00 ft.	Well Depth 1001.00 ft	Depth Completed 1001.00 ft	Date Well Completed 1963/06/17
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Contact EDINA 10 EDINA MN Changed	Drilling Method Drilling Fluid Well Hydrofractured? <input type="checkbox"/> YES <input type="checkbox"/> NO From ft. to Use Community Supply Casing Type Drive Shoe? <input type="checkbox"/> YES <input type="checkbox"/> NO Hole Diameter (in.) Diameter 16 Depth 881 24.00 in. from 0.00 to 184.00 ft. lbs/ft 20.00 in. from 184.00 to 651.00 ft. lbs/ft 16.00 in. from 651.00 to 881.00 ft. lbs/ft
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Description	Color	Hardness	From	To (ft.)
DRIFT			0	183
SHAKOPEE-ONEOTA			183	305
JORDAN SANDROCK			305	403
ST. LAWRENCE SHALE			403	446
FRANCONIA SHALE & SANDROCK			446	592
GALESVILLE SANDROCK			592	653
GALESVILLE SANDROCK			653	664
EAU CLAIRE SHALE			664	729
MT. SIMON SANDROCK			729	876
HINCKLEY SANDROCK			876	1000
RED SHALE			1000	1001

Screen Make _____ Type _____ Diameter Slot Length Set	Open Hole(ft.) From to
Static Water Level (Multiple SWL) 144.00 ft. Land surface Date measured 1963/05/27	
Pumping Level (below land surface) 280.00 ft. after hrs. pumping 2000.00 g.p.m.	
Well Head Completion Pitless adapter manufacturer _____ Model _____ <input type="checkbox"/> Casing Protection <input type="checkbox"/> 12 in. above grade <input type="checkbox"/> At-grade (Environmental Wells and Borings ONLY) <input type="checkbox"/> Basement offset	
Grouting Information Well grouted? <input type="checkbox"/> YES <input type="checkbox"/> NO	
Nearest Known Source of Contamination _____ feet Direction _____ Type _____ Well disinfected upon completion? <input type="checkbox"/> YES <input type="checkbox"/> NO	
Pump <input type="checkbox"/> Not Installed Date Installed _____ Manufacture's name _____ Model number _____ HP 0.00 Volts _____ Length of drop pipe _____ Material _____ Capacity _____ g.p.m. Type _____	
Abandoned Wells Does property have any not in use and not sealed well(s)? <input type="checkbox"/> YES <input type="checkbox"/> NO	
Variance Was a variance granted from the MDH for this well? <input type="checkbox"/> YES <input type="checkbox"/> NO	
Well Contractor Certification Bergerson-Caswell 27058	
License Business Name Lic. or Reg No.	

Remarks
 CASING: 024 TO 0184;020 TO 0651;016 TO 0881. EDINA NO.10 M.G.S. 274 M.G.S. NO.274

First Bedrock OPDC **Aquifer** Mt.Simon
Last Strat PMSC **Depth to Bedrock** 183.00 ft.

Unique Well Number 206184	County Hennepin Quad Bloomington Quad Id 104D	MINNESOTA DEPARTMENT OF HEALTH WELL AND BORING RECORD <i>MINNESOTA STATUTES CHAPTER 1031</i>	Entry Date 1991/08/24 Update Date 2004/12/27 Received Date
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Wellname EDINA 10	Township 28 Range 24 Dir W	Section 31 Subsection CDAADB	Depth Drilled 1001 ft Depth Completed 1001 ft	Date Completed 1963/06/17	Lic/Reg. No. 27058	Driller Name
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Elevation 826.00 ft.	Method Calc from DEM (USGS)	Aquifer Mt.Simon	Depth to Bedrock 183 ft.	Screen/Open Hole	SWL 144
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Field Located Minnesota Geological Survey	Location Method GPS Code Measurements (Ps Universal Transverse Mercator(UTM) - NAD83 - Zone 15 - Meters)		
Program	Input Source	UTM Easting (X) 473176	UTM Northing (Y) 4968046
Uni No.Verified	Input Date 1993/03/22		
Geologic Interpretation	Agency	Interpretation Method	

Geological Material	Color	Hardness	DEPTH			ELEVATION		Stratigraphy	LITHOLOGY		
			From	To	Thick	From	To		Primary	Secondary	Minor
DRIFT			0	183	183	826	643	Unknown deposit type	Drift		
SHAKOPEE-ONEOTA			183	305	122	643	521	Prairie Du Chien Group	Dolomite		
JORDAN SANDROCK			305	403	98	521	423	Jordan	Sandstone		
ST. LAWRENCE SHALE			403	446	43	423	380	St.Lawrence	Shale		
FRANCONIA SHALE & SANDROCK			446	592	146	380	234	Franconia	Shale	Sandstone	
GALESVILLE SANDROCK			592	653	61	234	173	Ironton-Galesville	Sandstone		
GALESVILLE SANDROCK			653	664	11	173	162	Eau Claire	Shale	Sandstone	
EAU CLAIRE SHALE			664	729	65	162	97	Eau Claire	Shale		
MT. SIMON SANDROCK			729	876	147	97	-50	Mt.Simon	Sandstone		
HINCKLEY SANDROCK			876	1000	124	-50	-174	Mt.Simon	Sandstone		
RED SHALE			1000	1001	1	-174	-175	Solor Church Formation	Shale		

Wellname EDINA 11 Township Range Dir 28 24 W Section Subsection 31 CDAADA Field Located MGS Elevation 826.00 ft.	Well Depth 403.00 ft Depth Completed 403.00 ft	Date Well Completed 1963/04/16
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Contact EDINA 11 EDINA MN Changed	Drilling Method Drilling Fluid Well Hydrofractured? <input type="checkbox"/> YES <input type="checkbox"/> NO From ft. to Use Community Supply Casing Type Drive Shoe? <input type="checkbox"/> YES <input type="checkbox"/> NO Hole Diameter (in.) Diameter 16 Depth 321 24.00 in. from 0.00 to 182.00 ft. lbs/ft 16.00 in. from 0.00 to 321.00 ft. lbs/ft
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Description	Color	Hardness	From	To (ft.)
SAND AND GRAVEL			0	36
CLAY AND ROCKS	BLUE		36	45
SANDY CLAY	BLUE		45	75
CLAY, SAND, GRAVEL & ROCKS	BROWN		75	173
COARSE GRAVEL AND ROCKS			173	179
SHAKOPEE-ONEOTA LIMEROCK			179	304
JORDAN SANDROCK COARSE		M.HARD	304	327
JORDAN SANDROCK		M.HARD	327	350
JORDAN SANDROCK		V.HARD	350	362
JORDAN SANDROCK MED. GRA		M.HARD	362	384
JORDAN SANDROCK SHALEY		HARD	384	402
ST. LAWRENCE SHALE			402	403

Screen Make _____ Type _____ Diameter Slot Length Set	Open Hole(ft.) From to
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Static Water Level 22.00 ft. Land surface	Date measured 1963/04/16
Pumping Level (below land surface) 47.00 ft. after hrs. pumping 1320.00 g.p.m.	

Well Head Completion Pitless adapter manufacturer _____ Model _____ <input type="checkbox"/> Casing Protection <input type="checkbox"/> 12 in. above grade <input type="checkbox"/> At-grade (Environmental Wells and Borings ONLY) <input type="checkbox"/> Basement offset	
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Grouting Information	Well grouted? <input type="checkbox"/> YES <input type="checkbox"/> NO
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Nearest Known Source of Contamination _____ feet Direction _____ Type _____ Well disinfected upon completion? <input type="checkbox"/> YES <input type="checkbox"/> NO	
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Pump <input type="checkbox"/> Not Installed Date Installed _____ Manufacture's name _____ Model number _____ HP 0.00 Volts _____ Length of drop pipe _____ Material _____ Capacity _____ g.p.m. Type _____	
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Abandoned Wells Does property have any not in use and not sealed well(s)? <input type="checkbox"/> YES <input type="checkbox"/> NO	
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Variance Was a variance granted from the MDH for this well? <input type="checkbox"/> YES <input type="checkbox"/> NO	
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Well Contractor Certification Bergerson-Caswell 27058	
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License Business Name	Lic. or Reg No.
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Remarks
 CASING: 024 TO 0182;016 TO 0321. EDINA NO.11 M.G.S. 285 M.G.S. NO.285

First Bedrock OPDC Last Strat CSTL	Aquifer Jordan Depth to Bedrock 179.00 ft.
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Unique Well Number 206183	County Hennepin Quad Bloomington Quad Id 104D	MINNESOTA DEPARTMENT OF HEALTH WELL AND BORING RECORD <i>MINNESOTA STATUTES CHAPTER 1031</i>	Entry Date 1991/08/24 Update Date 2004/12/27 Received Date
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Wellname EDINA 11	Township 28	Range 24	Dir W	Section 31	Subsection CDAADA	Depth Drilled 403 ft	Depth Completed 403 ft	Date Completed 1963/04/16	Lic/Reg. No. 27058	Driller Name
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Elevation 826.00 ft.	Method Calc from DEM (USGS)	Aquifer Jordan	Depth to Bedrock 179 ft.	Screen/Open Hole	SWL 22
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Field Located Minnesota Geological Survey	Location Method GPS Code Measurements (Ps Universal Transverse Mercator(UTM) - NAD83 - Zone 15 - Meters)		
Program	Input Source	UTM Easting (X) 473197	UTM Northing (Y) 4968034
Uni No.Verified	Input Date 1993/03/22		
Geologic Interpretation	Agency	Interpretation Method	

Geological Material	Color	Hardness	DEPTH			ELEVATION		Stratigraphy	LITHOLOGY		
			From	To	Thick	From	To		Primary	Secondary	Minor
SAND AND GRAVEL			0	36	36	826	790	Sand	Sand	Gravel	
CLAY AND ROCKS	BLUE		36	45	9	790	781	Till-gray	Clay	Cobble	
SANDY CLAY	BLUE		45	75	30	781	751	Till-gray	Clay	Sand	
CLAY, SAND, GRAVEL & ROCKS	BROWN		75	173	98	751	653	Unknown deposit type-brown	Clay	Sand	Cobble
COARSE GRAVEL AND ROCKS DIRTY			173	179	6	653	647	Sand	Gravel	Cobble	
SHAKOPEE-ONEOTA LIMEROCK			179	304	125	647	522	Prairie Du Chien Group	Dolomite		
JORDAN SANDROCK COARSE		M.HARD	304	327	23	522	499	Jordan	Sandstone		
JORDAN SANDROCK		M.HARD	327	350	23	499	476	Jordan	Sandstone		
JORDAN SANDROCK		V.HARD	350	362	12	476	464	Jordan	Sandstone		
JORDAN SANDROCK MED. GRAINED		M.HARD	362	384	22	464	442	Jordan	Sandstone		
JORDAN SANDROCK SHALEY		HARD	384	402	18	442	424	Jordan	Sandstone		
ST. LAWRENCE SHALE			402	403	1	424	423	St.Lawrence	Shale	Dolomite	

Wellname EDINA 12
 Township Range Dir Section Subsection Field Located MGS
 117 21 W 30 BABBAD Elevation 941.00 ft.

Well Depth 1080.00 ft Depth Completed 1080.00 ft Date Well Completed 1964/05/00

Contact EDINA 12
 BELMORE PARK
 EDINA MN Changed

Drilling Method
 Drilling Fluid _____ Well Hydrofractured? YES NO
 From _____ ft. to _____

Use Community Supply
 Casing Type _____ Drive Shoe? YES NO Hole Diameter (in.)
 Diameter 16 Depth 955
 24.00 in. from 0.00 to 116.00 ft. _____ lbs/ft
 16.00 in. from 0.00 to 955.00 ft. _____ lbs/ft

Description	Color	Hardness	From	To (ft.)
SAND			0	45
SANDY CLAY			45	54
SAND			54	88
SANDY CLAY			88	109
PLATTVILLE			109	122
SOAPSTONE			122	126
ST. PETER			126	295
SHAKOPEE			295	409
JORDAN			409	497
ST. LAWRENCE			497	545
FRANCONIA			545	680
DRESBACH			680	743
EAU CLAIRE			743	831
MT. SIMON			831	984
HINCKLEY			984	1079
RED CLASTICS			1079	1080

Screen No _____ Open Hole(ft.) From 955.0 to 1080.
 Make _____ Type _____
 Diameter Slot Length Set

Static Water Level 252.00 ft. Land surface Date measured 1964/05/00

Pumping Level (below land surface) 369.00 ft. after hrs. pumping 1400.00 g.p.m.

Well Head Completion
 Pitless adapter manufacturer _____ Model _____
 Casing Protection 12 in. above grade
 At-grade (Environmental Wells and Borings ONLY) Basement offset

Grouting Information Well grouted? YES NO

Nearest Known Source of Contamination
 _____ feet Direction _____ Type _____
 Well disinfected upon completion? YES NO

Pump
 Not Installed Date Installed _____
 Manufacture's name _____
 Model number _____ HP 0.00 Volts _____
 Length of drop pipe _____ Material _____ Capacity _____ g.p.m.
 Type _____

Abandoned Wells
 Does property have any not in use and not sealed well(s)? YES NO

Variance
 Was a variance granted from the MDH for this well? YES NO

Well Contractor Certification
 Keys Well Co. 62012

License Business Name _____ Lic. or Reg No. _____

Remarks
 CASING: 024 TO 0116;016 TO 0955.

First Bedrock OPVL Aquifer Mt.Simon
 Last Strat PMSU Depth to Bedrock 109.00 ft.

Unique Well Number 203614	County Hennepin Quad Hopkins Quad Id 104B	MINNESOTA DEPARTMENT OF HEALTH WELL AND BORING RECORD <i>MINNESOTA STATUTES CHAPTER 1031</i>	Entry Date 1991/08/24 Update Date 2004/12/29 Received Date
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Wellname EDINA 12	Township 117	Range 21	Dir W	Section 30	Subsection BABBAD	Depth Drilled 1080 ft	Depth Completed 1080 ft	Date Completed 1964/05/00	Lic/Reg. No. 62012	Driller Name
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Elevation 941.00 ft.	Method Calc from DEM (USGS)	Aquifer Mt.Simon	Depth to Bedrock 109 ft.	Open Hole 955-1080	SWL 252
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Field Located Minnesota Geological Survey	Location Method GPS Code Measurements (Ps Universal Transverse Mercator(UTM) - NAD83 - Zone 15 - Meters)		
Program	Input Source	UTM Easting (X) 468819	UTM Northing (Y) 4974191
Uni No.Verified	Input Date 1995/07/21		
Geologic Interpretation	Agency	Interpretation Method	

Geological Material	Color	Hardness	DEPTH			ELEVATION			Stratigraphy	LITHOLOGY		
			From	To	Thick	From	To	Primary		Secondary	Minor	
SAND			0	45	45	941	896	Sand	Sand			
SANDY CLAY			45	54	9	896	887	Till	Clay	Sand		
SAND			54	88	34	887	853	Sand	Sand			
SANDY CLAY			88	109	21	853	832	Till	Clay	Sand		
PLATTVILLE			109	122	13	832	819	Platteville	Limestone			
SOAPSTONE			122	126	4	819	815	Glenwood	Shale			
ST. PETER			126	295	169	815	646	St.Peter	Sandstone			
SHAKOPEE			295	409	114	646	532	Prairie Du Chien Group	Dolomite			
JORDAN			409	497	88	532	444	Jordan	Sandstone			
ST. LAWRENCE			497	545	48	444	396	St.Lawrence	Shale	Dolomite		
FRANCONIA			545	680	135	396	261	Franconia	Sandstone	Shale		
DRESBACH			680	743	63	261	198	Ironton-Galesville	Sandstone			
EAU CLAIRE			743	831	88	198	110	Eau Claire	Sandstone	Shale	Siltstone	
MT. SIMON			831	984	153	110	-43	Mt.Simon	Sandstone			
HINCKLEY			984	1079	95	-43	-138	Mt.Simon	Sandstone			
RED CLASTICS			1079	1080	1	-138	-139	Mid.Proterozoic Sedimentary	Shale	Siltstone		

Wellname EDINA 13 Township Range Dir 117 21 W Section Subsection 30 BABBAA Field Located MGS Elevation 944.00 ft.	Well Depth 495.00 ft Depth Completed 495.00 ft	Date Well Completed 1964/05/00
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Contact EDINA 13 BELMORE PARK EDINA MN Changed	Drilling Method Drilling Fluid Well Hydrofractured? <input type="checkbox"/> YES <input type="checkbox"/> NO From ft. to Use Community Supply Casing Type Drive Shoe? <input type="checkbox"/> YES <input type="checkbox"/> NO Hole Diameter (in.) Diameter 16 Depth 429 24.00 in. from 0.00 to 109.00 ft. lbs/ft 16.00 in. from 0.00 to 429.00 ft. lbs/ft
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Description	Color	Hardness	From	To (ft.)
SAND			0	39
SANDY CLAY			39	58
SAND			58	79
SANDY CLAY			79	104
PLATTVILLE			104	119
SOAPSTONE			119	123
ST. PETER			123	292
SHAKOPEE			292	412
JORDAN			412	494
ST. LAWRENCE			494	495

Screen No Make Type Diameter Slot Length Set	Open Hole(ft.) From 429.0 to 495.0
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Static Water Level 97.00 ft. Land surface Date measured 1964/05/00	Pumping Level (below land surface) 127.00 ft. after hrs. pumping 1000.00 g.p.m.
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Well Head Completion Pitless adapter manufacturer _____ Model _____ <input type="checkbox"/> Casing Protection <input type="checkbox"/> 12 in. above grade <input type="checkbox"/> At-grade (Environmental Wells and Borings ONLY) <input type="checkbox"/> Basement offset	Grouting Information Well grouted? <input type="checkbox"/> YES <input type="checkbox"/> NO
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Nearest Known Source of Contamination _____ feet Direction _____ Type _____ Well disinfected upon completion? <input type="checkbox"/> YES <input type="checkbox"/> NO	Pump <input type="checkbox"/> Not Installed Date Installed _____ Manufacture's name _____ Model number _____ HP 0.00 Volts _____ Length of drop pipe _____ Material _____ Capacity _____ g.p.m. Type _____
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Abandoned Wells Does property have any not in use and not sealed well(s)? <input type="checkbox"/> YES <input type="checkbox"/> NO	Variance Was a variance granted from the MDH for this well? <input type="checkbox"/> YES <input type="checkbox"/> NO
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Well Contractor Certification Keys Well Co. 62012	License Business Name Lic. or Reg No.
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Remarks CASING: 024 TO 0109;016 TO 0429.	First Bedrock OPVL Aquifer Jordan Last Strat CSTL Depth to Bedrock 104.00 ft.
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Unique Well Number 203613	County Hennepin Quad Hopkins Quad Id 104B	MINNESOTA DEPARTMENT OF HEALTH WELL AND BORING RECORD <i>MINNESOTA STATUTES CHAPTER 1031</i>	Entry Date 1991/08/24 Update Date 2004/12/29 Received Date
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Wellname EDINA 13	Township 117 Range 21 Dir W	Section 30 Subsection BABBAA	Depth Drilled 495 ft Depth Completed 495 ft	Date Completed 1964/05/00	Lic/Reg. No. 62012	Driller Name
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Elevation 944.00 ft.	Method Calc from DEM (USGS)	Aquifer Jordan	Depth to Bedrock 104 ft.	Open Hole 429-495	SWL 97
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Field Located Minnesota Geological Survey	Location Method GPS Code Measurements (Ps Universal Transverse Mercator(UTM) - NAD83 - Zone 15 - Meters)		
Program	Input Source	UTM Easting (X) 468828	UTM Northing (Y) 4974188
Uni No.Verified	Input Date 1995/07/21		
Geologic Interpretation	Agency	Interpretation Method	

Geological Material	Color	Hardness	DEPTH			ELEVATION		Stratigraphy	LITHOLOGY		
			From	To	Thick	From	To		Primary	Secondary	Minor
SAND			0	39	39	944	905	Sand	Sand		
SANDY CLAY			39	58	19	905	886	Till	Clay	Sand	
SAND			58	79	21	886	865	Sand	Sand		
SANDY CLAY			79	104	25	865	840	Till	Clay	Sand	
PLATTVILLE			104	119	15	840	825	Platteville	Limestone		
SOAPSTONE			119	123	4	825	821	Glenwood	Shale		
ST. PETER			123	292	169	821	652	St.Peter	Sandstone		
SHAKOPEE			292	412	120	652	532	Prairie Du Chien Group	Dolomite		
JORDAN			412	494	82	532	450	Jordan	Sandstone		
ST. LAWRENCE			494	495	1	450	449	St.Lawrence	Shale		

Wellname EDINA 14 Township Range Dir Section Subsection Field Located USGS 116 21 W 7 DAD Elevation 869.00 ft.	Well Depth 420.00 ft	Depth Completed 420.00 ft	Date Well Completed 1963/12/02
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Contact EDINA #14, CITY OF EDINA MN Changed	Drilling Method Cable Tool Drilling Fluid _____ Well Hydrofractured? <input type="checkbox"/> YES <input type="checkbox"/> NO From _____ ft. to _____ Use Community Supply Casing Type Steel (black or low Drive Shoe? <input type="checkbox"/> YES <input type="checkbox"/> NO Hole Diameter (in.) Diameter 16 Depth 325 16.00 in. from 0.00 to 325.00 ft. _____ lbs/ft 16.00 in. from 0.00 to 325.00 ft. _____ lbs/ft
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Description	Color	Hardness	From	To (ft.)
DRIFT			0	182
SHAKOPEE			182	315
JORDAN SANDSTONE			315	414
ST. LAWRENCE			414	420

Screen No	Open Hole(ft.) From 325.0 to 420.0
Make _____ Type _____	
Diameter _____ Slot _____ Length _____ Set _____	

Static Water Level (Multiple SWL)
38.00 ft. Land surface Date measured 1964/02/00

Pumping Level (below land surface)
130.00 ft. after hrs. pumping 2000.00 g.p.m.

Well Head Completion
Pitless adapter manufacturer _____ Model _____
 Casing Protection 12 in. above grade
 At-grade (Environmental Wells and Borings ONLY) Basement offset

Grouting Information Well grouted? YES NO

Nearest Known Source of Contamination
_____ feet Direction _____ Type _____
Well disinfected upon completion? YES NO

Pump
 Not Installed Date Installed _____
Manufacture's name _____
Model number _____ HP 0.00 Volts _____
Length of drop pipe _____ Material _____ Capacity _____ g.p.m.
Type _____

Abandoned Wells
Does property have any not in use and not sealed well(s)? YES NO

Variance
Was a variance granted from the MDH for this well? YES NO

Well Contractor Certification
Mueller Well Co. 96460

License Business Name _____ **Lic. or Reg No.** _____

Remarks
CASING: 024 TO 0182;016 TO 0325. WELL #14- GOLF COURSE

First Bedrock OPDC Aquifer Jordan
Last Strat CSTL Depth to Bedrock 182.00 ft.

Unique Well Number 200913	County Hennepin Quad Eden Prairie Quad Id 104C	MINNESOTA DEPARTMENT OF HEALTH WELL AND BORING RECORD <i>MINNESOTA STATUTES CHAPTER 1031</i>	Entry Date 1991/08/24 Update Date 2004/12/29 Received Date
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Wellname EDINA 14	Township 116	Range 21	Dir W	Section 7	Subsection DAD	Depth Drilled 420 ft	Depth Completed 420 ft	Date Completed 1963/12/02	Lic/Reg. No. 96460	Driller Name
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Elevation 869.00 ft.	Method Calc from DEM (USGS)	Aquifer Jordan	Depth to Bedrock 182 ft.	Open Hole 325-420	SWL 38
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Field Located United States Geological Survey	Location Method GPS Code Measurements (Ps Universal Transverse Mercator(UTM) - NAD83 - Zone 15 - Meters)		
Program	Input Source	UTM Easting (X) 469878	UTM Northing (Y) 4968167
Uni No.Verified	Input Date 1995/07/21		
Geologic Interpretation	Agency	Interpretation Method	

Geological Material	Color	Hardness	DEPTH			ELEVATION		Stratigraphy	LITHOLOGY		
			From	To	Thick	From	To		Primary	Secondary	Minor
DRIFT			0	182	182	869	687	Unknown deposit type	Drift		
SHAKOPEE			182	315	133	687	554	Prairie Du Chien Group	Dolomite		
JORDAN SANDSTONE			315	414	99	554	455	Jordan	Sandstone		
ST. LAWRENCE			414	420	6	455	449	St.Lawrence	Shale	Dolomite	Sandstone

Wellname EDINA 15 Township Range Dir Section Subsection Field Located MGS 117 21 W 29 DBBDBA Elevation 902.00 ft.	Well Depth 475.00 ft	Depth Completed 475.00 ft	Date Well Completed 2002/06/15
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Well Owner EDINA 15 5005 MIRROR LAKE DR EDINA MN 55436 Changed	Drilling Method Cable Tool Drilling Fluid Water Well Hydrofractured? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO From ft. to
Contact 5146 EDEN AV EDINA MN 55436 Changed	Use Community Supply Casing Type Steel (black or low Drive Shoe? <input type="checkbox"/> YES <input type="checkbox"/> NO Hole Diameter (in.) Diameter 20 Depth 275 30.00 in. from 0.00 to 92.00 ft. lbs/ft 24.00 in. from 0.00 to 225.00 ft. lbs/ft 20.00 in. from 0.00 to 275.00 ft. lbs/ft

Description	Color	Hardness	From	To (ft.)
SAND + CLAY			0	91
PLATTEVILLE ROCK			91	111
ST. PETER SAND			111	205
SHALE + SAND MIX		HARD	205	210
SHALE + SAND MIX			210	260
SHALE	BLUE	HARD	260	265
ROCK			265	400
JORDAN SANDSTONE			400	405
NO DATA			405	475

Screen No Make _____ Type _____ Diameter Slot Length Set	Open Hole(ft.) From 275.0 to 475.0
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Remarks
 M.G.S. NO.434 REDEVELOPMENT PROJECT #02-4PW (2002/07/09)

First Bedrock OPVL **Aquifer** Prairie Du Chien-Jordan
Last Strat CJDN **Depth to Bedrock** 91.00 ft.

Static Water Level (Multiple SWL) 112.00 ft. Land surface Date measured 2002/06/15
Pumping Level (below land surface) 123.00 ft. after 4.00 hrs. pumping 1150.00 g.p.m.
Well Head Completion Pitless adapter manufacturer _____ Model _____ <input type="checkbox"/> Casing Protection <input checked="" type="checkbox"/> 12 in. above grade <input type="checkbox"/> At-grade (Environmental Wells and Borings ONLY) <input type="checkbox"/> Basement offset
Grouting Information Well grouted? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Material Neat Cement From _____ To _____ ft. 27.00 Cubic yards
Nearest Known Source of Contamination 200 feet S Direction BOW Type Well disinfected upon completion? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
Pump <input type="checkbox"/> Not Installed Date Installed _____ Manufacture's name LAYNR Model number 13 ECH HP 150.00 Volts 480 Length of drop pipe 160.0 Material _____ Capacity 1150 g.p.m. Type Turbine
Abandoned Wells Does property have any not in use and not sealed well(s)? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
Variance Was a variance granted from the MDH for this well? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
Well Contractor Certification Bergerson-Caswell 27058
License Business Name Lic. or Reg No. MANTHIR, D.

Unique Well Number 207674	County Hennepin Quad Minneapolis South Quad Id 104A	MINNESOTA DEPARTMENT OF HEALTH WELL AND BORING RECORD <i>MINNESOTA STATUTES CHAPTER 1031</i>	Entry Date 1991/08/24 Update Date 2005/03/11 Received Date
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Wellname EDINA 15	Township 117 Range 21 Dir W	Section 29 Subsection DBBDBA	Depth Drilled 475 ft Depth Completed 475 ft	Date Completed 2002/06/15	Lic/Reg. No. 27058	Driller Name MANTHIR, D.
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Elevation 902.00 ft.	Method Calc from DEM (USGS)	Aquifer Prairie Du Chien-Jordan	Depth to Bedrock 91 ft.	Open Hole 275-475	SWL 112
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Field Located Minnesota Geological Survey Program	Location Method GPS Code Measurements (Ps Universal Transverse Mercator(UTM) - NAD83 - Zone 15 - Meters)
Uni No.Verified Information from owner	Input Source
Geologic Interpretation Bruce Bloomgren	Input Date 1995/07/21
	Agency MGS
	UTM Easting (X) 470883
	UTM Northing (Y) 4973294
	Interpretation Method Geologic study 1:24k to 1:100k

Geological Material	Color	Hardness	DEPTH			ELEVATION		Stratigraphy	LITHOLOGY		
			From	To	Thick	From	To		Primary	Secondary	Minor
SAND + CLAY			0	91	91	902	811	Unknown deposit type	Sand	Clay	
PLATTEVILLE ROCK			91	111	20	811	791	Platteville	Limestone		
ST. PETER SAND			111	205	94	791	697	St.Peter	Sandstone		
SHALE + SAND MIX		HARD	205	210	5	697	692	St.Peter	Sandstone	Shale	
SHALE + SAND MIX			210	260	50	692	642	St.Peter	Shale	Sandstone	
SHALE	BLUE	HARD	260	265	5	642	637	St.Peter	Shale		
ROCK			265	400	135	637	502	Prairie Du Chien Group	Dolomite		
JORDAN SANDSTONE			400	405	5	502	497	Jordan	Sandstone		
NO DATA			405	475	70	497	427				

Wellname EDINA 16 Township Range Dir 116 21 W Section Subsection 6 ACABBB Field Located MGS Elevation 895.00 ft.	Well Depth 381.00 ft Depth Completed 381.00 ft	Date Well Completed 1967/11/10
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Contact EDINA 16 1001 GLEASON RD EDINA MN Changed	Drilling Method Drilling Fluid Well Hydrofractured? <input type="checkbox"/> YES <input type="checkbox"/> NO From ft. to Use Community Supply Casing Type Drive Shoe? <input type="checkbox"/> YES <input type="checkbox"/> NO Hole Diameter (in.) Diameter 20 Depth 265 30.00 in. from 0.00 to 215.00 ft. lbs/ft 20.00 in. from 0.00 to 265.00 ft. lbs/ft
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Description	Color	Hardness	From	To (ft.)
NO RECORD			0	45
ROCKS, GRAVEL			45	115
ST. PETER			115	175
SHALE	BLUE		175	184
SHALE, SAND	GRAY		184	215
SHALE	GRAY		215	255
ROCK-SHAKOPEE LIMESTONE			255	380
JORDAN SANDSTONE			380	381

Screen Make _____ Type _____ Diameter Slot Length Set	Open Hole(ft.) From to
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Static Water Level
 66.00 ft. Land surface Date measured 1967/11/10

Pumping Level (below land surface)
 ft. after hrs. pumping g.p.m.

Well Head Completion
 Pitless adapter manufacturer _____ Model _____
 Casing Protection 12 in. above grade
 At-grade (Environmental Wells and Borings ONLY) Basement offset

Grouting Information Well grouted? YES NO

Nearest Known Source of Contamination
 _____ feet Direction _____ Type _____
 Well disinfected upon completion? YES NO

Pump
 Not Installed Date Installed _____
 Manufacture's name _____
 Model number _____ HP 0.00 Volts _____
 Length of drop pipe _____ Material _____ Capacity _____ g.p.m.
 Type _____

Abandoned Wells
 Does property have any not in use and not sealed well(s)? YES NO

Variance
 Was a variance granted from the MDH for this well? YES NO

Well Contractor Certification
 Layne Well Co. 27010

License Business Name _____ **Lic. or Reg No.** _____

Remarks
 CASING: 030 TO 0215;020 TO 0265. M.G.S. NO.435

First Bedrock NRCB Aquifer Prairie Du Chien-Jordan
 Last Strat CJDN Depth to Bedrock _____ ft.

Unique Well Number 203101	County Hennepin Quad Hopkins Quad Id 104B	MINNESOTA DEPARTMENT OF HEALTH WELL AND BORING RECORD <i>MINNESOTA STATUTES CHAPTER 1031</i>	Entry Date 1991/08/24 Update Date 2004/12/29 Received Date
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Wellname EDINA 16	Township 116 Range 21 Dir W	Section 6 Subsection ACABBB	Depth Drilled 381 ft Depth Completed 381 ft	Date Completed 1967/11/10	Lic/Reg. No. 27010	Driller Name
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Elevation 895.00 ft.	Method Calc from DEM (USGS)	Aquifer Prairie Du Chien-Jordan	Depth to Bedrock ft.	Screen/Open Hole	SWL 66
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Field Located Minnesota Geological Survey	Location Method GPS Code Measurements (Ps Universal Transverse Mercator(UTM) - NAD83 - Zone 15 - Meters)		
Program	Input Source	UTM Easting (X) 469482	UTM Northing (Y) 4970571
Uni No.Verified	Input Date 1995/07/21		
Geologic Interpretation	Agency	Interpretation Method	

Geological Material	Color	Hardness	DEPTH			ELEVATION		Stratigraphy	LITHOLOGY		
			From	To	Thick	From	To		Primary	Secondary	Minor
NO RECORD			0	45	45	895	850	No Record	No Record		
ROCKS, GRAVEL			45	115	70	850	780	Sand	Cobble	Gravel	
ST. PETER			115	175	60	780	720	St.Peter	Sandstone		
SHALE	BLUE		175	184	9	720	711	St.Peter	Shale		
SHALE, SAND	GRAY		184	215	31	711	680	St.Peter	Shale	Sandstone	
SHALE	GRAY		215	255	40	680	640	St.Peter	Shale		
ROCK-SHAKOPEE LIMESTONE			255	380	125	640	515	Prairie Du Chien Group	Dolomite		
JORDAN SANDSTONE			380	381	1	515	514	Jordan	Sandstone		

Wellname EDINA 17
Township Range Dir 28 24 W
Section Subsection 19 DBDAAC
Field Located MGS Elevation 873.00 ft.

Well Depth 461.00 ft
Depth Completed 461.00 ft
Date Well Completed 1970/11/17

Contact EDINA 17
 EDINA MN Changed

Drilling Method
Drilling Fluid
Well Hydrofractured? YES NO
 From ft. to

Use Community Supply

Casing Type Steel (black or low Drive Shoe? YES NO Hole Diameter (in.)
 Diameter 24 Depth 373
 30.00 in. from 0.00 to 196.00 ft. lbs/ft
 24.00 in. from 0.00 to 373.00 ft. lbs/ft

Description	Color	Hardness	From	To (ft.)
CLAY			0	76
SANDY CLAY			76	131
GRAVEL			131	133
SANDROCK		SOFT	133	196
SHALE			196	201
SHAKOPEE			201	363
JORDAN			363	461

Screen No
Open Hole(ft.) From 373.0 to 461.0
 Make Type
 Diameter Slot Length Set

Static Water Level
 59.00 ft. Land surface Date measured 1970/11/17

Pumping Level (below land surface)
 80.00 ft. after hrs. pumping 1500.00 g.p.m.

Well Head Completion
 Pitless adapter manufacturer _____ Model _____
 Casing Protection 12 in. above grade
 At-grade (Environmental Wells and Borings ONLY) Basement offset

Grouting Information Well grouted? YES NO

Nearest Known Source of Contamination
 _____ feet Direction _____ Type _____
 Well disinfected upon completion? YES NO

Pump
 Not Installed Date Installed _____
 Manufacture's name _____
 Model number _____ HP 0.00 Volts _____
 Length of drop pipe _____ Material _____ Capacity _____ g.p.m.
 Type _____

Abandoned Wells
 Does property have any not in use and not sealed well(s)? YES NO

Variance
 Was a variance granted from the MDH for this well? YES NO

Well Contractor Certification
 Keys Well Co. 62012

License Business Name Lic. or Reg No.
 SITTIG, R.

Remarks
 M.G.S. NO. 663

First Bedrock OSTP **Aquifer** Jordan
Last Strat CJDN **Depth to Bedrock** 133.00 ft.

Unique Well Number 200914	County Hennepin Quad Minneapolis South Quad Id 104A	MINNESOTA DEPARTMENT OF HEALTH WELL AND BORING RECORD <i>MINNESOTA STATUTES CHAPTER 1031</i>	Entry Date 1991/08/24 Update Date 2006/01/31 Received Date
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Wellname EDINA 17	Township Range Dir 28 24 W	Section Subsection 19 DBDAAC	Depth Drilled 461 ft	Depth Completed 461 ft	Date Completed 1970/11/17	Lic/Reg. No. 62012	Driller Name SITTIG, R.
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Elevation 873.00 ft.	Method 7.5 minute topographic	Aquifer Jordan	Depth to Bedrock 133 ft.	Open Hole 373-461	SWL 59
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Field Located Minnesota Geological Survey	Location Method GPS Code Measurements (Ps Universal Transverse Mercator(UTM) - NAD83 - Zone 15 - Meters		
Program	Input Source	UTM Easting (X) 473563	UTM Northing (Y) 4971458
Uni No.Verified Information from owner	Input Date 1993/03/22		
Geologic Interpretation Bruce Bloomgren	Agency MGS	Interpretation Method Geologic study 1:24k to 1:100k	

Geological Material	Color	Hardness	DEPTH			ELEVATION		Stratigraphy	LITHOLOGY		
			From	To	Thick	From	To		Primary	Secondary	Minor
CLAY			0	76	76	873	797	Till	Clay		
SANDY CLAY			76	131	55	797	742	Till	Clay	Sand	
GRAVEL			131	133	2	742	740	Sand	Gravel		
SANDROCK		SOFT	133	196	63	740	677	St.Peter	Sandstone		
SHALE			196	201	5	677	672	St.Peter	Shale		
SHAKOPEE			201	363	162	672	510	Prairie Du Chien Group	Dolomite		
JORDAN			363	461	98	510	412	Jordan	Sandstone		

Wellname EDINA 18 Township Range Dir Section Subsection Field Located MGS 28 24 W 32 BDACCD Elevation 859.00 ft.	Well Depth 446.00 ft	Depth Completed 446.00 ft	Date Well Completed 1973/10/16
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Contact EDINA 18 EDINA MN Changed	Drilling Method
	Drilling Fluid
	Well Hydrofractured? <input type="checkbox"/> YES <input type="checkbox"/> NO From ft. to
	Use Community Supply
	Casing Type Steel (black or low Drive Shoe? <input type="checkbox"/> YES <input type="checkbox"/> NO Hole Diameter (in.) Diameter 16 Depth 365
	30.00 in. from 0.00 to 150.00 ft. lbs/ft
	24.00 in. from 0.00 to 232.00 ft. lbs/ft
	16.00 in. from 0.00 to 365.00 ft. lbs/ft

Description	Color	Hardness	From	To (ft.)
CLAY			0	14
SAND + CLAY			14	61
SAND + GRAVEL			61	223
CLAY + GRAVEL			223	232
LIMEROCK			232	347
SANDROCK			347	440
SANDROCK			440	446

Screen No	Open Hole(ft.) From 365.0 to 446.0
Make	Type
Diameter Slot Length Set	

Static Water Level
61.00 ft. Land surface Date measured 1973/10/16

Pumping Level (below land surface)
150.00 ft. after hrs. pumping 1914.00 g.p.m.

Well Head Completion
Pitless adapter manufacturer _____ Model _____
 Casing Protection 12 in. above grade
 At-grade (Environmental Wells and Borings ONLY) Basement offset

Grouting Information Well grouted? YES NO

Nearest Known Source of Contamination
_____ feet Direction _____ Type _____
Well disinfected upon completion? YES NO

Pump
 Not Installed Date Installed _____
Manufacture's name _____
Model number _____ HP 0.00 Volts _____
Length of drop pipe _____ Material _____ Capacity _____ g.p.m.
Type _____

Abandoned Wells
Does property have any not in use and not sealed well(s)? YES NO

Variance
Was a variance granted from the MDH for this well? YES NO

Well Contractor Certification
Keys Well Co. 62012

License Business Name Lic. or Reg No.
O'BRIEN, F.

Remarks
M.G.S. NO.945

First Bedrock OPDC Aquifer Jordan
Last Strat CSTL Depth to Bedrock 232.00 ft.

Unique Well Number 200918	County Hennepin Quad Bloomington Quad Id 104D	MINNESOTA DEPARTMENT OF HEALTH WELL AND BORING RECORD <i>MINNESOTA STATUTES CHAPTER 1031</i>	Entry Date 1991/08/24 Update Date 2004/12/29 Received Date
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Wellname EDINA 18	Township 28 Range 24 Dir W	Section 32 Subsection BDACCD	Depth Drilled 446 ft	Depth Completed 446 ft	Date Completed 1973/10/16	Lic/Reg. No. 62012	Driller Name O'BRIEN, F.
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Elevation 859.00 ft.	Method Calc from DEM (USGS)	Aquifer Jordan	Depth to Bedrock 232 ft.	Open Hole 365-446	SWL 61
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Field Located Minnesota Geological Survey	Location Method GPS Code Measurements (Ps Universal Transverse Mercator(UTM) - NAD83 - Zone 15 - Meters)		
Program	Input Source	UTM Easting (X) 474656	UTM Northing (Y) 4968640
Uni No.Verified Information from owner	Input Date 1995/07/21		
Geologic Interpretation Bruce Bloomgren	Agency MGS	Interpretation Method Geologic study 1:24k to 1:100k	

Geological Material	Color	Hardness	DEPTH			ELEVATION		Stratigraphy	LITHOLOGY		
			From	To	Thick	From	To		Primary	Secondary	Minor
CLAY			0	14	14	859	845	Till	Clay		
SAND + CLAY			14	61	47	845	798	Unknown deposit type	Sand	Clay	
SAND + GRAVEL			61	223	162	798	636	Sand	Sand	Gravel	
CLAY + GRAVEL			223	232	9	636	627	Unknown deposit type	Clay	Gravel	
LIMEROCK			232	347	115	627	512	Prairie Du Chien Group	Dolomite		
SANDROCK			347	440	93	512	419	Jordan	Sandstone		
SANDROCK			440	446	6	419	413	St.Lawrence	Siltstone	Dolomite	

Wellname EDINA 19 Township Range Dir Section Subsection Field Located MGS 116 21 W 5 CBCBCD Elevation 944.00 ft.	Well Depth 521.00 ft	Depth Completed 520.00 ft	Date Well Completed 1989/10/26
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Contact EDINA 19 6054 VALLEYVIEW RD EDINA MN 55425 Changed	Drilling Method Cable Tool	Drilling Fluid _____	Well Hydrofractured? <input type="checkbox"/> YES <input type="checkbox"/> NO From _____ ft. to _____
Use Community Supply			
Casing Type Steel (black or low Drive Shoe? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Hole Diameter (in.) Diameter 18 Depth 440			
30.00 in. from 0.00 to 30.00 ft. _____ lbs/ft			
24.00 in. from 0.00 to 243.00 ft. _____ lbs/ft			
18.00 in. from 0.00 to 440.00 ft. _____ lbs/ft			

Description	Color	Hardness	From	To (ft.)
CLAY	YELLOW		0	52
CLAY	BLUE		52	70
CLAY AND GRAVEL	BROWN		70	182
ST. PETER	TAN		182	195
ST. PETER	WHITE		195	207
ST. PETER	TAN		207	228
SHALE AND ST. PETER	LT. BLU		228	240
ST. PETER	TAN		240	260
ST. PETER AND SHALE	BLUE		260	302
SHAKOPEE DOLOMITE	TAN		302	428
JORDAN SANDSTONE	WHITE		428	521

Screen No	Open Hole(ft.) From 440.0 to 520.0
Make _____	Type _____
Diameter _____	Slot _____
Length _____	Set _____
Static Water Level 163.00 ft. Land surface Date measured 1989/10/26	
Pumping Level (below land surface) 202.00 ft. after hrs. pumping 1200.00 g.p.m.	
Well Head Completion Pitless adapter manufacturer _____ Model _____ <input type="checkbox"/> Casing Protection <input type="checkbox"/> 12 in. above grade <input type="checkbox"/> At-grade (Environmental Wells and Borings ONLY) <input type="checkbox"/> Basement offset	
Grouting Information Well grouted? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Material Neat Cement From 0.0 To 242.0 ft. 6.00 Cubic yards Material Neat Cement From 0.0 To 440.0 ft. 63.00 Cubic yards	
Nearest Known Source of Contamination _____ feet Direction _____ Type _____ Well disinfected upon completion? <input type="checkbox"/> YES <input type="checkbox"/> NO	
Pump <input type="checkbox"/> Not Installed Date Installed _____ Manufacturer's name _____ Model number _____ HP _____ Volts _____ Length of drop pipe _____ Material _____ Capacity _____ g.p.m. Type _____	
Abandoned Wells Does property have any not in use and not sealed well(s)? <input type="checkbox"/> YES <input type="checkbox"/> NO	
Variance Was a variance granted from the MDH for this well? <input type="checkbox"/> YES <input type="checkbox"/> NO	
Well Contractor Certification Renner E.H. Well 71015	
License Business Name Lic. or Reg No. RENNER, E.	

Remarks

First Bedrock OSTP Aquifer Jordan
Last Strat CJDN Depth to Bedrock 182.00 ft.

Unique Well Number 505626	County Hennepin Quad Minneapolis South Quad Id 104A	MINNESOTA DEPARTMENT OF HEALTH WELL AND BORING RECORD <i>MINNESOTA STATUTES CHAPTER 1031</i>	Entry Date 1992/06/29 Update Date 2004/12/29 Received Date
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Wellname EDINA 19	Township 116	Range 21	Dir W	Section 5	Subsection CBCBCD	Depth Drilled 521 ft	Depth Completed 520 ft	Date Completed 1989/10/26	Lic/Reg. No. 71015	Driller Name RENNER, E.
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Elevation 944.00 ft.	Method Calc from DEM (USGS)	Aquifer Jordan	Depth to Bedrock 182 ft.	Open Hole 440-520	SWL 163
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Field Located Minnesota Geological Survey	Location Method GPS Code Measurements (Ps Universal Transverse Mercator(UTM) - NAD83 - Zone 15 - Meters)		
Program	Input Source	UTM Easting (X) 470092	UTM Northing (Y) 4969770
Uni No.Verified Information from owner	Input Date 1995/07/21		
Geologic Interpretation Bruce Bloomgren	Agency MGS	Interpretation Method Geologic study 1:24k to 1:100k	

Geological Material	Color	Hardness	DEPTH			ELEVATION		Stratigraphy	LITHOLOGY		
			From	To	Thick	From	To		Primary	Secondary	Minor
CLAY	YELLOW		0	52	52	944	892	Clay-yellow	Clay		
CLAY	BLUE		52	70	18	892	874	Clay-gray	Clay		
CLAY AND GRAVEL	BROWN		70	182	112	874	762	Pebbly sand/silt/clay-brown	Clay	Gravel	
ST. PETER	TAN		182	195	13	762	749	St.Peter	Sandstone		
ST. PETER	WHITE		195	207	12	749	737	St.Peter	Sandstone		
ST. PETER	TAN		207	228	21	737	716	St.Peter	Sandstone		
SHALE AND ST. PETER	LT. BLU		228	240	12	716	704	St.Peter	Shale	Sandstone	
ST. PETER	TAN		240	260	20	704	684	St.Peter	Sandstone		
ST. PETER AND SHALE	BLUE		260	302	42	684	642	St.Peter	Sandstone	Shale	
SHAKOPEE DOLOMITE	TAN		302	428	126	642	516	Prairie Du Chien Group	Dolomite		
JORDAN SANDSTONE	WHITE		428	521	93	516	423	Jordan	Sandstone		

Wellname EDINA 2 Township Range Dir 28 24 W Section Subsection 18 CAAABA Field Located MGS Elevation 878.00 ft.	Well Depth 448.00 ft Depth Completed 448.00 ft Date Well Completed 2007/04/00
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Well Owner EDINA 2 4521 50TH ST EDINA MN 55436 Changed Contact CITY OF EDINA 5146 EDEN AV EDINA MN 55436 Changed	Drilling Method Cable Tool Drilling Fluid Water Well Hydrofractured? <input type="checkbox"/> YES <input type="checkbox"/> NO From ft. to Use Community Supply Casing Type Steel (black or low Drive Shoe? <input type="checkbox"/> YES <input type="checkbox"/> NO Hole Diameter (in.) Diameter 12 Depth 266 20.00 in. from 0.00 to 53.00 ft. lbs/ft 16.00 in. from 0.00 to 260.00 ft. lbs/ft 12.00 in. from 0.00 to 266.00 ft. lbs/ft
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Description	Color	Hardness	From	To (ft.)
DRIFT			0	62
PLATTEVILLE LIMESTONE			62	86
PLATTEVILLE LIMESTONE			86	89
PLATTEVILLE LIMESTONE			89	97
ST. PETER SANDSTONE			97	258
ST. PETER SANDSTONE			258	262
PRAIRIE DU CHIEN GROUP			262	385
JORDAN SANDSTONE			385	389
JORDAN SANDSTONE			389	448

Static Water Level 80.00 ft. Land surface Date measured 2002/04/17
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Pumping Level (below land surface) ft. after hrs. pumping g.p.m.
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Well Head Completion Pitless adapter manufacturer _____ Model _____ <input checked="" type="checkbox"/> Casing Protection <input type="checkbox"/> 12 in. above grade <input type="checkbox"/> At-grade (Environmental Wells and Borings ONLY) <input type="checkbox"/> Basement offset

Grouting Information Well grouted? <input type="checkbox"/> YES <input type="checkbox"/> NO Material Neat Cement From _____ To 266.0 ft. 13.00 Cubic yards
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Nearest Known Source of Contamination 150 feet S Direction BOW Type Well disinfected upon completion? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
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Pump <input type="checkbox"/> Not Installed Date Installed 2007/01/02 Manufacture's name GOULDS Model number 11005100 HP 100.00 Volts 208 Length of drop pipe 140.0 Material _____ Capacity 900 g.p.m. Type Submersible

Abandoned Wells Does property have any not in use and not sealed well(s)? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO

Variance Was a variance granted from the MDH for this well? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO

Well Contractor Certification Keys Well Drilling Co. 1347

License Business Name Lic. or Reg No. GALVIN, M.
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Remarks
 LOCATED 20FT. S. OF NO. 1 GAMMA LOGGED 2-15-1984.
 REDEVELOPMENT PROJECT #02-2PW WELL RECONSTRUCTED
 4-2007 BY KEYS WELL CO. VARIANCE TN#3623. EDINA #2 MU#208399
 AMENDED RECORD

First Bedrock OPVL **Aquifer** Prairie Du Chien-Jordan
Last Strat CJDN **Depth to Bedrock** 63.00 ft.

Unique Well Number 208399	County Hennepin Quad Minneapolis South Quad Id 104A	MINNESOTA DEPARTMENT OF HEALTH WELL AND BORING RECORD <i>MINNESOTA STATUTES CHAPTER 1031</i>	Entry Date 1991/08/24 Update Date 2007/12/03 Received Date 2007/04/09
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Wellname EDINA 2	Township 28	Range 24	Dir W	Section 18	Subsection CAAABA	Depth Drilled 448 ft	Depth Completed 448 ft	Date Completed 2007/04/00	Lic/Reg. No. 1347	Driller Name GALVIN, M.
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Elevation 878.00 ft.	Method 7.5 minute topographic	Aquifer Prairie Du Chien-Jordan	Depth to Bedrock 63 ft.	Open Hole 266-446	SWL 80
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Field Located Minnesota Geological Survey	Location Method GPS Code Measurements (Ps Universal Transverse Mercator(UTM) - NAD83 - Zone 15 - Meters)		
Program	Input Source	UTM Easting (X) 473163	UTM Northing (Y) 4973279
Uni No.Verified Information from owner	Input Date 1995/08/10		
Geologic Interpretation Bruce Bloomgren	Agency MGS	Interpretation Method Geologic study 1:24k to 1:100k	

Geological Material	Color	Hardness	DEPTH			ELEVATION		Stratigraphy	LITHOLOGY		
			From	To	Thick	From	To		Primary	Secondary	Minor
DRIFT			0	62	62	878	816	Unknown deposit type	Drift		
PLATTEVILLE LIMESTONE			62	86	24	816	792	Platteville	Limestone		
PLATTEVILLE LIMESTONE			86	89	3	792	789	Glenwood	Shale		
PLATTEVILLE LIMESTONE			89	97	8	789	781	St.Peter	Sandstone		
ST. PETER SANDSTONE			97	258	161	781	620	St.Peter	Sandstone		
ST. PETER SANDSTONE			258	262	4	620	616	Prairie Du Chien Group	Dolomite		
PRAIRIE DU CHIEN GROUP			262	385	123	616	493	Prairie Du Chien Group	Dolomite		
JORDAN SANDSTONE			385	389	4	493	489	Prairie Du Chien Group	Dolomite		
JORDAN SANDSTONE			389	448	59	489	430	Jordan	Sandstone		

Wellname EDINA 20 Township Range Dir Section Subsection Field Located MDH 116 21 W 6 ABABCD Elevation 881.00 ft.	Well Depth 467.00 ft	Depth Completed 467.00 ft	Date Well Completed 2008/06/30
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Well Owner EDINA # 20 HWY 62 & GLEASON RD LM EDINA MN Contact CITY OF EDINA 4801 50TH ST W EDINA MN 55424	Drilling Method Cable Tool Drilling Fluid Bentonite Well Hydrofractured? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO From ft. to Use Community Supply Casing Type Steel (black or low Drive Shoe? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Diameter 18 Depth 265 30.00 in. from 0.00 to 187.00 ft. 118.65 lbs/ft 24.00 in. from 0.00 to 210.00 ft. 94.62 lbs/ft 18.00 in. from 0.00 to 265.00 ft. 20.59 lbs/ft Hole Diameter (in.) 30.0 To 187.0 24.0 To 264.0 18.0 To 467.0
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Description	Color	Hardness	From	To (ft.)
CLAY, SAND , GRAVEL	BROWN	SOFT	0	40
CLAY, SAND , GRAVEL ROCKS	BROWN	SOFT	40	125
SAND & GRAVEL	BROWN	SOFT	125	180
CLAY & SAND	GRAY	SOFT	180	200
SAND & GRAVEL	BROWN	SOFT	200	207
SANDSTONE & SHALE	TAN	MEDIUM	207	248
LIMESTONE	TAN	HARD	248	375
SANDSTONE	WHITE	MEDIUM	375	460
SHALE	GREEN	MEDIUM	460	467

Screen No Make _____ Type _____ Diameter Slot Length Set	Open Hole(ft.) From 264.0 to 467.0
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Remarks
 GAMMA LOGGED 6-27-2008. M.G.S. NO. 4841. LOGGED BY JIM TRAEN. 0-211QUUU, 211-247 OSTP, 247-380 OPDC, & 380-463 CJDN.

First Bedrock _____ **Aquifer** _____
Last Strat _____ **Depth to Bedrock** _____ ft.

Static Water Level 90.00 ft. Land surface Date measured 2008/06/11	Pumping Level (below land surface) 105.00 ft. after 24.00 hrs. pumping 1200.00 g.p.m.
Well Head Completion Pitless adapter manufacturer _____ Model _____ <input checked="" type="checkbox"/> Casing Protection <input checked="" type="checkbox"/> 12 in. above grade <input type="checkbox"/> At-grade (Environmental Wells and Borings ONLY) <input type="checkbox"/> Basement offset	
Grouting Information Well grouted? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Material Neat Cement From _____ To 187.0 ft. 12.00 Cubic yards Material Neat Cement From _____ To 264.0 ft. 16.00 Cubic yards	
Nearest Known Source of Contamination 100 feet W Direction SDF Type Well disinfected upon completion? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
Pump <input checked="" type="checkbox"/> Not Installed Date Installed _____ Manufacture's name _____ Model number _____ HP _____ Volts _____ Length of drop pipe _____ Material _____ Capacity _____ g.p.m. Type _____	
Abandoned Wells Does property have any not in use and not sealed well(s)? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	
Variance Was a variance granted from the MDH for this well? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	
Well Contractor Certification Keys Well Drilling Co. 1347	
License Business Name Lic. or Reg No. GALVIN, M.	

Unique Well Number 686286	County Hennepin Quad Hopkins Quad Id 104B	MINNESOTA DEPARTMENT OF HEALTH WELL AND BORING RECORD <i>MINNESOTA STATUTES CHAPTER 1031</i>	Entry Date 2008/07/09 Update Date 2008/08/12 Received Date
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Wellname EDINA 20	Township 116 Range 21 Dir W	Section 6 Subsection ABABCD	Depth Drilled 467 ft Depth Completed 467 ft	Date Completed 2008/06/30	Lic/Reg. No. 1347	Driller Name GALVIN, M.
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Elevation 881.00 ft.	Method 7.5 minute topographic	Aquifer	Depth to Bedrock ft.	Open Hole 264-467	SWL 90
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Field Located Program	Location Method Digitization (Screen) - Map (1:: Universal Transverse Mercator(UTM) - NAD83 - Zone 15 - Meters		
Uni No.Verified Info/GPS from data source	Input Source	UTM Easting (X) 469502	UTM Northing (Y) 4970896
Geologic Interpretation	Input Date 2008/07/09	Agency Interpretation Method	

Geological Material	Color	Hardness	DEPTH			ELEVATION		Stratigraphy	LITHOLOGY		
			From	To	Thick	From	To		Primary	Secondary	Minor
CLAY, SAND , GRAVEL	BROWN	SOFT	0	40	40	881	841				
CLAY, SAND , GRAVEL ROCKS	BROWN	SOFT	40	125	85	841	756				
SAND & GRAVEL	BROWN	SOFT	125	180	55	756	701				
CLAY & SAND	GRAY	SOFT	180	200	20	701	681				
SAND & GRAVEL	BROWN	SOFT	200	207	7	681	674				
SANDSTONE & SHALE	TAN	MEDIUM	207	248	41	674	633				
LIMESTONE	TAN	HARD	248	375	127	633	506				
SANDSTONE	WHITE	MEDIUM	375	460	85	506	421				
SHALE	GREEN	MEDIUM	460	467	7	421	414				

Wellname EDINA 3	Well Depth	Depth Completed	Date Well Completed
Township Range Dir 28 24 W	496.00 ft	496.00 ft	1949/00/00
Section Subsection 18 DDACDB			
Field Located MGS Elevation 877.00 ft.			

Well Owner EDINA 3	Drilling Method Cable Tool
EDINA MN 55424 Changed	Drilling Fluid
Contact CITY OF EDINA	Well Hydrofractured? <input type="checkbox"/> YES <input type="checkbox"/> NO
4801 50TH ST W EDINA MN 55424 Changed	From ft. to
	Use Community Supply
	Casing Type Steel (black or low Drive Shoe? <input type="checkbox"/> YES <input type="checkbox"/> NO Hole Diameter (in.)
	Diameter 12 Depth 265
	12.00 in. from 0.00 to 265.00 ft. lbs/ft

Description	Color	Hardness	From	To (ft.)
NO RECORD			0	496

Screen No	Open Hole(ft.) From 265.0 to 496.0
Make	Type
Diameter Slot Length Set	

Static Water Level
72.00 ft. Land surface Date measured 1949/00/00

Pumping Level (below land surface)
ft. after hrs. pumping g.p.m.

Well Head Completion
Pitless adapter manufacturer _____ Model _____
<input type="checkbox"/> Casing Protection <input checked="" type="checkbox"/> 12 in. above grade
<input type="checkbox"/> At-grate (Environmental Wells and Borings ONLY) <input type="checkbox"/> Basement offset

Grouting Information Well grouted? <input type="checkbox"/> YES <input type="checkbox"/> NO
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Nearest Known Source of Contamination
_____ feet _____ Direction _____ Type
Well disinfected upon completion? <input type="checkbox"/> YES <input type="checkbox"/> NO

Pump
<input type="checkbox"/> Not Installed Date Installed _____
Manufacture's name _____
Model number _____ HP _____ Volts _____
Length of drop pipe _____ Material _____ Capacity _____ g.p.m.
Type _____

Abandoned Wells
Does property have any not in use and not sealed well(s)? <input type="checkbox"/> YES <input type="checkbox"/> NO

Variance
Was a variance granted from the MDH for this well? <input type="checkbox"/> YES <input type="checkbox"/> NO

Well Contractor Certification
Minnesota Department of Health MDH

License Business Name	Lic. or Reg No.
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Remarks
 SUPPOSEDLY DRILLED BY LAYNE WELL CO. IN 1946. NO DRILLER'S LOG.

First Bedrock _____ **Aquifer** Prairie Du Chien-Jordan
Last Strat _____ **Depth to Bedrock** _____ ft.

Wellname EDINA 4 Township Range Dir Section Subsection Field Located MGS 28 24 W 19 BCDAAA Elevation 895.00 ft.	Well Depth 500.00 ft	Depth Completed 500.00 ft	Date Well Completed 1950/00/00
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Contact EDINA 4 EDINA MN Changed	Drilling Method
	Drilling Fluid
	Well Hydrofractured? <input type="checkbox"/> YES <input type="checkbox"/> NO From ft. to
	Use Community Supply
	Casing Type Drive Shoe? <input type="checkbox"/> YES <input type="checkbox"/> NO Hole Diameter (in.) Diameter 16 Depth 266 24.00 in. from 0.00 to 79.00 ft. lbs/ft 16.00 in. from 0.00 to 266.00 ft. lbs/ft

Description	Color	Hardness	From	To (ft.)
DRIFT			0	80
PLATTEVILLE LIMESTONE			80	110
ST PETER SANDSTONE			110	270
SHAKOPEE + JORDAN SANDST			270	410
JORDAN SANDSTONE			410	500

Screen	Open Hole(ft.) From to
Make	Type
Diameter Slot Length Set	

Static Water Level
80.00 ft. Land surface Date measured 1950/00/00

Pumping Level (below land surface)
138.00 ft. after hrs. pumping 750.00 g.p.m.

Well Head Completion
Pitless adapter manufacturer _____ Model _____
 Casing Protection 12 in. above grade
 At-grate (Environmental Wells and Borings ONLY) Basement offset

Grouting Information Well grouted? YES NO

Nearest Known Source of Contamination
_____ feet Direction _____ Type _____
Well disinfected upon completion? YES NO

Pump
 Not Installed Date Installed _____
Manufacture's name _____
Model number _____ HP 0.00 Volts _____
Length of drop pipe _____ Material _____ Capacity _____ g.p.m.
Type _____

Abandoned Wells
Does property have any not in use and not sealed well(s)? YES NO

Variance
Was a variance granted from the MDH for this well? YES NO

Well Contractor Certification
Bergerson-Caswell 27058

License Business Name Lic. or Reg No.

Remarks
CASING: 024 TO 0079;016 TO 0266. EDINA NO. 4 G.W.Q. NO.0202

First Bedrock OPVL Aquifer Prairie Du Chien-Jordan
Last Strat CJDN Depth to Bedrock 80.00 ft.

Unique Well Number 200561	County Hennepin Quad Minneapolis South Quad Id 104A	MINNESOTA DEPARTMENT OF HEALTH WELL AND BORING RECORD <i>MINNESOTA STATUTES CHAPTER 1031</i>	Entry Date 1991/08/24 Update Date 2004/12/29 Received Date
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Wellname EDINA 4	Township 28 Range 24 Dir W	Section 19 Subsection BCDAAA	Depth Drilled 500 ft Depth Completed 500 ft	Date Completed 1950/00/00	Lic/Reg. No. 27058	Driller Name
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Elevation 895.00 ft.	Method Calc from DEM (USGS)	Aquifer Prairie Du Chien-Jordan	Depth to Bedrock 80 ft.	Screen/Open Hole	SWL 80
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Field Located Minnesota Geological Survey	Location Method GPS Code Measurements (Ps Universal Transverse Mercator(UTM) - NAD83 - Zone 15 - Meters)		
Program	Input Source	UTM Easting (X) 472788	UTM Northing (Y) 4971862
Uni No.Verified	Input Date 1995/07/21		
Geologic Interpretation	Agency	Interpretation Method	

Geological Material	Color	Hardness	DEPTH			ELEVATION			Stratigraphy	LITHOLOGY		
			From	To	Thick	From	To	Primary		Secondary	Minor	
DRIFT			0	80	80	895	815	Unknown deposit type	Drift			
PLATTEVILLE LIMESTONE			80	110	30	815	785	Platteville	Limestone			
ST PETER SANDSTONE			110	270	160	785	625	St.Peter	Sandstone			
SHAKOPEE + JORDAN SANDSTONE			270	410	140	625	485	Prairie Du Chien Group	Dolomite			
JORDAN SANDSTONE			410	500	90	485	395	Jordan	Sandstone			

Wellname EDINA 5 Township Range Dir 28 24 W Section Subsection 29 CCBCCD Field Located MGS Elevation 869.00 ft.	Well Depth 443.00 ft Depth Completed 438.00 ft Date Well Completed 2002/06/13
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Well Owner EDINA 5 3850 69TH ST W EDINA MN 55435 Changed Contact CITY OF EDINA 5146 EDEN AV EDINA MN 55436 Changed	Drilling Method Cable Tool Drilling Fluid Water Well Hydrofractured? <input type="checkbox"/> YES <input type="checkbox"/> NO From ft. to Use Community Supply Casing Type Steel (black or low Drive Shoe? <input type="checkbox"/> YES <input type="checkbox"/> NO Hole Diameter (in.) Diameter 16 Depth 257 24.00 in. from 0.00 to 136.00 ft. lbs/ft 20.00 in. from 0.00 to 200.00 ft. lbs/ft 16.00 in. from 0.00 to 257.00 ft. lbs/ft
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Description	Color	Hardness	From	To (ft.)
SAND & GRAVEL			0	37
CLAY			37	84
MUDDY SAND			84	90
SAND & GRAVEL			90	168
SAND			168	180
SAND & GRAVEL			180	185
SANDSTONE			185	190
CLAY			190	200
ST. PETER SANDSTONE			200	237
SHAKOPEE LIMEROCK			237	365
JORDAN SANDSTONE			365	443

Screen Make _____ Type _____ Diameter Slot Length Set	Open Hole(ft.) From 252.C to 438.0
Static Water Level (Multiple SWL) 78.00 ft. Land surface Date measured 2002/06/13	
Pumping Level (below land surface) 90.00 ft. after 4.00 hrs. pumping 1000.00 g.p.m.	
Well Head Completion Pitless adapter manufacturer _____ Model _____ <input type="checkbox"/> Casing Protection <input checked="" type="checkbox"/> 12 in. above grade <input type="checkbox"/> At-grate (Environmental Wells and Borings ONLY) <input type="checkbox"/> Basement offset	
Grouting Information Well grouted? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
Nearest Known Source of Contamination _____ feet Direction _____ Type _____ Well disinfected upon completion? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	
Pump <input type="checkbox"/> Not Installed Date Installed _____ Manufacture's name J-LINE Model number 12 LC HP 100.00 Volts 220 Length of drop pipe 138.C Material _____ Capacity 1000 g.p.m. Type Turbine	
Abandoned Wells Does property have any not in use and not sealed well(s)? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	
Variance Was a variance granted from the MDH for this well? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	
Well Contractor Certification Bergerson-Caswell 27058	
License Business Name Lic. or Reg No. MANTHIR, D.	

Remarks
 CASING: 024 TO 0136;020 TO 0200;016 TO 0257. EDINA NO. 5 G.W.Q. NO.0203 PROJECT #02-5PW (2002/07/09)

First Bedrock OSTP **Aquifer** Prairie Du Chien-Jordan
Last Strat CJDN **Depth to Bedrock** 200.00 ft.

Unique Well Number 206377	County Hennepin Quad Minneapolis South Quad Id 104A	MINNESOTA DEPARTMENT OF HEALTH WELL AND BORING RECORD <i>MINNESOTA STATUTES CHAPTER 1031</i>	Entry Date 1991/08/24 Update Date 2006/02/06 Received Date
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Wellname EDINA 5	Township 28	Range 24	Dir W	Section 29	Subsection CCBCCD	Depth Drilled 443 ft	Depth Completed 438 ft	Date Completed 2002/06/13	Lic/Reg. No. 27058	Driller Name MANTHIR, D.
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Elevation 869.00 ft.	Method Calc from DEM (USGS)	Aquifer Prairie Du Chien-Jordan	Depth to Bedrock 200 ft.	Open Hole 252-438	SWL 78
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Field Located Minnesota Geological Survey	Location Method GPS Code Measurements (Ps Universal Transverse Mercator(UTM) - NAD83 - Zone 15 - Meters)		
Program	Input Source	UTM Easting (X) 474068	UTM Northing (Y) 4969468
Uni No.Verified	Input Date 1995/07/21		
Geologic Interpretation	Agency	Interpretation Method	

Geological Material	Color	Hardness	DEPTH			ELEVATION		Stratigraphy	LITHOLOGY		
			From	To	Thick	From	To		Primary	Secondary	Minor
SAND & GRAVEL			0	37	37	869	832	Sand	Sand	Gravel	
CLAY			37	84	47	832	785	Till	Clay		
MUDDY SAND			84	90	6	785	779	Sand	Sand	Silt	
SAND & GRAVEL			90	168	78	779	701	Sand	Sand	Gravel	
SAND			168	180	12	701	689	Sand	Sand		
SAND & GRAVEL			180	185	5	689	684	Sand	Sand	Gravel	
SANDSTONE			185	190	5	684	679	Sand	Sand		
CLAY			190	200	10	679	669	Till	Clay		
ST. PETER SANDSTONE			200	237	37	669	632	St.Peter	Sandstone		
SHAKOPEE LIMEROCK			237	365	128	632	504	Prairie Du Chien Group	Dolomite		
JORDAN SANDSTONE			365	443	78	504	426	Jordan	Sandstone		

Wellname EDINA 6 Township Range Dir Section Subsection Field Located MGS 28 24 W 19 CBBDAC Elevation 902.00 ft.	Well Depth 503.00 ft Depth Completed 503.00 ft	Date Well Completed 1954/07/07
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Contact EDINA 6 EDINA MN Changed	Drilling Method Drilling Fluid Well Hydrofractured? <input type="checkbox"/> YES <input type="checkbox"/> NO From ft. to Use Community Supply
	Casing Type Drive Shoe? <input type="checkbox"/> YES <input type="checkbox"/> NO Hole Diameter (in.) Diameter 16 Depth 316 24.00 in. from 0.00 to 96.00 ft. lbs/ft 16.00 in. from 0.00 to 316.00 ft. lbs/ft

Description	Color	Hardness	From	To (ft.)
CLAY (SANDY)	YELLOW		0	94
LIMEROCK			94	110
SOAPSTONE			110	118
ST PETER			118	278
SHAKOPEE			278	408
JORDAN			408	493
SHALE			493	503

Screen Make Diameter Slot Length Set	Open Hole(ft.) From to Type
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Static Water Level (Multiple SWL)
90.00 ft. Land surface Date measured 1954/06/00

Pumping Level (below land surface)
150.00 ft. after hrs. pumping 1599.00 g.p.m.

Well Head Completion
Pitless adapter manufacturer _____ Model _____
 Casing Protection 12 in. above grade
 At-grade (Environmental Wells and Borings ONLY) Basement offset

Grouting Information Well grouted? YES NO

Nearest Known Source of Contamination
_____ feet Direction _____ Type _____
Well disinfected upon completion? YES NO

Pump
 Not Installed Date Installed _____
Manufacture's name PEERLESS
Model number _____ HP 100.00 Volts 220
Length of drop pipe _____ Material _____ Capacity 1000 g.p.m.
Type Turbine

Abandoned Wells
Does property have any not in use and not sealed well(s)? YES NO

Variance
Was a variance granted from the MDH for this well? YES NO

Well Contractor Certification
62010 62010

License Business Name _____ **Lic. or Reg No.** _____

Remarks
CASING: 024 TO 0096;016 TO 0316. EDINA NO. 6

First Bedrock OPVL Aquifer Prairie Du Chien-Jordan
Last Strat CSTL Depth to Bedrock 94.00 ft.

Unique Well Number 200564	County Hennepin Quad Minneapolis South Quad Id 104A	MINNESOTA DEPARTMENT OF HEALTH WELL AND BORING RECORD <i>MINNESOTA STATUTES CHAPTER 1031</i>	Entry Date 1991/08/24 Update Date 2004/12/29 Received Date
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Wellname EDINA 6	Township 28 Range 24 Dir W	Section 19 Subsection CBBDAC	Depth Drilled 503 ft Depth Completed 503 ft	Date Completed 1954/07/07	Lic/Reg. No. 62010	Driller Name
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Elevation 902.00 ft.	Method Calc from DEM (USGS)	Aquifer Prairie Du Chien-Jordan	Depth to Bedrock 94 ft.	Screen/Open Hole	SWL 90
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Field Located Minnesota Geological Survey	Location Method GPS Code Measurements (Ps Universal Transverse Mercator(UTM) - NAD83 - Zone 15 - Meters)		
Program	Input Source	UTM Easting (X) 472600	UTM Northing (Y) 4971537
Uni No.Verified	Input Date 1995/07/21		
Geologic Interpretation	Agency	Interpretation Method	

Geological Material	Color	Hardness	DEPTH			ELEVATION		Stratigraphy	LITHOLOGY		
			From	To	Thick	From	To		Primary	Secondary	Minor
CLAY (SANDY)	YELLOW		0	94	94	902	808	Till-brown	Clay		
LIMEROCK			94	110	16	808	792	Platteville	Limestone		
SOAPSTONE			110	118	8	792	784	Glenwood	Shale		
ST PETER			118	278	160	784	624	St.Peter	Sandstone		
SHAKOPEE			278	408	130	624	494	Prairie Du Chien Group	Dolomite		
JORDAN			408	493	85	494	409	Jordan	Sandstone		
SHALE			493	503	10	409	399	St.Lawrence	Shale		

Wellname EDINA 7 Township Range Dir Section Subsection Field Located MGS 117 21 W 28 CCDCAA Elevation 951.00 ft.	Well Depth 547.00 ft Depth Completed 547.00 ft	Date Well Completed 0019/55/03
--	---	---------------------------------------

Contact EDINA 7 EDINA MN Changed	Drilling Method Drilling Fluid Well Hydrofractured? <input type="checkbox"/> YES <input type="checkbox"/> NO From ft. to Use Community Supply Casing Type Steel (black or low Drive Shoe? <input type="checkbox"/> YES <input type="checkbox"/> NO Hole Diameter (in.) Diameter 16 Depth 350 24.00 in. from 0.00 to 148.00 ft. lbs/ft 16.00 in. from 0.00 to 350.00 ft. lbs/ft
--	---

Description	Color	Hardness	From	To (ft.)
CLAY			0	18
SAND + GRAVEL			18	35
CLAY			35	78
SAND			78	132
LIMEROCK			132	159
SOAPSTONE			159	162
SANDROCK			162	290
SANDROCK + SHALE			290	324
SHAKOPEE			324	453
JORDAN			453	459
JORDAN			459	545
SHALE			545	547

Screen No Make _____ Type _____ Diameter Slot Length Set	Open Hole(ft.) From 350.0 to 547.0
---	---

Static Water Level 112.00 ft. Land surface Date measured 1955/03/03	Pumping Level (below land surface) 159.00 ft. after hrs. pumping 1809.00 g.p.m.
---	---

Well Head Completion Pitless adapter manufacturer _____ Model _____ <input type="checkbox"/> Casing Protection <input type="checkbox"/> 12 in. above grade <input type="checkbox"/> At-grade (Environmental Wells and Borings ONLY) <input type="checkbox"/> Basement offset
--

Grouting Information Well grouted? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO

Nearest Known Source of Contamination _____ feet Direction _____ Type _____ Well disinfected upon completion? <input type="checkbox"/> YES <input type="checkbox"/> NO

Pump <input type="checkbox"/> Not Installed Date Installed _____ Manufacture's name _____ Model number _____ HP 0.00 Volts _____ Length of drop pipe _____ Material _____ Capacity _____ g.p.m. Type _____
--

Abandoned Wells Does property have any not in use and not sealed well(s)? <input type="checkbox"/> YES <input type="checkbox"/> NO
--

Variance Was a variance granted from the MDH for this well? <input type="checkbox"/> YES <input type="checkbox"/> NO
--

Well Contractor Certification Keys Well Co. 62012

License Business Name	Lic. or Reg No.
------------------------------	------------------------

Remarks
GAMMA LOGGED 11-8-04 BY JIM TRAEEN

First Bedrock OPVL **Aquifer** Prairie Du Chien-Jordan
Last Strat CSTL **Depth to Bedrock** 132.00 ft.

Unique Well Number 206474	County Hennepin Quad Minneapolis South Quad Id 104A	MINNESOTA DEPARTMENT OF HEALTH WELL AND BORING RECORD <i>MINNESOTA STATUTES CHAPTER 1031</i>	Entry Date 1991/08/24 Update Date 2006/05/09 Received Date
--	--	--	---

Wellname EDINA 7	Township 117 Range 21 Dir W	Section 28 Subsection CCDCAA	Depth Drilled 547 ft Depth Completed 547 ft	Date Completed 0019/55/03	Lic/Reg. No. 62012	Driller Name
----------------------------	--	---	--	----------------------------------	---------------------------	---------------------

Elevation 951.00 ft.	Method 7.5 minute topographic	Aquifer Prairie Du Chien-Jordan	Depth to Bedrock 132 ft.	Open Hole 350-547	SWL 112
-----------------------------	--------------------------------------	--	---------------------------------	--------------------------	----------------

Field Located Minnesota Geological Survey Program	Location Method GPS Code Measurements (Ps Universal Transverse Mercator(UTM) - NAD83 - Zone 15 - Meters)
Uni No.Verified Information from owner	Input Source
Geologic Interpretation John Mossler	Input Date 1993/03/22
	Agency MGS
	UTM Easting (X) 471863
	UTM Northing (Y) 4972656
	Interpretation Method Geologic study 1:24k to 1:100k

Geological Material	Color	Hardness	DEPTH			ELEVATION		Stratigraphy	LITHOLOGY		
			From	To	Thick	From	To		Primary	Secondary	Minor
CLAY			0	18	18	951	933	Till	Clay		
SAND + GRAVEL			18	35	17	933	916	Sand	Sand	Gravel	
CLAY			35	78	43	916	873	Till	Clay		
SAND			78	132	54	873	819	Sand	Sand		
LIMEROCK			132	159	27	819	792	Platteville	Limestone		
SOAPSTONE			159	162	3	792	789	Glenwood	Shale		
SANDROCK			162	290	128	789	661	St.Peter	Sandstone		
SANDROCK + SHALE			290	324	34	661	627	St.Peter	Sandstone	Shale	
SHAKOPEE			324	453	129	627	498	Prairie Du Chien Group	Dolomite		
JORDAN			453	459	6	498	492	Prairie Du Chien Group	Dolomite		
JORDAN			459	545	86	492	406	Jordan	Sandstone		
SHALE			545	547	2	406	404	St.Lawrence	Shale	Dolomite	

Wellname EDINA 8 Township Range Dir Section Subsection Field Located MGS 116 21 W 4 CBBBAA Elevation 869.00 ft.	Well Depth 472.00 ft Depth Completed 472.00 ft	Date Well Completed
---	---	----------------------------

Contact EDINA 8 EDINA MN Changed	Drilling Method Drilling Fluid Well Hydrofractured? <input type="checkbox"/> YES <input type="checkbox"/> NO From ft. to Use Community Supply Casing Type Drive Shoe? <input type="checkbox"/> YES <input type="checkbox"/> NO Hole Diameter (in.) Diameter 16 Depth 232 24.00 in. from 0.00 to 219.00 ft. lbs/ft 16.00 in. from 0.00 to 232.00 ft. lbs/ft
--	---

Description	Color	Hardness	From	To (ft.)
CLAY			0	18
CLAY, SAND & BOULDERS			18	40
HARD SAND & STONES			40	60
SANDY CLAY & BOULDERS			60	100
MUDDY SAND, GRAVEL & STON			100	157
SAND & GRAVEL			157	173
CLAY	GRAY	HARD	173	191
CLAY, GRVL & LIMEROCK MIXEI			191	218
BLUE & GRAY SHALE	VARIED	HARD	218	220
SHAKOPEE LIMEROCK			220	361
SHALE & LIMEROCK MIXED			361	364
JORDAN SANDROCK			364	445
SHALE ST. LAWRENCE	BLUE		445	472

Screen Make _____ Type _____ Diameter Slot Length Set	Open Hole(ft.) From to
--	-------------------------------

Static Water Level (Multiple SWL) 49.00 ft. Land surface Date measured	Pumping Level (below land surface) 82.00 ft. after hrs. pumping 1200.00 g.p.m.
--	--

Well Head Completion Pitless adapter manufacturer _____ Model _____ <input type="checkbox"/> Casing Protection <input type="checkbox"/> 12 in. above grade <input type="checkbox"/> At-grade (Environmental Wells and Borings ONLY) <input type="checkbox"/> Basement offset	Grouting Information Well grouted? <input type="checkbox"/> YES <input type="checkbox"/> NO
--	--

Nearest Known Source of Contamination _____ feet Direction _____ Type _____ Well disinfected upon completion? <input type="checkbox"/> YES <input type="checkbox"/> NO	Pump <input type="checkbox"/> Not Installed Date Installed _____ Manufacture's name _____ Model number _____ HP 0.00 Volts _____ Length of drop pipe _____ Material _____ Capacity _____ g.p.m. Type _____
---	--

Remarks
CASING: 024 TO 0219;016 TO 0232.

Abandoned Wells Does property have any not in use and not sealed well(s)? <input type="checkbox"/> YES <input type="checkbox"/> NO	Variance Was a variance granted from the MDH for this well? <input type="checkbox"/> YES <input type="checkbox"/> NO
--	--

Well Contractor Certification Bergerson-Caswell 27058	License Business Name Lic. or Reg No.
---	--

First Bedrock OSTP Last Strat CSTL	Aquifer Prairie Du Chien-Jordan Depth to Bedrock 218.00 ft.	County Well Index v.5	REPORT Printed on 6/29/2009
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Name of Driller	Date HE-01205-07 (Rev. 2/99)
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Wellname EDINA 9 Township Range Dir 117 21 W Section Subsection 32 DAD Field Located Elevation USGS 928.00 ft.	Well Depth 1130.00 ft Depth Completed 1130.00 ft Date Well Completed 1957/09/30
---	--

Contact EDINA #9, CITY OF EDINA MN Changed	Drilling Method Cable Tool Drilling Fluid Well Hydrofractured? <input type="checkbox"/> YES <input type="checkbox"/> NO From ft. to Use Community Supply Casing Type Steel (black or low Drive Shoe? <input type="checkbox"/> YES <input type="checkbox"/> NO) Hole Diameter (in.) Diameter 10 Depth 1010 16.00 in. from 0.00 to ft. lbs/ft 16.00 in. from 124.00 to 563.00 ft. lbs/ft 10.00 in. from 563.00 to 010.00 ft. lbs/ft
--	---

Description	Color	Hardness	From	To (ft.)
CLAY & STONES			0	16
GRAVEL & ROCKS			16	28
SANDY CLAY			28	63
CLAY	BROWN		63	83
SANDY CLAY	GRAY		83	98
CLAY, GRAVEL & ROCKS			98	119
LIMEROCK			119	129
SOAPSTONE			129	133
ST. PETER SANDROCK			133	297
SHAKOPEE LIMEROCK			297	431
JORDAN SANDROCK			431	513
ST. LAWRENCE SHALE			513	523
SHALE & LIMEROCK			523	698
SANDROCK & SHALE			698	778
SHALE			778	863
SHALE W/SANDROCK LAYERS			863	993
HINCKLEY SANDROCK	PINK		993	1123
SHALE			1123	1130

Screen No Make _____ Type _____ Diameter Slot Length Set	Open Hole(ft.) From to
---	-------------------------------

Static Water Level (Multiple SWL) 325.30 ft. Land surface Date measured 1987/11/10	Pumping Level (below land surface) 305.00 ft. after hrs. pumping 891.00 g.p.m.
--	--

Well Head Completion Pitless adapter manufacturer _____ Model _____ <input type="checkbox"/> Casing Protection <input type="checkbox"/> 12 in. above grade <input type="checkbox"/> At-grate (Environmental Wells and Borings ONLY) <input type="checkbox"/> Basement offset
--

Grouting Information Well grouted? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO

Nearest Known Source of Contamination _____ feet Direction _____ Type _____ Well disinfected upon completion? <input type="checkbox"/> YES <input type="checkbox"/> NO

Pump <input type="checkbox"/> Not Installed Date Installed _____ Manufacture's name _____ Model number _____ HP 0.00 Volts _____ Length of drop pipe _____ Material _____ Capacity _____ g.p.m. Type _____
--

Abandoned Wells Does property have any not in use and not sealed well(s)? <input type="checkbox"/> YES <input type="checkbox"/> NO
--

Variance Was a variance granted from the MDH for this well? <input type="checkbox"/> YES <input type="checkbox"/> NO
--

Well Contractor Certification Keys Well Co. 62012

License Business Name	Lic. or Reg No.
------------------------------	------------------------

Remarks
 CASING: 024 TO 0124;016 TO 0563;010 TO 1010. COMBINATION TELESCOPING AND STEP DOWN COMBINATION TELESCOPING AND STEP DOWN. G.W.Q. NO.0062

First Bedrock OPVL **Aquifer** Mt.Simon
Last Strat PMSU **Depth to Bedrock** 119.00 ft.

Unique Well Number 206588	County Hennepin Quad Minneapolis South Quad Id 104A	MINNESOTA DEPARTMENT OF HEALTH WELL AND BORING RECORD MINNESOTA STATUTES CHAPTER 1031	Entry Date 1991/08/24 Update Date 2004/12/29 Received Date
--	--	--	---

Wellname EDINA 9	Township 117	Range 21	Dir W	Section 32	Subsection DAD	Depth Drilled 1130 ft	Depth Completed 1130 ft	Date Completed 1957/09/30	Lic/Reg. No. 62012	Driller Name
----------------------------	---------------------	-----------------	--------------	-------------------	-----------------------	------------------------------	--------------------------------	----------------------------------	---------------------------	---------------------

Elevation 928.00 ft.	Method Calc from DEM (USGS)	Aquifer Mt.Simon	Depth to Bedrock 119 ft.	Screen/Open Hole	SWL 325.3
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Field Located United States Geological Survey	Location Method GPS Code Measurements (Ps Universal Transverse Mercator(UTM) - NAD83 - Zone 15 - Meters)		
Program	Input Source	UTM Easting (X) 471483	UTM Northing (Y) 4971517
Uni No.Verified	Input Date 1995/07/21		
Geologic Interpretation	Agency	Interpretation Method	

Geological Material	Color	Hardness	DEPTH			ELEVATION			Stratigraphy	LITHOLOGY		
			From	To	Thick	From	To	Primary		Secondary	Minor	
CLAY & STONES			0	16	16	928	912	Till	Clay	Cobble		
GRAVEL & ROCKS			16	28	12	912	900	Sand	Gravel	Cobble		
SANDY CLAY			28	63	35	900	865	Till	Clay	Sand		
CLAY	BROWN		63	83	20	865	845	Till-brown	Clay			
SANDY CLAY	GRAY		83	98	15	845	830	Till-gray	Clay	Sand		
CLAY, GRAVEL & ROCKS			98	119	21	830	809	Unknown deposit type	Clay	Gravel	Cobble	
LIMEROCK			119	129	10	809	799	Platteville	Limestone			
SOAPSTONE			129	133	4	799	795	Glenwood	Shale			
ST. PETER SANDROCK			133	297	164	795	631	St.Peter	Sandstone			
SHAKOPEE LIMEROCK			297	431	134	631	497	Prairie Du Chien Group	Dolomite			
JORDAN SANDROCK			431	513	82	497	415	Jordan	Sandstone			
ST. LAWRENCE SHALE			513	523	10	415	405	St.Lawrence	Shale	Siltstone		
SHALE & LIMEROCK			523	698	175	405	230	St.Lawrence-Franconia	Shale	Dolomite	Sandstone	
SANDROCK & SHALE			698	778	80	230	150	Ironton-Galesville	Sandstone			
SHALE			778	863	85	150	65	Eau Claire	Shale	Siltstone	Sandstone	
SHALE W/SANDROCK LAYERS			863	993	130	65	-65	Mt.Simon	Shale	Sandstone		
HINCKLEY SANDROCK	PINK		993	1123	130	-65	-195	Mt.Simon	Sandstone			
SHALE			1123	1130	7	-195	-202	Mid.Proterozoic Sedimentary	Shale			

Appendix C

Aquifer Test Plans



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

Aquifer Test Plan

Public Water Supply ID:	1270011	PWS Name:	Edina
Contact			
Aquifer Test Contact:	Erik Tomlinson		
Contractor Name and Address:	SEH		
	3535 Vadnais Center Drive		
City, State, Zip:	St. Paul, Minnesota 55110		
Phone and Fax Number:	651-490-2022		
Proposed Aquifer Test Method			
<input checked="" type="checkbox"/>	1) An existing pumping test that meets the requirements of wellhead protection rule part 4720.5520 and that was previously conducted on a public well in your water supply system.		
<input type="checkbox"/>	2) An existing pumping test that meets the requirements of wellhead protection rule part 4720.5520 and that was previously conducted on another well in a hydrogeologic setting determined by the department to be equivalent.		
<input type="checkbox"/>	3) A pumping test conducted on a new or existing public well in your water supply system and that meets the requirements for larger sized water systems (wellhead protection rule part 4720.5520).		
<input type="checkbox"/>	4) A pumping test conducted on a new or existing public well in your water supply system and that meets the requirements for smaller sized water systems (wellhead protection rule part 4720.5530).		
<input type="checkbox"/>	5) An existing pumping test that does not meet the requirements of wellhead protection rule part 4720.5520 and that was previously conducted on: 1) a public water supply well or 2) another well in a hydrogeologic setting determined by the department to be equivalent.		
<input type="checkbox"/>	6) An existing specific capacity test or specific capacity test for the public water supply well.		
<input type="checkbox"/>	7) An existing published transmissivity value.		
<ul style="list-style-type: none"> ▪ Include all pumping test data and the estimated transmissivity value when the aquifer test method proposed is one of those specified in Nos. 1, 2, 5, 6, or 7 listed above. 			

To request this document in another format, please call the Section Receptionist at (651) 201-4700 or Division TTY at (651) 201-5797. 

Test Description

Pumped Well Unique No:	240630	Test Duration (Hours):	49
Location (Township, Range, Section, Quarters):	28N, 24W, 18, DDACBD	Pump Type:	
		Discharge Rate:	576 gpm
Number of Observation Wells:	1	Flow Rate Measuring Device Type:	Circular recorder

Confined Unconfined

▪ You must include a map showing the location of the pumping well and observation well(s).

Rationale for Proposed Test Method

Briefly describe the rationale for method selected:

List all unique numbers of wells that this Aquifer Test Plan applies to:

Well 2 (208399)	Well 16 (203101)				
Well 3 (240630)	Well 20 (686286)				
Well 4 (200561)					
Well 5 (206377)					
Well 8 (204884)					
Well 15 (207674)					

Reviewed by:

Approved: Yes No

Approval Date:

**Pumping Test Analysis
of Edina Well #3 (240630)
May 24, 1995**

Introduction

The MDH was requested to assist in the delineation of wellhead protection areas by the City of Edina, Minnesota, around the public water supply wells serving the community. An important part of the delineation process is to determine aquifer properties at the well site as accurately as possible. This is normally accomplished by performing a pumping test. Because of the need to test most public water supply wells, the MDH agreed to help with the pumping test as a part of in-house staff training and program development.

The pumping test conducted by the MDH at the Edina Well #3 was conducted as described below. The results were analyzed using standard nonequilibrium and semisteady-state methods, cited in references. Data and graphic analysis plots are included in Appendix 1 and test results are summarized on Table 1.

The analysis shows that the aquifer responds as generally expected from the geologic setting. However, significant problems encountered during the test increase the uncertainty of the results.

Description of the Test

The test of Well #3 was scheduled for a time when the well would be accessible after maintenance work and before it was returned to service. Access to well #2, the observation well, was optimal because the turbine pump had been removed for refitting.

The transducer was placed in well #2 on May 5, 1995 and in well #3 on May 11, 1995 to obtain long-term background water level readings because of the well known well interference problems in the aquifer. Prior to the start of the test, an attempt was made to lower the transducer in the pumping well so as to prevent the drawdown from exceeding the depth of the transducer. Even though an additional two feet of depth was obtained, unfortunately the drawdown exceeded the transducer depth after 400 minutes into the test.

The test was started at 08:31 on May 24, 1995. The initial pumping rate was approximately 600 gallons per minute. The pumping rate did not remain constant during the test because the system back pressure varied. The high pumping rate was about 600 gpm and the low was about 550 gpm as shown by the circular recorder. The average pumping rate was 576 gpm.

The recovery test started at 08:35 on May 25, 1995 and continued until 09:38 May 26, 1995 when the transducers were removed from the wells.

Problems with the Analysis

There were several aspects to this test that present problems in the analysis and increase the uncertainty of the results. These problems do not invalidate the results but cause there to be limits in the confidence that can be placed in the numbers.

First of all, the early-time data from the pumping well was disturbed by fluctuations in the pumping rate and/or pressure surges caused by the well pumping into the distribution system. This caused problems

with the Theis curve match analysis. The later-time pumping data was also compromised because the drawdown exceeded the depth of the transducer after 400 minutes.

The most difficult problem encountered was strong well interference that obscured the influence of the pumping well at the observation well and disrupted late-time data at both wells. The well interference prevented analysis of the later time pumping and recovery data without adjustment. An attempt was made to remove the effects of the interference by averaging the drawdown of the pumping and recovery phases. This made it possible to perform a typical semi-steady state analysis on the adjusted data between 1 and 100 minutes in the pumping well. It also made both early and later-time analysis possible for the observation well data.

The rationale for this technique is that fluctuations in water levels due to pumping often follow a diurnal pattern because of demand in the public water supply system(s). When calculating drawdown and recovery, both values increase over time even though they have an inverse relationship. Therefore, comparison of the drawdown and recovery for a twenty-four hour test will reveal the magnitude of daily fluctuation in water level. And if the drawdown and recovery values from the same time in the pumping and recovery phases of the test are averaged, the diurnal trend should be removed.

An interesting feature of this test is the difference in response to the well interference between wells 2 and 3. Well #3 shows a much greater effect from the pumping of other wells than #2. This is not thought to be caused by the proximity of other pumping wells because the wells are scattered fairly evenly throughout the nearby communities. It is most likely that the difference in response is due to a difference in the character of the rock penetrated by the wells.

In conclusion, the most accurate calculation of the transmissivity and storage coefficient for this test are from the data that was adjusted to remove the effects of well interference. The later-time and recovery data which usually give better results were, in this case, less reliable because of well interference problems.

Summary of Results

A transmissivity value of 110,000 gal/day/ft and a storativity value of 0.00001³ are chosen as being representative of aquifer properties in the area for the capture zone analysis. This is the value calculated for the observation well composite data. Problems with the test prevent analysis of unadjusted data with confidence. However, comparison of the calculated values for both the pumping and observation wells showed that the test response is typical of a slightly leaky confined aquifer where there is an apparent increase in transmissivity with time.

References:

Jacob, C. E. and Lohman, S. W., (1952) Nonsteady Flow to a Well of Constant Drawdown in an Extensive Aquifer, Trans. American Geophysical Union, Vol. 33, No. 4, August, 1952, pp. 559-69.

Theis, C. V., (1935) The Relation Between the Lowering of the Piezometric Surface and the Rate and Duration of Discharge of a Well Using Ground-Water Storage, Trans. American Geophysical Union, 16th Annual Meeting, April, 1935, pp. 519-24.

Table 1.

**Edina #3 Pumping Test
Prairie du Chien - Jordan Aquifer
April 20, 1995**

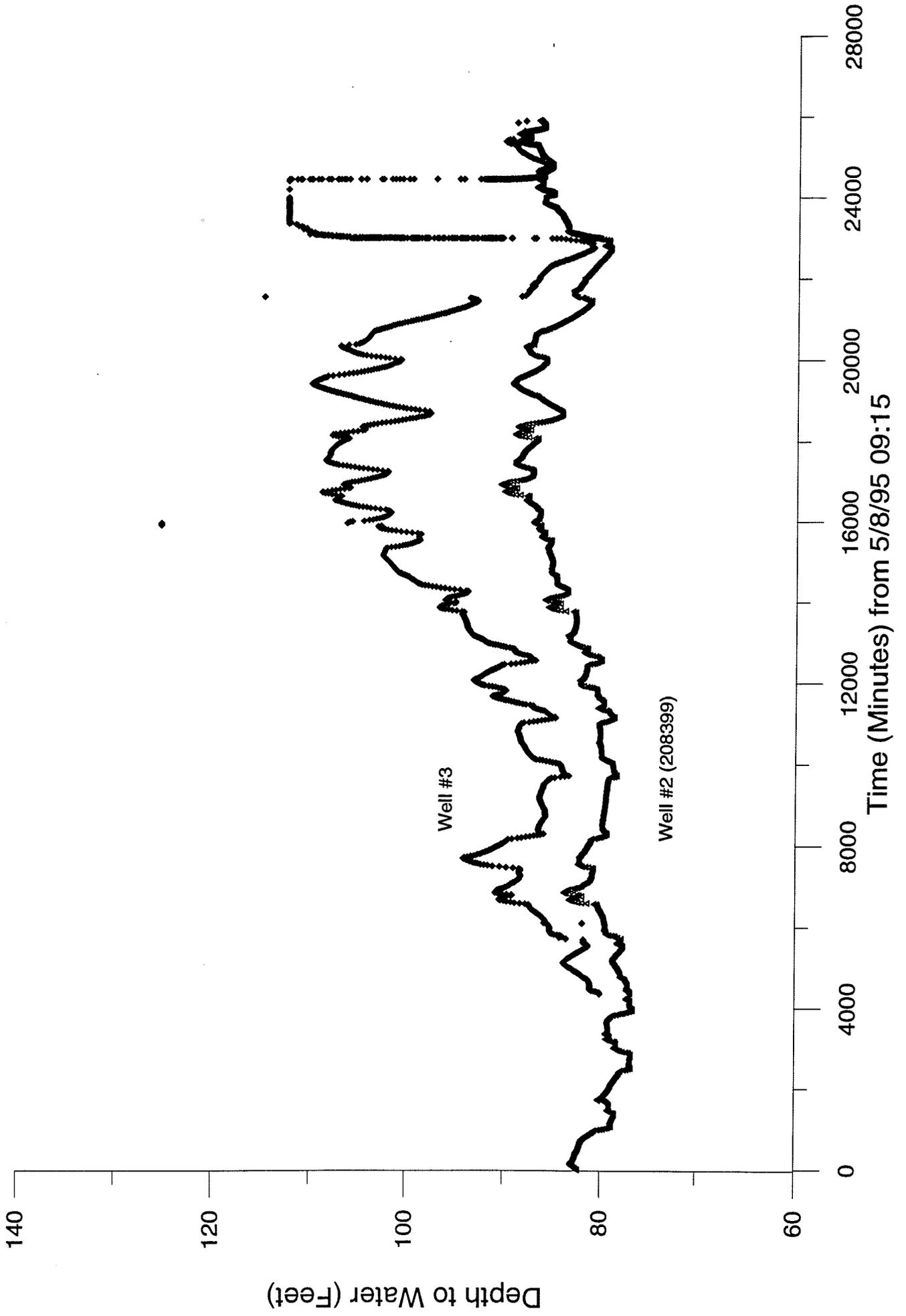
	Transmissivity T (gpd/ft) -----	Storage Coefficient S -----	Time Period Emphasized -----	Analysis Method -----
Pumped Well	19,000	N/A	Early Composite	Theis
Edina #3 (240630)	38,000	N/A	Late Composite	Jacob
Observation Well	110,000	0.00003	Early Composite	Theis
Edina #2 (208399)	148,000	0.00001	Late Composite	Jacob

Representative aquifer values are best shown by the early pumping values at the observation well, giving an average T of 110,000 and S of 0.00003.

Appendix 1.

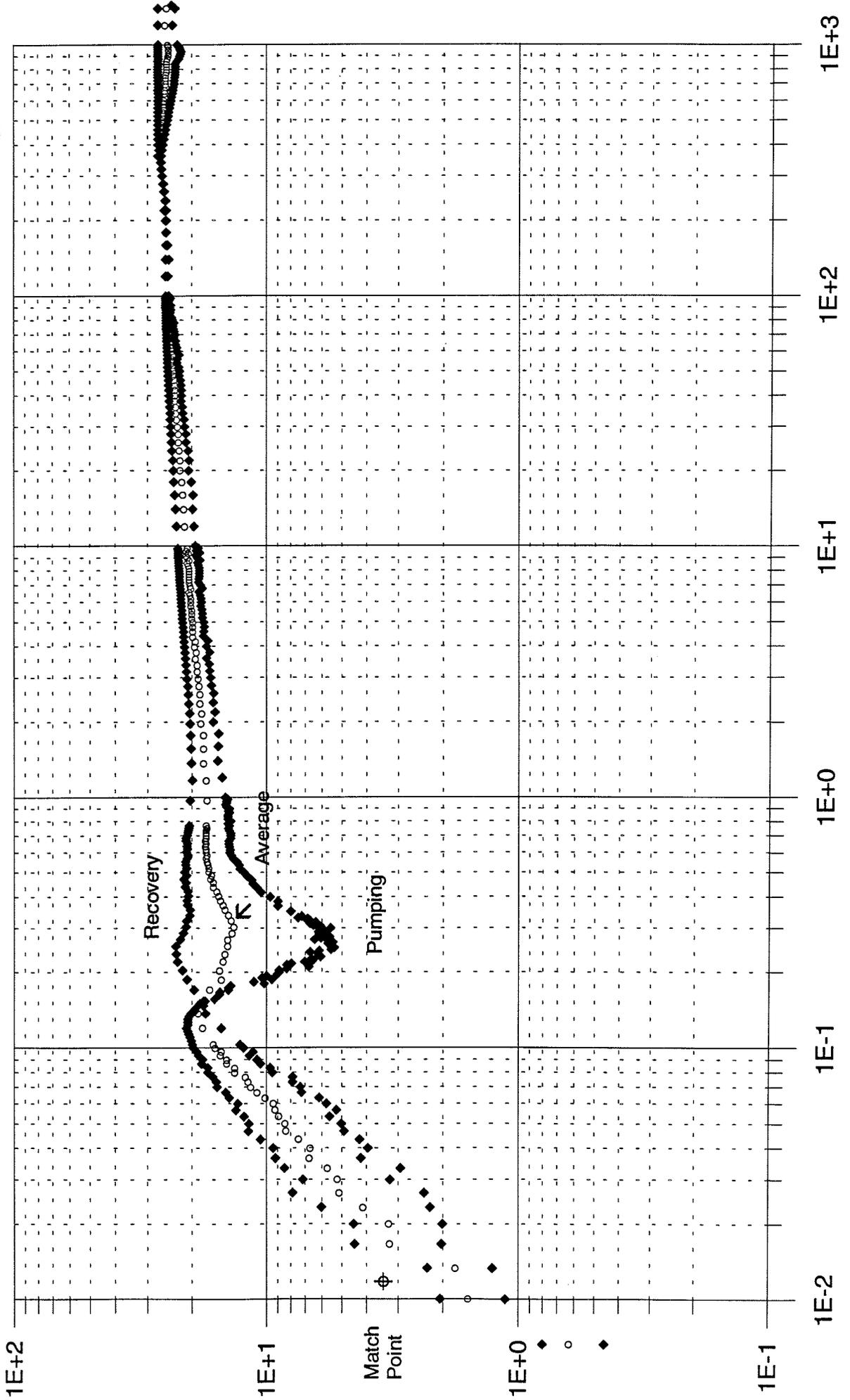
Data and Graphic Analysis

Test of Edina #3 (240630)



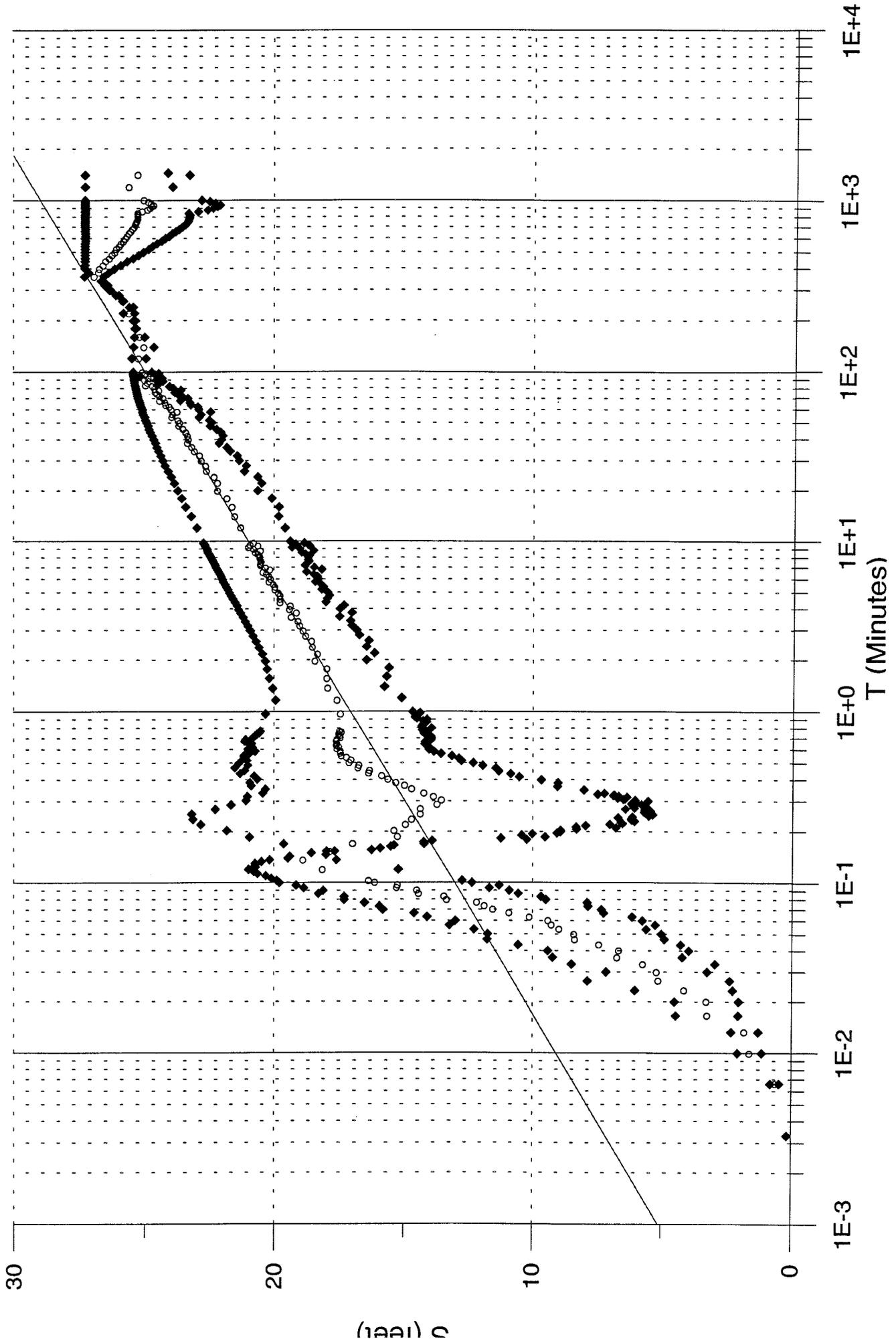
Edina #3 (240630)
Average of pumping and recovery data

$T = 114.6 \text{ 576} / 3.5 = 19,000 \text{ gpd/ft}$



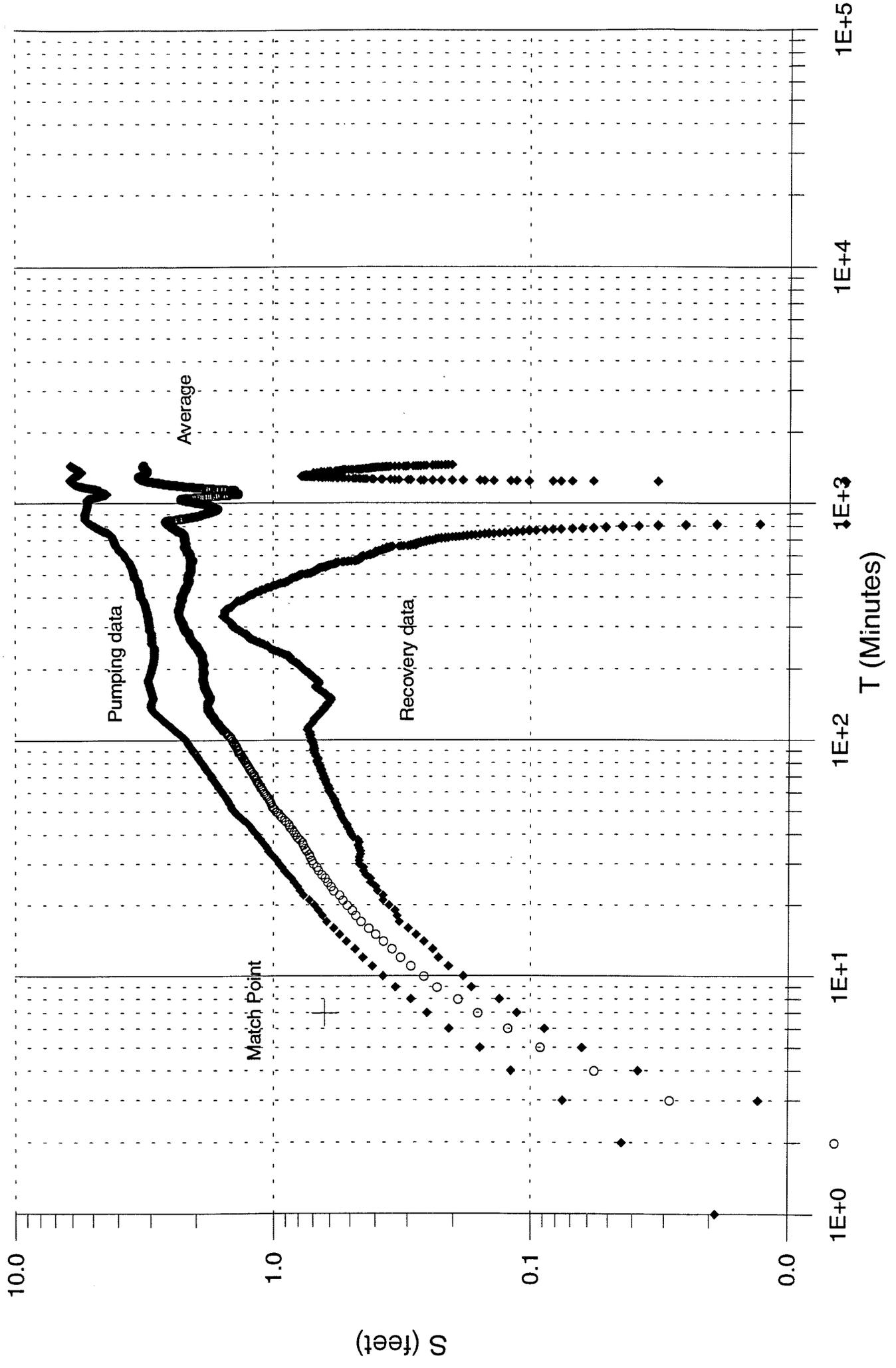
Edina #3 (240630)
Average of pumping and recovery data

$T = 264\ 576 / 4 = 38,000\ \text{gpd/ft}$



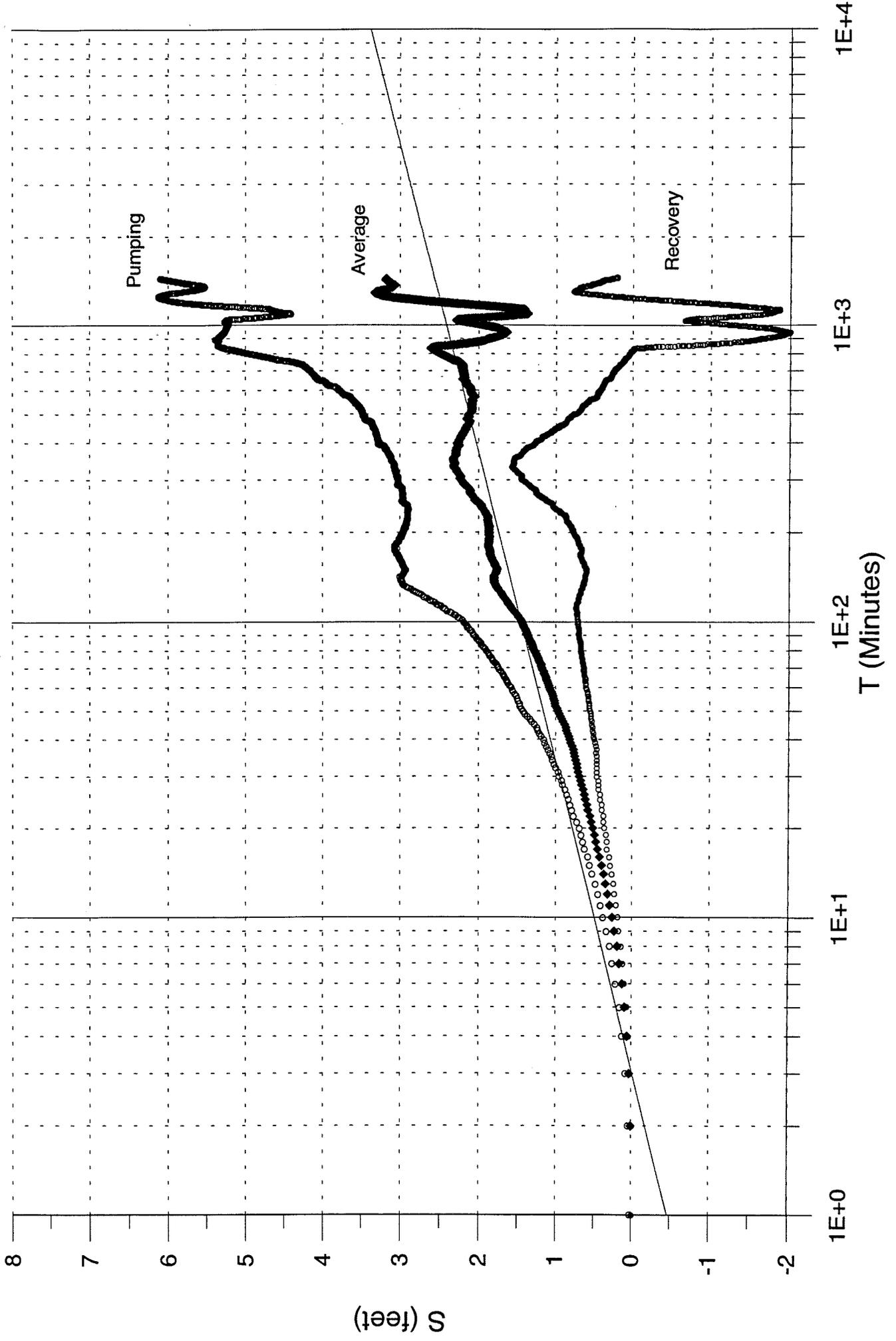
Test of Edina #3 (240630) at #2 (208399)
 Average of pumping and recovery data

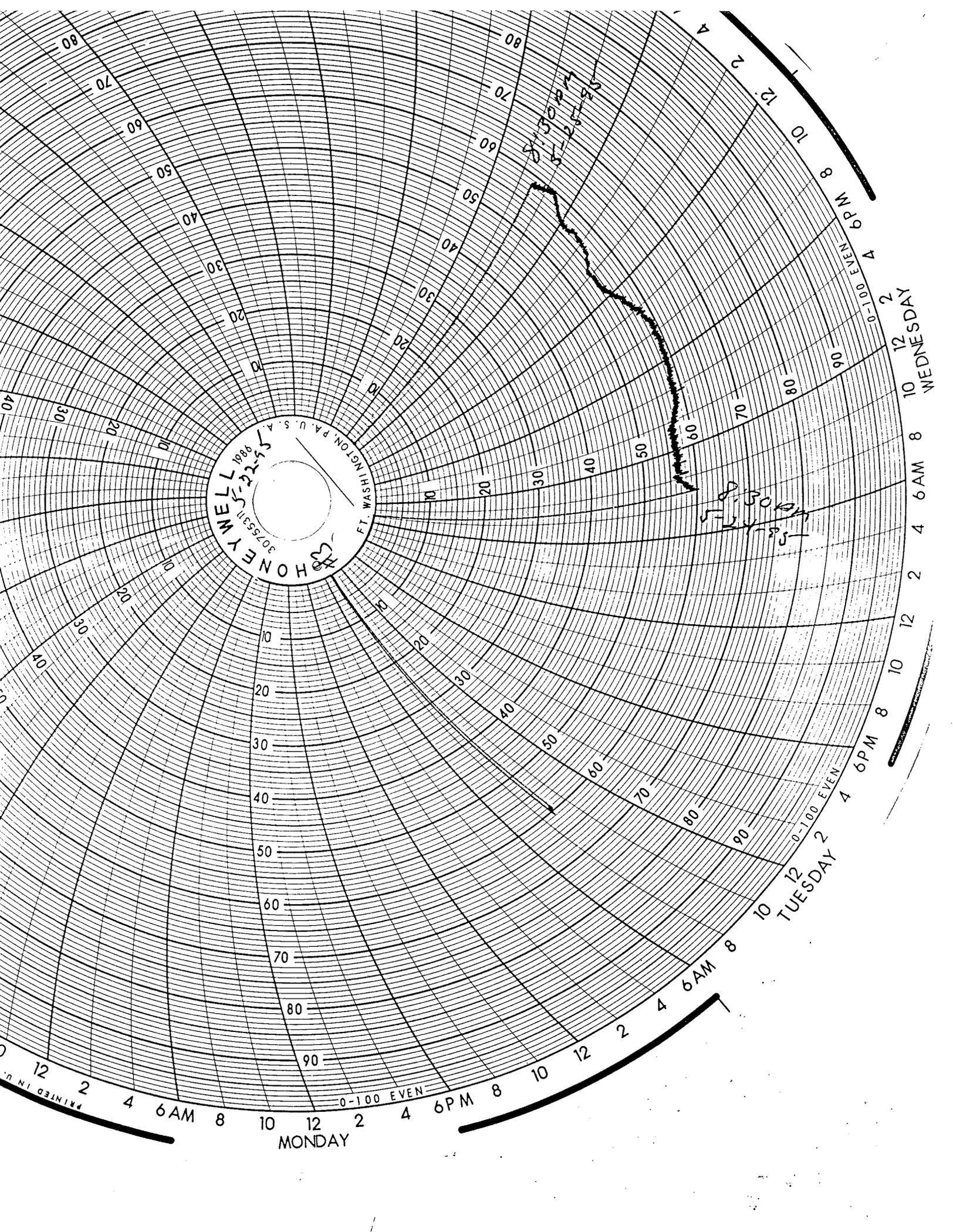
$T = 114.6 * 576 / 0.6 = 110,000 \text{ gpd/ft}$
 $S = 110,000 * 7 * 1 / (2992^2 * 2693) = 3 * 10^{-5}$



Test of Edina #3 (240630) at #2 (208399)
Average of pumping and recovery data

$T = 264 (576) / 1 = 147,000 \text{ gpd/ft}$
 $S = 0.000208 \cdot 147,000^3 / 2992^2 = 1 \times 10^{-5}$





HONEYWELL
30755311 1984
FT. WASHINGTON, PA. U.S.A. 9884

MONDAY

TUESDAY

WEDNESDAY

PRINTED IN U.S.A.

Unique No. 00240630	MINNESOTA DEPARTMENT OF HEALTH WELL AND BORING RECORD <i>Minnesota Statutes Chapter 1031</i>	Update Date 2005/03/11
County Name Hennepin		Entry Date 1992/06/29
Township Name Township Range Dir Section Subsection 28 24 W 18 DDACBD	Well Depth 496 ft. Depth Completed 496 ft. Date Well Completed 1949/00/00	
Well Name EDINA 3	Drilling Method Cable Tool	
Well Owner's Name EDINA 3 EDINA MN 55424	Drilling Fluid _____ Well Hydrofractured? <input type="checkbox"/> Yes <input type="checkbox"/> No From _____ ft. to _____ ft.	
Contact's Name CITY OF EDINA 4801 50TH W ST EDINA MN 55424	Use Community Supply (municipal)	
GEOLOGICAL MATERIAL COLOR HARDNESS FROM TO NO RECORD 0 496	Casing Drive Shoe? <input type="checkbox"/> Yes <input type="checkbox"/> N Hole Diameter	
	Casing Diameter Weight(lbs/ft) 12 in. to 265 ft	
	Screen N Open Hole From 265 ft. to 496 ft. Make _____ Type _____	
	Static Water Level 72 ft. from Land surface Date 1949/00/00	
	PUMPING LEVEL (below land surface) ft. after _____ hrs. pumping _____ g.p.m.	
	Well Head Completion Pitless adapter mfr _____ Model _____ Casing Protection <input checked="" type="checkbox"/> 12 in. above grade <input type="checkbox"/> At-grade(Environmental Wells and Borings ONLY)	
	Grouting Information Well grouted? <input type="checkbox"/> Yes <input type="checkbox"/> No	
	Nearest Known Source of Contamination ft. direction _____ type _____ Well disinfected upon completion? <input type="checkbox"/> Yes <input type="checkbox"/> No	
	Pump <input type="checkbox"/> Not Installed Date Installed _____ Mfr name _____ Model _____ HP _____ Volts _____ Drop Pipe Length _____ ft. Capacity _____ g.p.m. Type _____	
REMARKS, ELEVATION, SOURCE OF DATA, etc. SUPPOSEDLY DRILLED BY LAYNE WELL CO. IN 1946. NO DRILLER'S LOG.	Any not in use and not sealed well(s) on property? <input type="checkbox"/> Yes <input type="checkbox"/> No	
	Was a variance granted from the MDH for this Well? <input type="checkbox"/> Yes <input type="checkbox"/> No	
USGS Quad: Minneapolis South Elevation 875 Aquifer: OPCJ Alt Id: 73-1119	Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. <u>MDH</u> License Business Name _____ Name of Driller _____	

Report Copy



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

Aquifer Test Plan

Public Water Supply ID:	1270011	PWS Name:	Edina
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Contact

Aquifer Test Contact:	Erik Tomlinson
Contractor Name and Address:	SEH
	3535 Vadnais Center Drive
City, State, Zip:	St. Paul, Minnesota 55110
Phone and Fax Number:	651-490-2022

Proposed Aquifer Test Method

- 1) An existing pumping test that meets the requirements of wellhead protection rule part 4720.5520 and that was previously conducted on a public well in your water supply system.
- 2) An existing pumping test that meets the requirements of wellhead protection rule part 4720.5520 and that was previously conducted on another well in a hydrogeologic setting determined by the department to be equivalent.
- 3) A pumping test conducted on a new or existing public well in your water supply system and that meets the requirements for larger sized water systems (wellhead protection rule part 4720.5520).
- 4) A pumping test conducted on a new or existing public well in your water supply system and that meets the requirements for smaller sized water systems (wellhead protection rule part 4720.5530).
- 5) An existing pumping test that does not meet the requirements of wellhead protection rule part 4720.5520 and that was previously conducted on: 1) a public water supply well or 2) another well in a hydrogeologic setting determined by the department to be equivalent.
- 6) An existing specific capacity test or specific capacity test for the public water supply well.
- 7) An existing published transmissivity value.

▪ Include all pumping test data and the estimated transmissivity value when the aquifer test method proposed is one of those specified in Nos. 1, 2, 5, 6, or 7 listed above.

To request this document in another format, please call the Section Receptionist at (651) 201-4700 or Division TTY at (651) 201-5797.



Test Description

Pumped Well Unique No:	208021	Test Duration (Hours):	56
Location (Township, Range, Section, Quarters):	28N, 21W, 35, CDDDBD	Pump Type:	
		Discharge Rate:	1000 gpm
Number of Observation Wells:	1	Flow Rate Measuring Device Type:	Flowmeter

Confined Unconfined

▪ You must include a map showing the location of the pumping well and observation well(s).

Rationale for Proposed Test Method

Briefly describe the rationale for method selected:

List all unique numbers of wells that this Aquifer Test Plan applies to:

Well 6 (200564)	Well 17 (200914)				
Well 7 (206474)	Well 18 (200918)				
Well 11 (206183)	Well 19 (505626)				
Well 13 (203613)					
Well 14 (200913)					

Reviewed by: _____ **Approved:** Yes No **Approval Date:** _____

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Analysis of the Minnetonka #6A (208021) Pumping Test
August 15, 1994
Confined Prairie du Chien - Jordan Aquifer

Introduction

The MDH was requested to assist in the delineation of wellhead protection areas by the City of Minnetonka, Minnesota, around the public water supply wells serving the community. An important part of the delineation process is to determine aquifer properties at the well site as accurately as possible. This is normally accomplished by performing a pumping test. Because of the need to test most public water supply wells, the MDH agreed to help with the pumping test as a part of technical assistance for communities, and program and staff development.

The pumping test conducted by the MDH at Minnetonka #6A was conducted as described below. The only problem in conducting the test was that data from the first three minutes of the recovery period were lost. The results were analyzed using standard nonequilibrium and semisteady-state methods, cited in references. Data plots are included in Appendix 1 and test results are summarized on Table 1. The analysis shows that the aquifer responds as generally expected from the geologic setting.

Description of the Test

One nearby public supply well, #6 (204054), was used as a monitoring point for this test because there was no access to the pumped well for water level measurements. There were no other nearby wells to cause well interference for this test. All wells were turned off at 12:00 on August 12, 1994, providing a sixty-eight hour resting period before the start of the test. A pressure transducer was placed in Well 6A at this time to obtain background readings.

The test started at 08:40 on August 15, 1994. Well #6A was pumped at an average rate of 1000 gallons per minute. The flowmeter on the well was not used because the flowmeter data was recorded electronically and displayed at the Minnetonka City public works offices.

The pump was turned off at 08:50 on August 16, 1994 to start the recovery period. The recovery was extended to 16:43 on August 17th and about 90 percent of full recovery was obtained.

Summary of Results

A transmissivity value of 2.400 ft²/day and a storativity value of 0.000015 are chosen as being representative of aquifer properties in the area of the well field for the capture zone analysis.

The results are also consistent with the conceptual model of a confined aquifer receiving water from adjacent leaky layers.

Problems with the Analysis

None of the problems that occurred during this test affected the analysis and the analysis is quite straight forward.

References:

- Jacob, C. E. and Lohman, S. W., (1952) Nonsteady Flow to a Well of Constant Drawdown in an Extensive Aquifer. Trans. American Geophysical Union, Vol. 33, No. 4. August. 1952. pp. 559-69.
- Theis, C. V., (1935) The Relation Between the Lowering of the Piezometric Surface and the Rate and Duration of Discharge of a Well Using Ground-Water Storage, Trans. American Geophysical Union. 16th Annual Meeting. April. 1935. pp. 519-24.

Table 1.

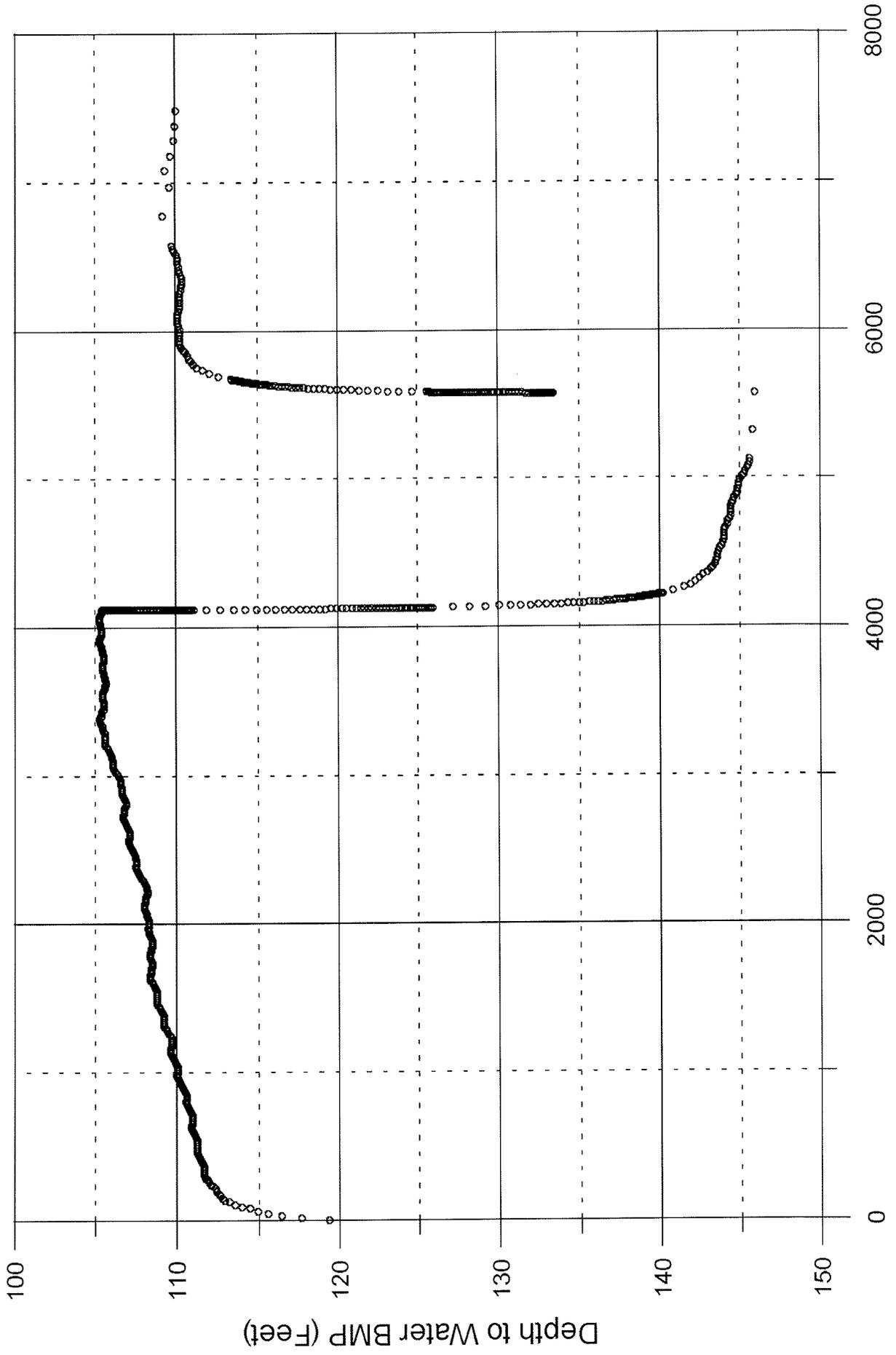
Minnetonka #6A Pumping Test
August 15, 1994

	Transmissivity T (gpd/ft) -----	Storage Coefficient S -----	Time Period Emphasized -----	Analysis Method -----
Pumping Well #6A (208012)	No data			
Observation Wells				
#6 (204054)	2,360	0.000015	Early Pumping	Theis
	11,800		Late Pumping	Jacob
	2,510	0.000015	Early Recovery	Theis
	5,430		Late Recovery	Jacob t/t'

Representative aquifer values are best shown by the early pumping and recovery value from the observation well, giving an average T of 2,400, S of 0.000015, and r/B of 0.07.

Appendix I.
Graphical Analysis

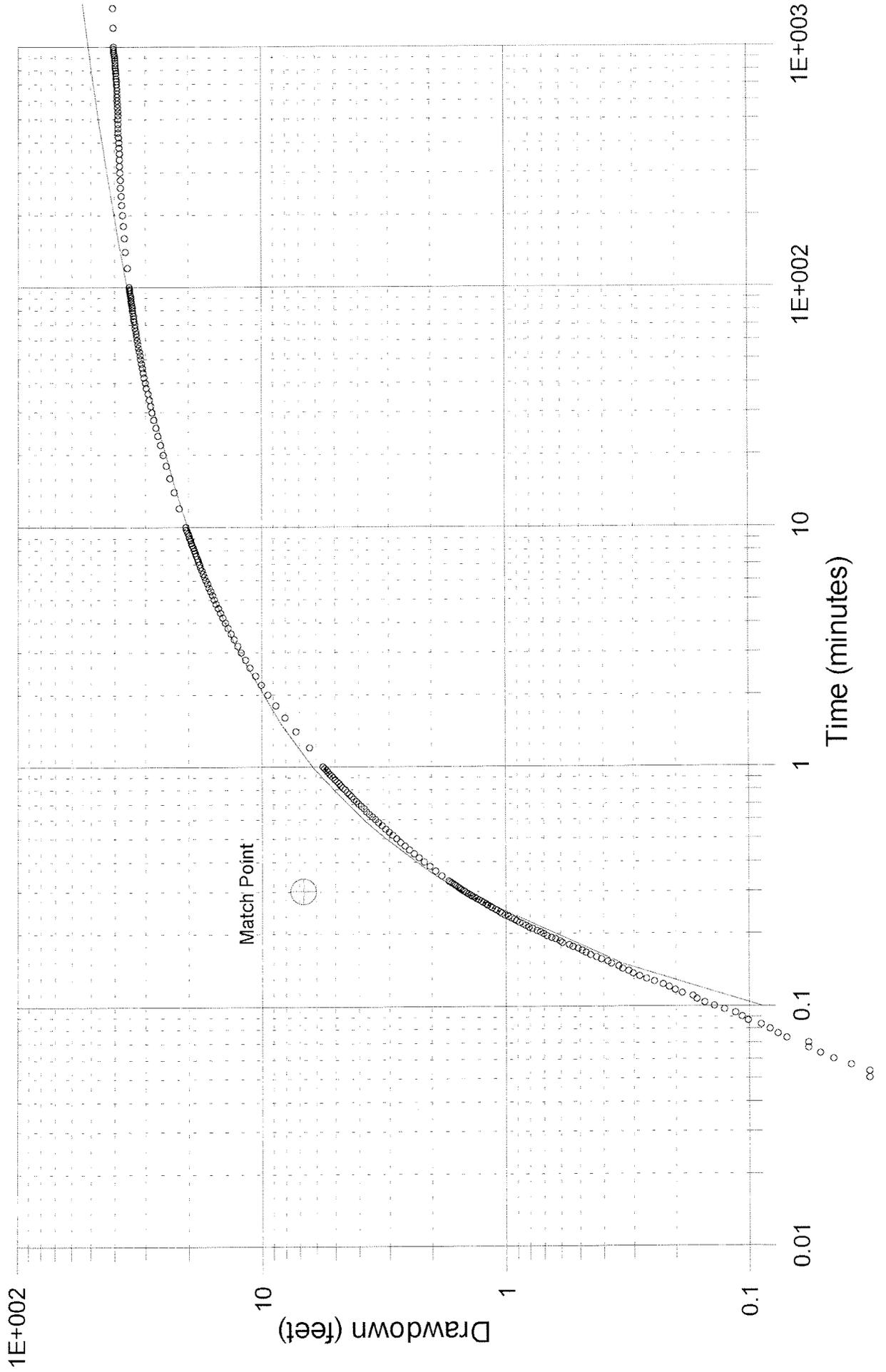
Test of Minnetonka #6A (208021)
at #6 (204054)
August 15, 1994



Time (Minutes) from August 12, 1994 12:00

Test of Minnetonka #6A (208021)
at #6 (204054)
August 15, 1994
Pumping Data

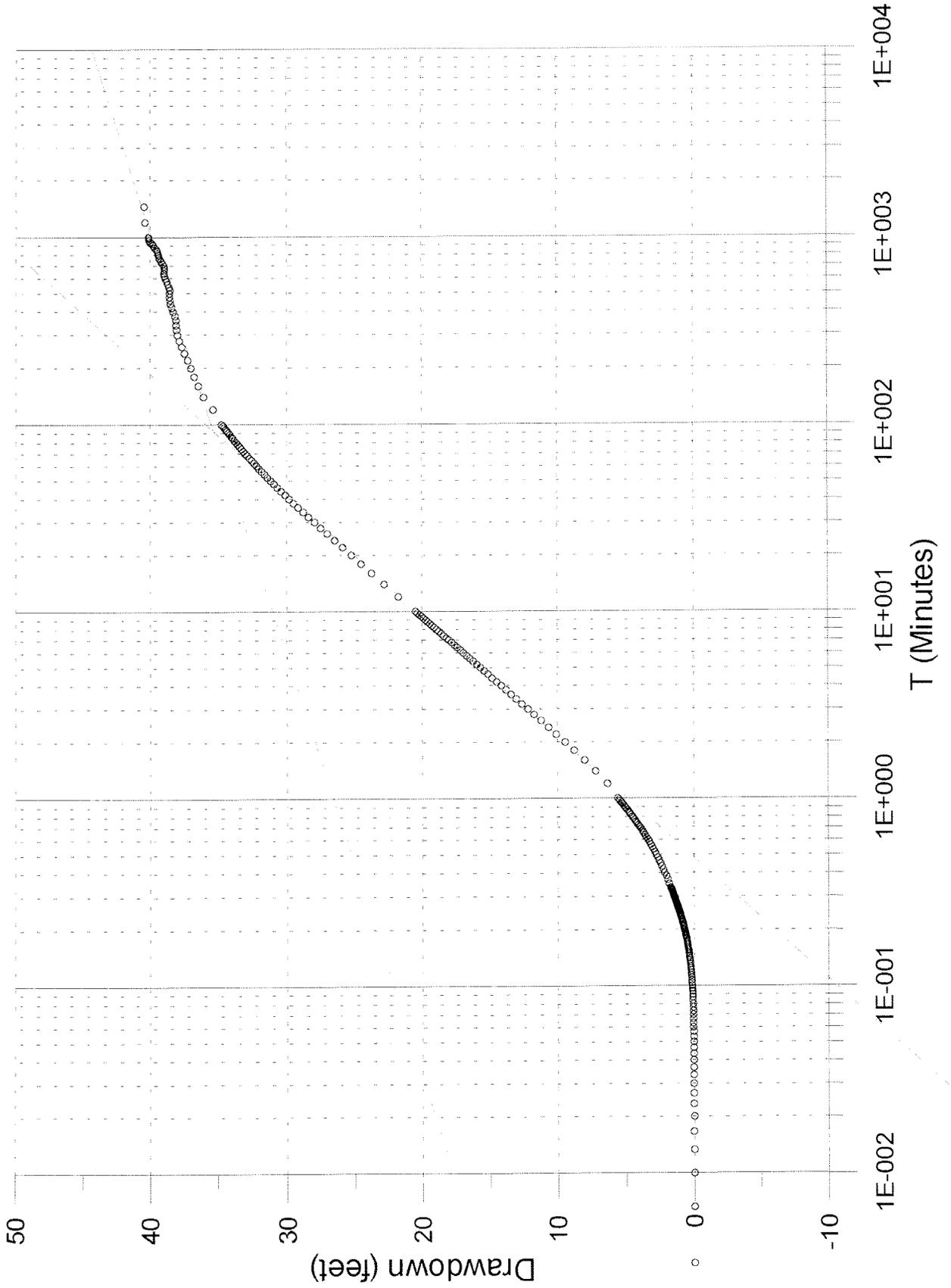
$$T = 15.32 \frac{1000}{6.5} = 2,360 \text{ ft}^2/\text{day}$$
$$S = 2,360 \cdot 0.3 \cdot \frac{1}{(359)^2} = 0.000015$$



Test of Minnetonka #6A (208021)
at #6 (204054)
August 15, 1994
Pumping

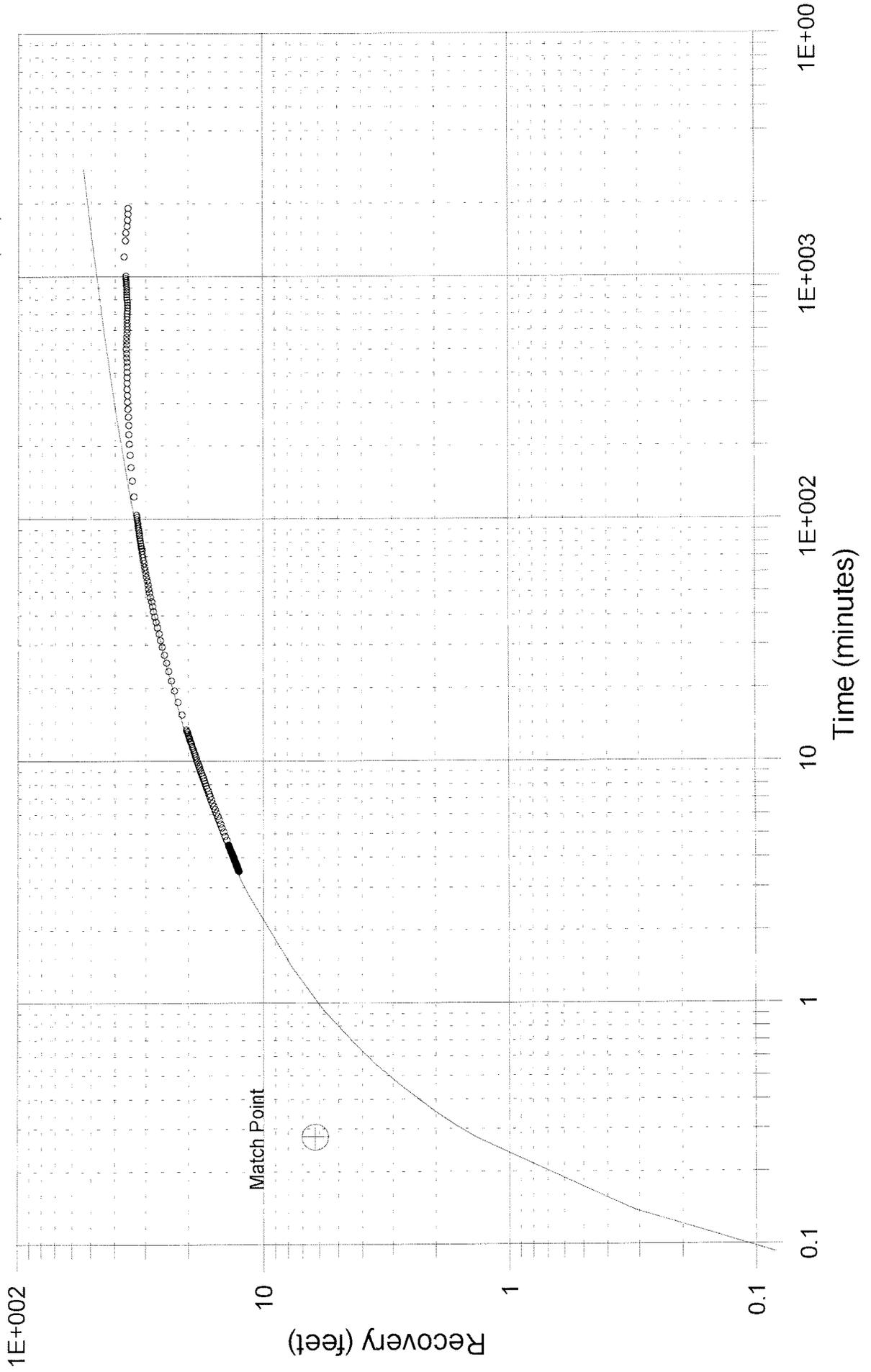
$T1 = 35.3 \text{ 1000} / 15.7 = 2,250 \text{ ft}^2/\text{day}$
 $S1 = 2,250 \text{ 0.5} / 359^2 \text{ 640} = 0.00013$

$T2 = 35.3 \text{ 1000} / 3 = 11,800 \text{ ft}^2/\text{day}$



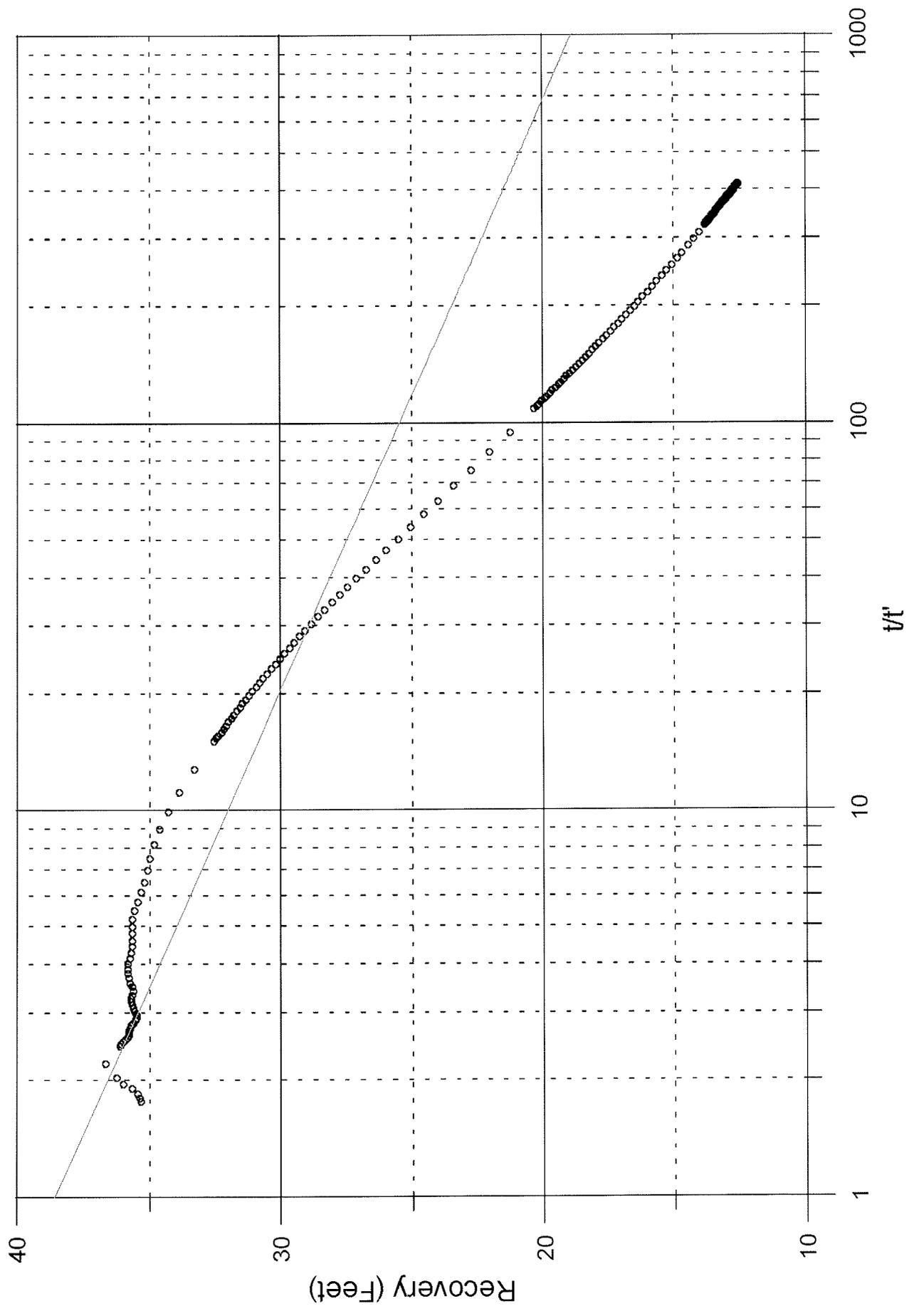
Test of Minnetonka #6A (208021)
at #6 (204054)
August 15, 1994
Recovery

$$T = 15.32 \cdot 1000 \cdot 1 / 6.1 = 2,510 \text{ ft}^2/\text{day}$$
$$S = 2,510 \cdot 0.27 \cdot 1 / (359)^2 \cdot 360 = 0.000015$$



Test of Minnetonka #6A (208021)
at #6 (204054)
August 15, 1994

$$T = 35.3 \cdot 1000 / 6.5 = 5,430 \text{ ft}^2/\text{day}$$



Unique No. 00208012	MINNESOTA DEPARTMENT OF HEALTH WELL AND BORING RECORD <i>Minnesota Statutes Chapter 1031</i>	Update Date 2005/06/22
County Name Hennepin		Entry Date 1991/08/24
Township Name Township Range Dir Section Subsection 117 22 W 12 CDCBCD	Well Depth 486 ft. Depth Completed 486 ft. Date Well Completed 1967/07/00	
Well Name MINNETONKA 6A	Drilling Method	
Contact's Name MINNETONKA 7 10701 CEDAR LAKE RD MINNETONKA MN	Drilling Fluid	Well Hydrofractured? <input type="checkbox"/> Yes <input type="checkbox"/> No From ft. to ft.
	Use Community Supply (municipal)	
	Casing Drive Shoe? <input type="checkbox"/> Yes <input type="checkbox"/> No	Hole Diameter
GEOLOGICAL MATERIAL COLOR HARDNESS FROM TO	Casing Diameter Weight(lbs/ft)	
DRIFT 0 104	24 in. to 114 ft.	
SHALE 104 112	20 in. to 315 ft.	
LIMEROCK 112 121	16 in. to 341 ft.	
SHALE 121 136		
SANDROCK SOFT 136 248	Screen Open Hole From ft. to ft.	
SHALE 248 261	Make Type	
SANDROCK 261 304		
SHAKOPEE BROKEN 304 315	Static Water Level 86 ft. from Land surface Date 1967/07/00	
SHAKOPEE SANDY 315 392	PUMPING LEVEL (below land surface) 157 ft. after hrs. pumping 1571 g.p.m.	
JORDAN SANDROCK 392 485	Well Head Completion Pitless adapter mfr Model Casing Protection 12 in. above grade At-grade(Environmental Wells and Borings ONLY)	
SHALE 485 486	Grouting Information Well grouted? <input type="checkbox"/> Yes <input type="checkbox"/> No	
	Nearest Known Source of Contamination ft. direction. type Well disinfected upon completion? <input type="checkbox"/> Yes <input type="checkbox"/> No	
	Pump Not Installed Date Installed Mfr name Model HP 0 Volts Drop Pipe Length ft. Capacity g.p.m. Type	
REMARKS, ELEVATION, SOURCE OF DATA, etc.	Any not in use and not sealed well(s) on property? <input type="checkbox"/> Yes <input type="checkbox"/> No	
CASING: 024 TO 0114;020 TO 0315;016 TO 0341;012 TO 0397.	Was a variance granted from the MDH for this Well? <input type="checkbox"/> Yes <input type="checkbox"/> No	
USGS Quad: Hopkins Elevation: 912	Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. <u>62012</u>	
Aquifer: CJDN Alt Id: 79-6207	License Business Name Name of Driller	

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Unique No. 00204054	MINNESOTA DEPARTMENT OF HEALTH WELL AND BORING RECORD <i>Minnesota Statutes Chapter 1031</i>	Update Date 2004/12/29
County Name Hennepin		Entry Date 1991/08/24
Township Name Township Range Dir Section Subsection 117 22 W 12 CDCBDB	Well Depth 488 ft. Depth Completed 488 ft. Date Well Completed 1967/06/00	
Well Name MINNETONKA 6	Drilling Method	
Contact's Name MINNETONKA 6 10701 CEDAR LAKE RD MINNETONKA MN	Drilling Fluid	Well Hydrofractured? Yes No From ft. to ft.
	Use Community Supply (municipal)	
	Casing Drive Shoe? Yes No	Hole Diameter
GEOLOGICAL MATERIAL COLOR HARDNESS FROM TO	Casing Diameter Weight(lbs/ft)	
DRIFT 0 101	24 in. to 103 ft.	
LIMEROCK 101 117	23 in. to 52 ft.	
SHALE 117 133	19 in. to 165 ft.	
SANDROCK SOFT 133 248	0 in. to 394 ft.	
SHALE 248 261		
SANDROCK SOFT 261 310	Screen Open Hole From ft. to ft.	
SHAKOPEE BROKEN 310 322	Make Type	
SHAKOPEE SANDY 322 392		
JORDAN SOFT 392 435	Static Water Level 90 ft. from Land surface Date 1967/06/00	
JORDAN SHALE 435 442	PUMPING LEVEL (below land surface) 160 ft. after 2 hrs. pumping 2103 g.p.m.	
JORDAN 442 486	Well Head Completion Pitless adapter mfr Model Casing Protection 12 in. above grade At-grade(Environmental Wells and Borings ONLY)	
SHALE 486 488	Grouting Information Well grouted? Yes No	
	Nearest Known Source of Contamination ft. direction. type Well disinfected upon completion? Yes No	
	Pump Not Installed Date Installed Mfr name Model HP 0 Volts Drop Pipe Length ft. Capacity g.p.m. Type	
REMARKS, ELEVATION, SOURCE OF DATA, etc.	Any not in use and not sealed well(s) on property? Yes No	
16" CASING FROM 312' TO 394'.	Was a variance granted from the MDH for this Well? Yes No	
CASING: 024 TO 0103;020 TO 0320;016 TO 0394.	Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 62012	
CASING: 026 TO 0103;020 TO 0320;016 TO 0394.	License Business Name	
USGS Quad: Hopkins Elevation: 915	Name of Driller	
Aquifer: CJDN Alt Id: 79-6207		

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Unique No. 00204054	MINNESOTA DEPARTMENT OF HEALTH WELL AND BORING RECORD <i>Minnesota Statutes Chapter 1031</i>						Update Date 2004/12/29	
County Name Hennepin							Entry Date 1991/08/24	
Township Name	Township	Range	Dir	Section	Subsection	Well Depth	Depth Completed	Date Well Completed
	117	22	W	12	CDCBDB	488 ft.	488 ft.	1967/06/00
Well Name	MINNETONKA 6			Lic. Or	Reg. No.	62012 Name of Driller		
USGS Quad	Hopkins	Elevation	915	Aquifer	CJDN	Alternative Id	79-6207	

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM TO	STRAT	LITH PRIM	LITH SEC	LITH MINOR
DRIFT QUUU = Unknown deposit type	DRFT = Drift		0 101	QUUU	DRFT		
LIMEROCK OPVL = Platteville	LMSN = Limestone		101 117	OPVL	LMSN		
SHALE OGWD = Glenwood	SHLE = Shale		117 133	OGWD	SHLE		
SANDROCK OSTP = St.Peter	SNDS = Sandstone	SOFT	133 248	OSTP	SNDS		
SHALE OSTP = St.Peter	SHLE = Shale		248 261	OSTP	SHLE		
SANDROCK OSTP = St.Peter	SNDS = Sandstone	SOFT	261 310	OSTP	SNDS		
SHAKOPEE BROKEN OPDC = Prairie Du Chien Group	DLMT = Dolomite		310 322	OPDC	DLMT		
SHAKOPEE SANDY OPDC = Prairie Du Chien Group	DLMT = Dolomite		322 392	OPDC	DLMT		
JORDAN CJDN = Jordan	SNDS = Sandstone	SOFT	392 435	CJDN	SNDS		
JORDAN SHALE CJDN = Jordan	SHLE = Shale		435 442	CJDN	SHLE		
JORDAN CJDN = Jordan	SNDS = Sandstone		442 486	CJDN	SNDS		
SHALE CSTL = St.Lawrence	SHLE = Shale		486 488	CSTL	SHLE		

Unique No. 00208012	MINNESOTA DEPARTMENT OF HEALTH						Update Date 2005/06/22	
County Name Hennepin	WELL AND BORING RECORD						Entry Date 1991/08/24	
<i>Minnesota Statutes Chapter 1031</i>								
Township Name	Township	Range	Dir	Section	Subsection	Well Depth	Depth Completed	Date Well Completed
	117	22	W	12	CDCBCD	486 ft.	486 ft.	1967/07/00
Well Name	MINNETONKA 6A			Lic. Or Reg. No.	62012	Name of Driller		
USGS Quad	Hopkins	Elevation	912	Aquifer	CJDN	Alternative Id	79-6207	

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM TO	STRAT	LITH PRIM	LITH SEC	LITH MINOR
DRIFT QUUU = Unknown deposit type	DRFT = Drift		0 104	QUUU	DRFT		
SHALE OPVL = Platteville	SHLE = Shale		104 112	OPVL	SHLE	LMSN	LMSN = Limestone
LIMEROCK OPVL = Platteville	LMSN = Limestone		112 121	OPVL	LMSN		
SHALE OGWD = Glenwood	SHLE = Shale		121 136	OGWD	SHLE		
SANDROCK OSTP = St.Peter	SNDS = Sandstone	SOFT	136 248	OSTP	SNDS		
SHALE OSTP = St.Peter	SHLE = Shale		248 261	OSTP	SHLE		
SANDROCK OSTP = St.Peter	SNDS = Sandstone		261 304	OSTP	SNDS		
SHAKOPEE BROKEN OPDC = Prairie Du Chien Group	DLMT = Dolomite		304 315	OPDC	DLMT		
SHAKOPEE SANDY OPDC = Prairie Du Chien Group	DLMT = Dolomite		315 392	OPDC	DLMT		
JORDAN SANDROCK CJDN = Jordan	SNDS = Sandstone		392 485	CJDN	SNDS		
SHALE CSTL = St.Lawrence	SHLE = Shale		485 486	CSTL	SHLE		



"Djerrari, Amal (MDH)"
<Amal.Djerrari@state.mn.us>
05/10/2010 08:59 AM

To Erik Tomlinson <etomlinson@sehinc.com>
cc
bcc
Subject Jordan T

For Follow Up:  Normal Priority

History:  This message has been forwarded.

Hi Erik

Here is the aquifer test report for Minnetonka Well 7 (6A in the report). Although the report says that the aquifer is the Prairie du Chien/Jordan, in fact both wells (6 and 7) are open to the Jordan only. I think you could use this value for the Jordan.

I had a look at your minutes. They look good, except that you did not mention the calibration. You should look at how the model represents heads in observation wells at the regional level, but more importantly verify the calibration at the local level.

I checked also the refinement that Barr did. They used the refine grid command in GWV, using a spacing of 20 m as a base. You can do the same and use a 1.35 ratio for adjacent cells.

Let me know if you have any question.

Amal



mtk_a_aquifer_test.pdf



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

Aquifer Test Plan

Public Water Supply ID:	1270011	PWS Name:	Edina
Contact			
Aquifer Test Contact:	Erik Tomlinson		
Contractor Name and Address:	SEH		
	3535 Vadnais Center Drive		
City, State, Zip:	St. Paul, Minnesota 55110		
Phone and Fax Number:	651-490-2022		
Proposed Aquifer Test Method			
<input checked="" type="checkbox"/>	1) An existing pumping test that meets the requirements of wellhead protection rule part 4720.5520 and that was previously conducted on a public well in your water supply system.		
<input type="checkbox"/>	2) An existing pumping test that meets the requirements of wellhead protection rule part 4720.5520 and that was previously conducted on another well in a hydrogeologic setting determined by the department to be equivalent.		
<input type="checkbox"/>	3) A pumping test conducted on a new or existing public well in your water supply system and that meets the requirements for larger sized water systems (wellhead protection rule part 4720.5520).		
<input type="checkbox"/>	4) A pumping test conducted on a new or existing public well in your water supply system and that meets the requirements for smaller sized water systems (wellhead protection rule part 4720.5530).		
<input type="checkbox"/>	5) An existing pumping test that does not meet the requirements of wellhead protection rule part 4720.5520 and that was previously conducted on: 1) a public water supply well or 2) another well in a hydrogeologic setting determined by the department to be equivalent.		
<input type="checkbox"/>	6) An existing specific capacity test or specific capacity test for the public water supply well.		
<input type="checkbox"/>	7) An existing published transmissivity value.		
<ul style="list-style-type: none"> ▪ Include all pumping test data and the estimated transmissivity value when the aquifer test method proposed is one of those specified in Nos. 1, 2, 5, 6, or 7 listed above. 			

To request this document in another format, please call the Section Receptionist at (651) 201-4700 or Division TTY at (651) 201-5797.

**Pumping Test Analysis
of Edina Well #10 (206184)
March 13, 1995**

Introduction

The MDH was requested to assist in the delineation of wellhead protection areas by the City of Edina, Minnesota, around the public water supply wells serving the community. An important part of the delineation process is to determine aquifer properties at the well site as accurately as possible. This is normally accomplished by performing a pumping test. Because of the need to test most public water supply wells, the MDH agreed to help with the pumping test as a part of in-house staff training and program development.

The pumping test conducted by the MDH at the Edina Well #10 was conducted as described below. The results were analyzed using standard nonequilibrium and semisteady-state methods, cited in references. Data and graphic analysis plots are included in Appendix 1 and test results are summarized on Table 1. The analysis shows that the aquifer responds as generally expected from the geologic setting. However, significant problems encountered during the test increase the uncertainty of the results.

Description of the Test

The transducer was placed in well #10 on March 5, 1995 to obtain long-term background water level readings because of possible well interference problems in the aquifer. Initially #10 was to be used as an observation well when pumping Well #9, also completed in the Mt Simon - Hinkley Aquifer. However, after #9 was pumped for four hours #10 showed no response. It was concluded that the wells were too far apart for a two well test and a single well test was recommended.

The test was started at 09:10 on March 13, 1995. The initial pumping rate was approximately 850 gallons per minute. The pumping rate declined during the test because the system back pressure varied. The low pumping rate was about 600 gpm as shown by the circular recorder. The average pumping rate was 684 gpm.

The recovery test started at 09:15 on March 14, 1995 and continued until 08:35 March 15, 1995 when an attempt was made to remove the transducer from the well. The transducer was lost in the well because it had been set too low and interfered with the bowls. This also caused stress on the electronics and the transducer failed after about 200 minutes into the recovery phase of the test.

Problems with the Analysis

There were several aspects to this test that present problems in the analysis and increase the uncertainty of the results. These problems do not invalidate the results but cause there to be limits in the confidence that can be placed in the numbers.

First of all, the early-time data from the pumping well was disturbed by fluctuations in the pumping rate and/or pressure surges caused by the well pumping into the distribution system and the transducer setting too close to the water intake. This caused problems with the Theis curve match analysis. The later-time recovery data was also compromised because of failure of the transducer after 200 minutes.

Summary of Results

A transmissivity value of 16,400 gal/day/ft was chosen as being representative of aquifer properties in the area for the capture zone analysis for the Mt. Simon Hinkley Aquifer. Comparison of the calculated values for the pumping and recovery phases showed that the test response is typical of a highly confined aquifer.

References:

Jacob, C. E. and Lohman, S. W., (1952) Nonsteady Flow to a Well of Constant Drawdown in an Extensive Aquifer, Trans. American Geophysical Union, Vol. 33, No. 4, August, 1952, pp. 559-69.

Theis, C. V., (1935) The Relation Between the Lowering of the Piezometric Surface and the Rate and Duration of Discharge of a Well Using Ground-Water Storage, Trans. American Geophysical Union, 16th Annual Meeting, April, 1935, pp. 519-24.

Table 1.

Edina #10 Pumping Test
 Mt. Simon - Hinkley Aquifer
 March 13, 1995

	Transmissivity T (gpd/ft)	Storage Coefficient S	Time Period Emphasized	Analysis Method
	-----		-----	-----
Pumping Phase 17,400	N/A		Early	Theis
	16,400	N/A	Late	Jacob
Recovery Phase 17,400	N/A		Early	Theis
	14,400	N/A	Late	Jacob

Representative aquifer values are best shown by the late pumping values, giving an average T of 16,400 gpd/ft.

Appendix 1.

Data and Graphic Analysis

Unique No. 00206184	MINNESOTA DEPARTMENT OF HEALTH WELL AND BORING RECORD <i>Minnesota Statutes Chapter 1031</i>	Update Date 2004/12/27
County Name Hennepin		Entry Date 1991/08/24
Township Name Township Range Dir Section Subsection 28 24 W 31 CDAADB	Well Depth 1001 ft. Depth Completed 1001 ft. Date Well Completed 1963/06/17	
Well Name EDINA 10	Drilling Method	
Contact's Name EDINA 10 EDINA MN	Drilling Fluid	Well Hydrofractured? Yes No From ft. to ft.
	Use Community Supply (municipal)	
	Casing Drive Shoe? Yes N	Hole Diameter
GEOLOGICAL MATERIAL COLOR HARDNESS FROM TO	Casing Diameter Weight(lbs/ft)	
DRIFT 0 183	24 in. to 184 ft	
SHAKOPEE-ONEOTA 183 305	20 in. to 651 ft	
JORDAN SANDROCK 305 403	16 in. to 881 ft	
ST. LAWRENCE SHALE 403 446		
FRANCONIA SHALE & SAND 446 592		
GALESVILLE SANDROCK 592 653		
GALESVILLE SANDROCK 653 664		
EAU CLAIRE SHALE 664 729		
MT. SIMON SANDROCK 729 876		
HINCKLEY SANDROCK 876 1000		
RED SHALE 1000 1001		
	Screen Open Hole From ft. to ft.	
	Make Type	
	Static Water Level 144 ft. from Land surface Date 1963/05/27	
	PUMPING LEVEL (below land surface) 280 ft. after hrs. pumping 2000 g.p.m.	
	Well Head Completion Pitless adapter mfr Model Casing Protection 12 in. above grade At-grade(Environmental Wells and Borings ONLY)	
	Grouting Information Well grouted? Yes No	
	Nearest Known Source of Contamination ft. direction type Well disinfected upon completion? Yes No	
	Pump Not Installed Date Installed Mfr name Model HP 0 Volts Drop Pipe Length ft. Capacity g.p.m. Type	
	Any not in use and not sealed well(s) on property? Yes No	
	Was a variance granted from the MDH for this Well? Yes No	
REMARKS, ELEVATION, SOURCE OF DATA, etc. CASING: 024 TO 0184;020 TO 0651;016 TO 0881. EDINA NO.10 M.G.S. 274 M.G.S. NO.274 USGS Quad: Bloomington Elevation 826 Aquifer: CMTS Alt Id: 73-1119	Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 27058 License Business Name Name of Driller	

Report Copy

Unique No. 00206184	MINNESOTA DEPARTMENT OF HEALTH						Update Date 2004/12/27
County Name Hennepin	WELL AND BORING RECORD						Entry Date 1991/08/24
<i>Minnesota Statutes Chapter 1031</i>							
Township Name Township	Range Dir	Section	Subsection	Well Depth	Depth Completed	Date Well Completed	
28	24 W	31	CDAADB	1001 ft.	1001 ft.	1963/06/17	
Well Name EDINA 10	Lic. Or Reg. No. 27058		Name of Driller				
USGS Quad Bloomingto	Elevation 826	Aquifer CMTS	Alternative Id 73-1119				

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO	STRAT	LITH PRIM	LITH SEC	LITH MINOR
DRIFT QUUU = Unknown deposit type	DRFT = Drift		0	183	QUUU	DRFT		
SHAKOPEE-ONEOTA OPDC = Prairie Du Chien Group	DLMT = Dolomite		183	305	OPDC	DLMT		
JORDAN SANDROCK CJDN = Jordan	SNDS = Sandstone		305	403	CJDN	SNDS		
ST. LAWRENCE SHALE CSTL = St.Lawrence	SHLE = Shale		403	446	CSTL	SHLE		
FRANCONIA SHALE & SANDROCK CFRN = Franconia	SHLE = Shale		446	592	CFRN	SHLE	SNDS	
							SNDS = Sandstone	
GALESVILLE SANDROCK CIGL = Ironton-Galesville	SNDS = Sandstone		592	653	CIGL	SNDS		
GALESVILLE SANDROCK CECR = Eau Claire	SHLE = Shale		653	664	CECR	SHLE	SNDS	
							SNDS = Sandstone	
EAU CLAIRE SHALE CECR = Eau Claire	SHLE = Shale		664	729	CECR	SHLE		
MT. SIMON SANDROCK CMTS = Mt.Simon	SNDS = Sandstone		729	876	CMTS	SNDS		
HINCKLEY SANDROCK CMTS = Mt.Simon	SNDS = Sandstone		876	1000	CMTS	SNDS		
RED SHALE PMSC = Solor Church Formation	SHLE = Shale		1000	1001	PMSC	SHLE		

Appendix D

MODFLOW Model Files (CD)

Appendix E

GIS Shapefiles (CD)

Appendix F

Vulnerability Assessments



**MINNESOTA DEPARTMENT OF HEALTH
SECTION OF DRINKING WATER PROTECTION
SWP Vulnerability Rating**



625 Robert St. N. St. Paul MN 55155
P.O. Box 64975 St. Paul MN 55164 - 0975

PWSID: 1270011
SYSTEM NAME: Edina
WELL NAME: Well #2

TIER: 2
WHP RANK:
UNIQUE WELL #: 00208399

COUNTY: Hennepin TOWNSHIP NUMBER: 28 RANGE: 24 W SECTION: 18 QUARTERS: CAAB

<u>CRITERIA</u>	<u>DESCRIPTION</u>	<u>POINTS</u>
Aquifer Name(s) :	Prairie Du Chien-Jordan	
DNR Geologic Sensitivity Rating :	Very low	0
L Score :	0	
Geologic Data From :	Well Record	
Year Constructed :	2002	
Construction Method :	Cable Tool/Bored	0
Casing Depth :	266	5
Well Depth :	448	
Casing grouted into borehole?	Unknown	0
Cement grout between casings?	Not applicable	0
All casings extend to land surface?	Yes	0
Gravel - packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	No	0
Isolation distance violations?		0
Pumping Rate :	1000	10
Pathogen Detected?		0
Surface Water Characteristics?		0
Maximum nitrate detected :	<1	0
Maximum tritium detected :	Unknown	0
Non-THMS VOCs detected?	1,1,2-Trichloroethane	06/13/1989
Pesticides detected?		VULNERABLE
Carbon 14 age :	Unknown	0
Wellhead Protection Score :		15
Wellhead Protection Vulnerability Rating :		VULNERABLE
Vulnerability Overridden :		

COMMENTS

NITRATE DATA FROM PWSD 1989, 3/73 SAMPLE and basal St. Peter confining layers. Additional protection may be provided by glacial deposits. New data on amended geologic log when blasted & redeveloped changed the following: date (from 1935); well depth (from 460'); casing depth (from 260'); multiple casings (from unk. to NA); holes in casing (from unk. to N). No change in aquifer. Very low vulnerability rating is based on the presence of the Glenwood



**MINNESOTA DEPARTMENT OF HEALTH
SECTION OF DRINKING WATER PROTECTION
SWP Vulnerability Rating**



625 Robert St. N. St. Paul MN 55155
P.O. Box 64975 St. Paul MN 55164 - 0975

PWSID: 1270011
SYSTEM NAME: Edina
WELL NAME: Well #3

TIER: 2
WHP RANK:
UNIQUE WELL #: 00240630

COUNTY: Hennepin TOWNSHIP NUMBER: 28 RANGE: 24 W SECTION: 18 QUARTERS: DDAC

<u>CRITERIA</u>	<u>DESCRIPTION</u>	<u>POINTS</u>
Aquifer Name(s)	: Prairie Du Chien-Jordan	
DNR Geologic Sensitivity Rating	: Low	20
L Score	: 0	
Geologic Data From	: Data Inferred From Nearby Wells	
Year Constructed	: 1949	
Construction Method	: Cable Tool/Bored	0
Casing Depth	: 265	5
Well Depth	: 496	
Casing grouted into borehole?	Unknown	0
Cement grout between casings?	Unknown	5
All casings extend to land surface?	Unknown	5
Gravel - packed casings?	No	0
Wood or masonry casing?	Unknown	0
Holes or cracks in casing?	Unknown	0
Isolation distance violations?		0
Pumping Rate	: 800	10
Pathogen Detected?		0
Surface Water Characteristics?		0
Maximum nitrate detected	: <1	0
Maximum tritium detected	: Unknown	0
Non-THMS VOCs detected?		0
Pesticides detected?		0
Carbon 14 age	: Unknown	0
Wellhead Protection Score		45
Wellhead Protection Vulnerability Rating		VULNERABLE
Vulnerability Overridden	:	

COMMENTS

NITRATE DATA FROM PWSID 1989, 3/73 SAMPLE
VULNERABLE BASED ON TRITIUM DATA FROM CJDN FOR OTHER CITY WELLS.



**MINNESOTA DEPARTMENT OF HEALTH
SECTION OF DRINKING WATER PROTECTION
SWP Vulnerability Rating**



625 Robert St. N. St. Paul MN 55155
P.O. Box 64975 St. Paul MN 55164 - 0975

PWSID: 1270011
SYSTEM NAME: Edina
WELL NAME: Well #4

TIER: 2
WHP RANK:
UNIQUE WELL #: 00200561

COUNTY: Hennepin TOWNSHIP NUMBER: 28 RANGE: 24 W SECTION: 19 QUARTERS: BCDA

<u>CRITERIA</u>	<u>DESCRIPTION</u>	<u>POINTS</u>
Aquifer Name(s) :	Prairie Du Chien-Jordan	
DNR Geologic Sensitivity Rating :	Very low	0
L Score :	0	
Geologic Data From :	Well Record	
Year Constructed :	1950	
Construction Method :	Cable Tool/Bored	0
Casing Depth :	266	5
Well Depth :	500	
Casing grouted into borehole?	Unknown	0
Cement grout between casings?	Unknown	5
All casings extend to land surface?	Yes	0
Gravel - packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	Unknown	0
Isolation distance violations?		0
Pumping Rate :	650	10
Pathogen Detected?		0
Surface Water Characteristics?		0
Maximum nitrate detected :	<1	0
Maximum tritium detected :	Unknown	0
Non-THMS VOCs detected?		0
Pesticides detected?		0
Carbon 14 age :	Unknown	0
Wellhead Protection Score :		20
Wellhead Protection Vulnerability Rating :		VULNERABLE
Vulnerability Overridden :		Jim Walsh

COMMENTS

NITRATE DATA FROM PWSID 1989, 3/73 SAMPLE and basal St. Peter confining layers. Additional protection may be offered by glacial deposits. Very low vulnerability rating is based on the presence of the Glenwood



**MINNESOTA DEPARTMENT OF HEALTH
SECTION OF DRINKING WATER PROTECTION
SWP Vulnerability Rating**



625 Robert St. N. St. Paul MN 55155
P.O. Box 64975 St. Paul MN 55164 - 0975

PWSID: 1270011
SYSTEM NAME: Edina
WELL NAME: Well #5

TIER: 2
WHP RANK:
UNIQUE WELL #: 00206377

COUNTY: Hennepin TOWNSHIP NUMBER: 28 RANGE: 24 W SECTION: 29 QUARTERS: CCBC

<u>CRITERIA</u>	<u>DESCRIPTION</u>	<u>POINTS</u>
Aquifer Name(s) :	Prairie Du Chien-Jordan	
DNR Geologic Sensitivity Rating :	Very low	15
L Score :	5	
Geologic Data From :	Well Record	
Year Constructed :	2002	
Construction Method :	Cable Tool/Bored	0
Casing Depth :	257	5
Well Depth :	443	
Casing grouted into borehole?	Yes	0
Cement grout between casings?	Not applicable	0
All casings extend to land surface?	Yes	0
Gravel - packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	No	0
Isolation distance violations?		0
Pumping Rate :	1000	10
Pathogen Detected?		0
Surface Water Characteristics?		0
Maximum nitrate detected :	<1	0
Maximum tritium detected :	Unknown	0
Non-THMS VOCs detected?		0
Pesticides detected?		0
Carbon 14 age :	Unknown	0
Wellhead Protection Score :		30
Wellhead Protection Vulnerability Rating :		NOT VULNERABLE

Vulnerability Overridden :

COMMENTS

NITRATE DATA FROM PWSID 1989, 3/73 SAMPLE Very low vulnerability rating is based on an L-5 score for the glacial deposits and the presence of the basal St. Peter confining layer. New data on amended geologic log when blasted & redeveloped: date (from 1954); well depth (from 443'); casing depth (from 257'); pump capacity (from 850 gpm). Also changed the following data from 'unknown': casing grouted (Y); casing to surface (Y); gravel-packed (N); wood or masonry casing (N); holes in casing (N); and changed question of multiple casings to 'NA.' No change in aquifer.



**MINNESOTA DEPARTMENT OF HEALTH
SECTION OF DRINKING WATER PROTECTION
SWP Vulnerability Rating**



625 Robert St. N. St. Paul MN 55155
P.O. Box 64975 St. Paul MN 55164 - 0975

PWSID: 1270011
SYSTEM NAME: Edina
WELL NAME: Well #6

TIER: 2
WHP RANK:
UNIQUE WELL #: 00200564

COUNTY: Hennepin TOWNSHIP NUMBER: 28 RANGE: 24 W SECTION: 19 QUARTERS: CBBB

<u>CRITERIA</u>	<u>DESCRIPTION</u>	<u>POINTS</u>
Aquifer Name(s) :	Prairie Du Chien-Jordan	
DNR Geologic Sensitivity Rating :	Very low	0
L Score :	0	
Geologic Data From :	Well Record	
Year Constructed :	1954	
Construction Method :	Cable Tool/Bored	0
Casing Depth :	316	5
Well Depth :	503	
Casing grouted into borehole?	Unknown	0
Cement grout between casings?	Unknown	5
All casings extend to land surface?	Yes	0
Gravel - packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	Unknown	0
Isolation distance violations?		0
Pumping Rate :	1090	20
Pathogen Detected?		0
Surface Water Characteristics?		0
Maximum nitrate detected :	<1	0
Maximum tritium detected :	Unknown	0
Non-THMS VOCs detected?		0
Pesticides detected?		0
Carbon 14 age :	Unknown	0
Wellhead Protection Score :		30
Wellhead Protection Vulnerability Rating :		VULNERABLE
Vulnerability Overridden :		Jim Walsh

COMMENTS

NITRATE DATA FROM PWSID 1989, 3/73 SAMPLE and basal St. Peter confining layers. Additional

Very low vulnerability rating is based on the presence of the protection may be afforded by glacial deposits.

Glenwood



**MINNESOTA DEPARTMENT OF HEALTH
SECTION OF DRINKING WATER PROTECTION
SWP Vulnerability Rating**



625 Robert St. N. St. Paul MN 55155
P.O. Box 64975 St. Paul MN 55164 - 0975

PWSID: 1270011
SYSTEM NAME: Edina
WELL NAME: Well #7

TIER: 2
WHP RANK:
UNIQUE WELL #: 00206474

COUNTY: Hennepin TOWNSHIP NUMBER: 117 RANGE: 21 W SECTION: 28 QUARTERS: CCDC

<u>CRITERIA</u>	<u>DESCRIPTION</u>	<u>POINTS</u>
Aquifer Name(s) :	Prairie Du Chien-Jordan	
DNR Geologic Sensitivity Rating :	Very low	0
L Score :	4	
Geologic Data From :	Well Record	
Year Constructed :	1955	
Construction Method :	Cable Tool/Bored	0
Casing Depth :	350	5
Well Depth :	547	
Casing grouted into borehole?	Unknown	0
Cement grout between casings?	Yes	0
All casings extend to land surface?	Yes	0
Gravel - packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	Unknown	0
Isolation distance violations?		0
Pumping Rate :	900	10
Pathogen Detected?		0
Surface Water Characteristics?		0
Maximum nitrate detected :	<1	0
Maximum tritium detected :	14.8 01/20/2005	VULNERABLE
Non-THMS VOCs detected?	Vinyl chloride 05/23/2002	VULNERABLE
Pesticides detected?		0
Carbon 14 age :	Unknown	0
Wellhead Protection Score :		15
Wellhead Protection Vulnerability Rating :		VULNERABLE
Vulnerability Overridden :		Jim Walsh

COMMENTS

NITRATE DATA FROM PWSID 1989, 3/73 SAMPLE and basal St. Peter confining layers. L-1 rating for the glacial deposits is not included. This well has had numerous VOC detects and is therefore considered vulnerable. THE TRITIUM DATA NOTED COMES FROM A SAMPLE TAKEN AT 450 FEET. OTHER SAMPLES TAKEN AT 400 AND 500 FEET SHOWED 13.4 AND 14.4 TU. HOWEVER, A SAMPLE TAKEN AT 360 FEET SHOWED <0.8 TU. Very low vulnerability rating is based on the presence of the Glenwood



**MINNESOTA DEPARTMENT OF HEALTH
SECTION OF DRINKING WATER PROTECTION
SWP Vulnerability Rating**



625 Robert St. N. St. Paul MN 55155
P.O. Box 64975 St. Paul MN 55164 - 0975

PWSID: 1270011
SYSTEM NAME: Edina
WELL NAME: Well #8

TIER: 2
WHP RANK:
UNIQUE WELL #: 00204884

COUNTY: Hennepin TOWNSHIP NUMBER: 116 RANGE: 21 W SECTION: 4 QUARTERS: CBBB

<u>CRITERIA</u>	<u>DESCRIPTION</u>	<u>POINTS</u>
Aquifer Name(s) :	Prairie Du Chien-Jordan	
DNR Geologic Sensitivity Rating :	Very low	10
L Score :	11	
Geologic Data From :	Well Record	
Year Constructed :	1953	
Construction Method :	Cable Tool/Bored	0
Casing Depth :	232	5
Well Depth :	472	
Casing grouted into borehole?	Unknown	0
Cement grout between casings?	Unknown	5
All casings extend to land surface?	Yes	0
Gravel - packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	Unknown	0
Isolation distance violations?		0
Pumping Rate :	900	10
Pathogen Detected?		0
Surface Water Characteristics?		0
Maximum nitrate detected :	<1	0
Maximum tritium detected :	Unknown	0
Non-THMS VOCs detected?		0
Pesticides detected?		0
Carbon 14 age :	Unknown	0
Wellhead Protection Score :		30
Wellhead Protection Vulnerability Rating :		VULNERABLE
Vulnerability Overridden :		Jim Walsh

COMMENTS
NITRATE DATA FROM PWSD 1989, 3/73 SAMPLE



**MINNESOTA DEPARTMENT OF HEALTH
SECTION OF DRINKING WATER PROTECTION
SWP Vulnerability Rating**



625 Robert St. N. St. Paul MN 55155
P.O. Box 64975 St. Paul MN 55164 - 0975

PWSID: 1270011
SYSTEM NAME: Edina
WELL NAME: Well #9

TIER: 2
WHP RANK:
UNIQUE WELL #: 00206588

COUNTY: Hennepin TOWNSHIP NUMBER: 117 RANGE: 21 W SECTION: 32 QUARTERS: DAD

<u>CRITERIA</u>	<u>DESCRIPTION</u>	<u>POINTS</u>
Aquifer Name(s) :	Mt. Simon	
DNR Geologic Sensitivity Rating :	Very low	10
L Score :	9	
Geologic Data From :	Well Record	
Year Constructed :	1957	
Construction Method :	Cable Tool/Bored	0
Casing Depth :	1010	0
Well Depth :	1130	
Casing grouted into borehole?	Yes	0
Cement grout between casings?	Yes	0
All casings extend to land surface?	No	10
Gravel - packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	Unknown	0
Isolation distance violations?		0
Pumping Rate :	650	10
Pathogen Detected?		0
Surface Water Characteristics?		0
Maximum nitrate detected :	<.05 09/21/1994	0
Maximum tritium detected :	Unknown	0
Non-THMS VOCs detected?		0
Pesticides detected?		0
Carbon 14 age :	A	-20
Wellhead Protection Score :		10
Wellhead Protection Vulnerability Rating :		NOT VULNERABLE

Vulnerability Overridden :

COMMENTS

Nitrate data from GWRD presence of the Gelenwood and basal St. Very low vulnerability rating is based on glacial deposits and Peter, St. Lawrence, and Eau Claire confining layers. does not include the



**MINNESOTA DEPARTMENT OF HEALTH
SECTION OF DRINKING WATER PROTECTION
SWP Vulnerability Rating**



625 Robert St. N. St. Paul MN 55155
P.O. Box 64975 St. Paul MN 55164 - 0975

PWSID: 1270011
SYSTEM NAME: Edina
WELL NAME: Well #10

TIER: 2
WHP RANK:
UNIQUE WELL #: 00206184

COUNTY: Hennepin TOWNSHIP NUMBER: 28 RANGE: 24 W SECTION: 31 QUARTERS: CDA4

<u>CRITERIA</u>	<u>DESCRIPTION</u>	<u>POINTS</u>
Aquifer Name(s) :	Mt. Simon	
DNR Geologic Sensitivity Rating :	Very low	0
L Score :	13	
Geologic Data From :	Well Record	
Year Constructed :	1963	
Construction Method :	Cable Tool/Bored	0
Casing Depth :	881	0
Well Depth :	1001	
Casing grouted into borehole?	Unknown	0
Cement grout between casings?	Unknown	5
All casings extend to land surface?	No	10
Gravel - packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	Unknown	0
Isolation distance violations?		0
Pumping Rate :	850	10
Pathogen Detected?		0
Surface Water Characteristics?		0
Maximum nitrate detected :	Unknown	0
Maximum tritium detected :	Unknown	0
Non-THMS VOCs detected?		0
Pesticides detected?		0
Carbon 14 age :	A	-20
Wellhead Protection Score :		5
Wellhead Protection Vulnerability Rating :		NOT VULNERABLE
Vulnerability Overridden :		

COMMENTS

NITRATE DATA FROM GWRD FROM GWRD, 6/12/87
 NITRATE DATA FROM PWS 1989, 3/73 SAMPLE
 NITRATE DATA FROM PWS 1989, 3/73 SAMPLE
 NITRATE DATA FROM
 GWRD
 Very low vulnerability rating is based on the presence of the St. Lawrence and Eau Claire confining layers and an assessment of till layers from nearby well records. The L-score reflects till layers.



**MINNESOTA DEPARTMENT OF HEALTH
SECTION OF DRINKING WATER PROTECTION
SWP Vulnerability Rating**



625 Robert St. N. St. Paul MN 55155
P.O. Box 64975 St. Paul MN 55164 - 0975

PWSID: 1270011
SYSTEM NAME: Edina
WELL NAME: Well #11

TIER: 2
WHP RANK:
UNIQUE WELL #: 00206183

COUNTY: Hennepin TOWNSHIP NUMBER: 28 RANGE: 24 W SECTION: 31 QUARTERS: CDAA

<u>CRITERIA</u>	<u>DESCRIPTION</u>	<u>POINTS</u>
Aquifer Name(s) :	Jordan	
DNR Geologic Sensitivity Rating :	Very low	10
L Score :	10	
Geologic Data From :	Well Record	
Year Constructed :	1963	
Construction Method :	Cable Tool/Bored	0
Casing Depth :	321	5
Well Depth :	403	
Casing grouted into borehole?	Unknown	0
Cement grout between casings?	Unknown	5
All casings extend to land surface?	Yes	0
Gravel - packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	Unknown	0
Isolation distance violations?		0
Pumping Rate :	1200	20
Pathogen Detected?		0
Surface Water Characteristics?		0
Maximum nitrate detected :	<1	0
Maximum tritium detected :	6.1 04/30/2009	VULNERABLE
Non-THMS VOCs detected?		0
Pesticides detected?		0
Carbon 14 age :	Unknown	0
Wellhead Protection Score :		40
Wellhead Protection Vulnerability Rating :		VULNERABLE
Vulnerability Overridden :		Jim Walsh

COMMENTS

VULNERABLE RATING BASED ON TRITIUM DATA FROM OTHER CITY WELLS.



**MINNESOTA DEPARTMENT OF HEALTH
SECTION OF DRINKING WATER PROTECTION
SWP Vulnerability Rating**



625 Robert St. N. St. Paul MN 55155
P.O. Box 64975 St. Paul MN 55164 - 0975

PWSID: 1270011
SYSTEM NAME: Edina
WELL NAME: Well #12

TIER: 2
WHP RANK:
UNIQUE WELL #: 00203614

COUNTY: Hennepin TOWNSHIP NUMBER: 117 RANGE: 21 W SECTION: 30 QUARTERS: BABB

<u>CRITERIA</u>	<u>DESCRIPTION</u>	<u>POINTS</u>
Aquifer Name(s) :	Mt. Simon	
DNR Geologic Sensitivity Rating :	Very low	0
L Score :	14	
Geologic Data From :	Well Record	
Year Constructed :	1964	
Construction Method :	Cable Tool/Bored	0
Casing Depth :	955	0
Well Depth :	1080	
Casing grouted into borehole?	Yes	0
Cement grout between casings?	Unknown	5
All casings extend to land surface?	Yes	0
Gravel - packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	Unknown	0
Isolation distance violations?		0
Pumping Rate :	850	10
Pathogen Detected?		0
Surface Water Characteristics?		0
Maximum nitrate detected :	Unknown	0
Maximum tritium detected :	Unknown	0
Non-THMS VOCs detected?		0
Pesticides detected?		0
Carbon 14 age :	A	-20
Wellhead Protection Score :		-5
Wellhead Protection Vulnerability Rating :		NOT VULNERABLE
Vulnerability Overridden :		

COMMENTS

Very low vulnerability rating is based on the presence of the St. Lawrence and Eau Clair confining layers and the assessment of till units from nearby well records. The L-score reflects till layers.



**MINNESOTA DEPARTMENT OF HEALTH
SECTION OF DRINKING WATER PROTECTION
SWP Vulnerability Rating**



625 Robert St. N. St. Paul MN 55155
P.O. Box 64975 St. Paul MN 55164 - 0975

PWSID: 1270011
SYSTEM NAME: Edina
WELL NAME: Well #13

TIER: 2
WHP RANK:
UNIQUE WELL #: 00203613

COUNTY: Hennepin TOWNSHIP NUMBER: 117 RANGE: 21 W SECTION: 30 QUARTERS: BAB

<u>CRITERIA</u>	<u>DESCRIPTION</u>	<u>POINTS</u>
Aquifer Name(s)	: Jordan	
DNR Geologic Sensitivity Rating	: Very low	0
L Score	: 0	
Geologic Data From	: Well Record	
Year Constructed	: 1964	
Construction Method	: Cable Tool/Bored	0
Casing Depth	: 429	0
Well Depth	: 495	
Casing grouted into borehole?	Unknown	0
Cement grout between casings?	Unknown	5
All casings extend to land surface?	Yes	0
Gravel - packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	Unknown	0
Isolation distance violations?		0
Pumping Rate	: 1000	10
Pathogen Detected?		0
Surface Water Characteristics?		0
Maximum nitrate detected	: <1	0
Maximum tritium detected	: 2.4 04/30/2009	VULNERABLE
Non-THMS VOCs detected?		0
Pesticides detected?		0
Carbon 14 age	: Unknown	0
Wellhead Protection Score	:	15
Wellhead Protection Vulnerability Rating	:	VULNERABLE
Vulnerability Overridden	:	Jim Walsh

COMMENTS

Very low vulnerability rating is based on the presence of the basal St. Peter sandstone and the Glenwood confining layers. Additional protection is provided by glacial deposits but the geologic log is too general to identify till units. VULNERABLE RATING BASED ON TRITIUM DATA FROM OTHER CITY WELLS.



**MINNESOTA DEPARTMENT OF HEALTH
SECTION OF DRINKING WATER PROTECTION
SWP Vulnerability Rating**



625 Robert St. N. St. Paul MN 55155
P.O. Box 64975 St. Paul MN 55164 - 0975

PWSID: 1270011
SYSTEM NAME: Edina
WELL NAME: Well #14

TIER: 2
WHP RANK:
UNIQUE WELL #: 00200913

COUNTY: Hennepin TOWNSHIP NUMBER: 116 RANGE: 21 W SECTION: 7 QUARTERS: DADC

<u>CRITERIA</u>	<u>DESCRIPTION</u>	<u>POINTS</u>
Aquifer Name(s)	: Jordan	
DNR Geologic Sensitivity Rating	: Very low	10
L Score	: 8	
Geologic Data From	: Well Record	
Year Constructed	: 1964	
Construction Method	: Cable Tool/Bored	0
Casing Depth	: 325	5
Well Depth	: 420	
Casing grouted into borehole?	Unknown	0
Cement grout between casings?	Unknown	5
All casings extend to land surface?	Yes	0
Gravel - packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	Unknown	0
Isolation distance violations?		0
Pumping Rate	: 900	10
Pathogen Detected?		0
Surface Water Characteristics?		0
Maximum nitrate detected	: .1	0
Maximum tritium detected	: 1.5	VULNERABLE
Non-THMS VOCs detected?		0
Pesticides detected?		0
Carbon 14 age	: Unknown	0
<hr/>		
Wellhead Protection Score	:	30
Wellhead Protection Vulnerability Rating	:	VULNERABLE
<hr/>		
Vulnerability Overridden	:	

COMMENTS

L-score is based on the glacial stratigraphy from nearby wells.



**MINNESOTA DEPARTMENT OF HEALTH
SECTION OF DRINKING WATER PROTECTION
SWP Vulnerability Rating**



625 Robert St. N. St. Paul MN 55155
P.O. Box 64975 St. Paul MN 55164 - 0975

PWSID: 1270011
SYSTEM NAME: Edina
WELL NAME: Well #15

TIER: 2
WHP RANK:
UNIQUE WELL #: 00207674

COUNTY: Hennepin TOWNSHIP NUMBER: 117 RANGE: 21 W SECTION: 29 QUARTERS: DBBD

<u>CRITERIA</u>	<u>DESCRIPTION</u>	<u>POINTS</u>
Aquifer Name(s) :	Prairie Du Chien-Jordan	
DNR Geologic Sensitivity Rating :	Very low	0
L Score :	0	
Geologic Data From :	Well Record	
Year Constructed :	2002	
Construction Method :	Cable Tool/Bored	0
Casing Depth :	275	5
Well Depth :	475	
Casing grouted into borehole?	Yes	0
Cement grout between casings?	Yes	0
All casings extend to land surface?	Yes	0
Gravel - packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	No	0
Isolation distance violations?		0
Pumping Rate :	1150	20
Pathogen Detected?		0
Surface Water Characteristics?		0
Maximum nitrate detected :	<.05 09/21/1994	0
Maximum tritium detected :	Unknown	0
Non-THMS VOCs detected?		0
Pesticides detected?		0
Carbon 14 age :	Unknown	0
Wellhead Protection Score :		25
Wellhead Protection Vulnerability Rating :		VULNERABLE
Vulnerability Overridden :		Jim Walsh

COMMENTS

Very low vulnerability rating is based on the presence of the Glenwood and basal St. Peter confining layers. Additional protection is provided by the glacial deposits but the geologic log is too general to identify till units. VULNERABLE RATING BASED ON TRITIUM DATA FROM OTHER CITY WELLS AND LOW-LEVEL VOC DETECTS FROM 1997-2001. New data from amended log when redrilled & blasted for redevelopment: date (orig. 1967); depth (orig. 405'); holes in casing (from unk.); pump capacity (from 600 gpm). The aquifer apparently did not change, based on geology of nearby wells.



MINNESOTA DEPARTMENT OF HEALTH SECTION OF DRINKING WATER PROTECTION SWP Vulnerability Rating



625 Robert St. N. St. Paul MN 55155
P.O. Box 64975 St. Paul MN 55164 - 0975

PWSID: 1270011
SYSTEM NAME: Edina
WELL NAME: Well #16

TIER: 2
WHP RANK:
UNIQUE WELL #: 00203101

COUNTY: Hennepin TOWNSHIP NUMBER: 116 RANGE: 21 W SECTION: 6 QUARTERS: ACAB

<u>CRITERIA</u>	<u>DESCRIPTION</u>	<u>POINTS</u>
Aquifer Name(s) :	Prairie Du Chien-Jordan	
DNR Geologic Sensitivity Rating :	Very low	10
L Score :	8	
Geologic Data From :	Well Record	
Year Constructed :	1967	
Construction Method :	Cable Tool/Bored	0
Casing Depth :	265	5
Well Depth :	381	
Casing grouted into borehole?	Unknown	0
Cement grout between casings?	Unknown	5
All casings extend to land surface?	Yes	0
Gravel - packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	Unknown	0
Isolation distance violations?		0
Pumping Rate :	1200	20
Pathogen Detected?		0
Surface Water Characteristics?		0
Maximum nitrate detected :	<.05 12/07/1993	0
Maximum tritium detected :	Unknown	0
Non-THMS VOCs detected?		0
Pesticides detected?		0
Carbon 14 age :	Unknown	0
Wellhead Protection Score :		40
Wellhead Protection Vulnerability Rating :		VULNERABLE
Vulnerability Overridden :		Jim Walsh

COMMENTS

Very low vulnerability rating is based on the presence of the basal St. Peter sandstone confining layer. The L-score reflects the its thickness.
VULNERABLE RATING BASED ON TRITIUM DATA FROM OTHER CITY WELLS.



**MINNESOTA DEPARTMENT OF HEALTH
SECTION OF DRINKING WATER PROTECTION
SWP Vulnerability Rating**



625 Robert St. N. St. Paul MN 55155
P.O. Box 64975 St. Paul MN 55164 - 0975

PWSID: 1270011
SYSTEM NAME: Edina
WELL NAME: Well #17

TIER: 2
WHP RANK:
UNIQUE WELL #: 00200914

COUNTY: Hennepin TOWNSHIP NUMBER: 28 RANGE: 24 W SECTION: 19 QUARTERS: DBDA

<u>CRITERIA</u>	<u>DESCRIPTION</u>	<u>POINTS</u>
Aquifer Name(s) :	Jordan	
DNR Geologic Sensitivity Rating :	Very low	0
L Score :	12	
Geologic Data From :	Well Record	
Year Constructed :	1970	
Construction Method :	Cable Tool/Bored	0
Casing Depth :	373	5
Well Depth :	461	
Casing grouted into borehole?	Unknown	0
Cement grout between casings?	Unknown	5
All casings extend to land surface?	Yes	0
Gravel - packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	Unknown	0
Isolation distance violations?		0
Pumping Rate :	1050	20
Pathogen Detected?		0
Surface Water Characteristics?		0
Maximum nitrate detected :	<.05 09/21/1994	0
Maximum tritium detected :	Unknown	0
Non-THMS VOCs detected?		0
Pesticides detected?		0
Carbon 14 age :	Unknown	0
Wellhead Protection Score :		30
Wellhead Protection Vulnerability Rating :		VULNERABLE
Vulnerability Overridden :		Jim Walsh

COMMENTS

VULNERABLE RATING BASED ON TRITIUM DATA FROM OTHER CITY WELLS.



**MINNESOTA DEPARTMENT OF HEALTH
SECTION OF DRINKING WATER PROTECTION
SWP Vulnerability Rating**



625 Robert St. N. St. Paul MN 55155
P.O. Box 64975 St. Paul MN 55164 - 0975

PWSID: 1270011
SYSTEM NAME: Edina
WELL NAME: Well #18

TIER: 2
WHP RANK:
UNIQUE WELL #: 00200918

COUNTY: Hennepin TOWNSHIP NUMBER: 28 RANGE: 24 W SECTION: 32 QUARTERS: BDAC

<u>CRITERIA</u>	<u>DESCRIPTION</u>	<u>POINTS</u>
Aquifer Name(s) :	Jordan	
DNR Geologic Sensitivity Rating :	High	VULNERABLE
L Score :	0	
Geologic Data From :	Well Record	
Year Constructed :	1973	
Construction Method :	Cable Tool/Bored	0
Casing Depth :	365	5
Well Depth :	446	
Casing grouted into borehole?	Unknown	0
Cement grout between casings?	Unknown	5
All casings extend to land surface?	Yes	0
Gravel - packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	Unknown	0
Isolation distance violations?		0
Pumping Rate :	650	10
Pathogen Detected?		0
Surface Water Characteristics?		0
Maximum nitrate detected :	<.05 09/21/1994	0
Maximum tritium detected :	Unknown	0
Non-THMS VOCs detected?		0
Pesticides detected?		0
Carbon 14 age :	Unknown	0
Wellhead Protection Score :		20
Wellhead Protection Vulnerability Rating :		VULNERABLE
Vulnerability Overridden :		

COMMENTS



**MINNESOTA DEPARTMENT OF HEALTH
SECTION OF DRINKING WATER PROTECTION
SWP Vulnerability Rating**



625 Robert St. N. St. Paul MN 55155
P.O. Box 64975 St. Paul MN 55164 - 0975

PWSID: 1270011
SYSTEM NAME: Edina
WELL NAME: Well #19

TIER: 2
WHP RANK:
UNIQUE WELL #: 00505626

COUNTY: Hennepin TOWNSHIP NUMBER: 116 RANGE: 21 W SECTION: 5 QUARTERS: CCC

<u>CRITERIA</u>	<u>DESCRIPTION</u>	<u>POINTS</u>
Aquifer Name(s) :	Jordan	
DNR Geologic Sensitivity Rating :	Very low	0
L Score :	17	
Geologic Data From :	Well Record	
Year Constructed :	1989	
Construction Method :	Cable Tool/Bored	0
Casing Depth :	440	0
Well Depth :	521	
Casing grouted into borehole?	Yes	0
Cement grout between casings?	Yes	0
All casings extend to land surface?	Yes	0
Gravel - packed casings?	No	0
Wood or masonry casing?	No	0
Holes or cracks in casing?	Unknown	0
Isolation distance violations?		0
Pumping Rate :	1000	10
Pathogen Detected?		0
Surface Water Characteristics?		0
Maximum nitrate detected :	<.05 09/21/1994	0
Maximum tritium detected :	Unknown	0
Non-THMS VOCs detected?		0
Pesticides detected?		0
Carbon 14 age :	Unknown	0
Wellhead Protection Score :		10
Wellhead Protection Vulnerability Rating :		VULNERABLE
Vulnerability Overridden :		Jim Walsh

COMMENTS

The very low vulnerability score is based on till layers.
ON TRITIUM DATA FROM OTHER CITY WELLS.

The basal St. Peter confining layer is also present. **VULNERABLE RATING BASED**



**MINNESOTA DEPARTMENT OF HEALTH
SECTION OF DRINKING WATER PROTECTION
SWP Vulnerability Rating**



625 Robert St. N. St. Paul MN 55155
P.O. Box 64975 St. Paul MN 55164 - 0975

PWSID: 1270011
SYSTEM NAME: Edina
WELL NAME: Well #20 Entry Point

TIER: 2
WHP RANK:
UNIQUE WELL #: 00686286

COUNTY: Hennepin	TOWNSHIP NUMBER:	RANGE:	SECTION:	QUARTERS:
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<u>CRITERIA</u>	<u>DESCRIPTION</u>	<u>POINTS</u>
Aquifer Name(s) :	Prairie Du Chien-Jordan	
DNR Geologic Sensitivity Rating :	High	VULNERABLE
L Score :	0	
Geologic Data From :	Well Record	
Year Constructed :	2008	
Construction Method :	Cable Tool/Bored	0
Casing Depth :	265	5
Well Depth :	467	
Casing grouted into borehole?	No	0
Cement grout between casings?	Yes	0
All casings extend to land surface?	Yes	0
Gravel - packed casings?	Yes	20
Wood or masonry casing?	No	0
Holes or cracks in casing?	Unknown	0
Isolation distance violations?		0
Pumping Rate :		0
Pathogen Detected?		0
Surface Water Characteristics?		0
Maximum nitrate detected :	<.05 07/08/2009	0
Maximum tritium detected :	Unknown	0
Non-THMS VOCs detected?		0
Pesticides detected?		0
Carbon 14 age :	Unknown	0
Wellhead Protection Score :		25
Wellhead Protection Vulnerability Rating :		VULNERABLE
Vulnerability Overridden :		

COMMENTS