WHITE BEAR TOWNSHIP
MINNESOTA

SURFACE WATER MANAGEMENT PLAN

ADOPTED FEBRUARY 20, 2013

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TKDA project number 14124.000

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1. EXECUTIVE SUMMARY

This Local Surface Water Management Plan will help to guide the protection and management of surface waters, ground water, and related natural resources in White Bear Township. The Plan was developed to meet the requirements of the State Statutes, the Metropolitan Council, and local watershed organizations. This Plan combines the Town's previous Surface Water Management Plan (2001) with more recent policy documents, plans and permits from various levels of government. The Plan incorporates the requirements of the Town's MS4 permit and Storm Water Pollution Prevention Plan, which have been approved by the Minnesota Pollution Control Agency (MPCA).

White Bear Township is in the watersheds of the Rice Creek Watershed District (RCWD) and the Vadnais Lake Area Water Management Organization (VLAWMO).

Per State Statute, White Bear Township is required to complete its LSWMP update within two years of the Watershed Management Plans. VLAWMO adopted its updated Watershed Management Plan in December, 2007 and RCWD updated its plan in January 2010. White Bear Township expects to again update this Local Surface Water Management Plan within two years after the next Watershed Management Plan update.

The Plan describes key land and water resources. Lakes, shoreland, and wetlands are significant features in the landscape. High quality natural areas are especially present in the many park and public lands within White Bear Township.

Because the Township is almost completely developed, much of the emphasis in the Local Surface Water Management Plan is on identification of existing issues and planning for redevelopment and retrofitting. The plan includes an inventory of surface waters and natural resources within the Township. Goals and policies provide guidance for decision-making by the Township. Water resource issues were identified in cooperation with the watershed organizations. The Plan concludes with implementation measures.

2. PURPOSE AND SCOPE

2.1 Purpose

The purpose of this Surface Water Management Plan (Plan) is to serve as a comprehensive planning document to guide White Bear Township in conserving, protecting, and maintaining the quality of its water resources. This Plan recognizes the numerous entities involved in water resources management and environmental protection and has been created to meet the provisions of Minnesota Statutes §473.157 and §103B.235. It also conforms to the Rice Creek Watershed District Rules, watershed management plan, and Vadnais Lake Area Water Management Organization watershed management plan. The Plan avoids duplicating efforts of others by referencing or adopting the plans and rules of other organizations when applicable, including the Rice Creek Watershed District (RCWD), Vadnais Lake Area Water Management Organization (VLAWMO), the Metropolitan Council, and State of Minnesota Agencies.

2.2 Scope

To achieve its general goal of improving the quality of Township surface waters, the Plan develops specific goals in the following critical issue areas:

- ✓ Lakes
- ✓ Wetlands
- ✓ Streams, Creeks, and Drainage Systems
- ✓ Floodplains
- ✓ Erosion and Sedimentation Control
- ✓ Water Quality
- ✓ Water Quantity
- ✓ Groundwater
- ✓ Natural Resources
- ✓ Implementation

Collectively, the goals set forth the desired future condition of surface water resources in the Township. Each of the Plan goals has one or more corresponding policy. A policy is a specific means for achieving established goals. Finally, the plan identifies actions the Township will undertake to implement the plan, namely creation and revision of ordinances, and cooperative efforts with other organizations to protect water and natural resources.

2.3 Water Resources Related Agreements

White Bear Township is a participant in the Joint Powers Agreement that created and maintains the Vadnais Lake Area Water Management Organization (VLAWMO). VLAWMO was organized in 1983 by a Joint Powers Agreement. The WMO includes White Bear Township and the Cities of Lino Lakes, North Oaks, Vadnais Heights, White Bear Lake, and Gem Lake.

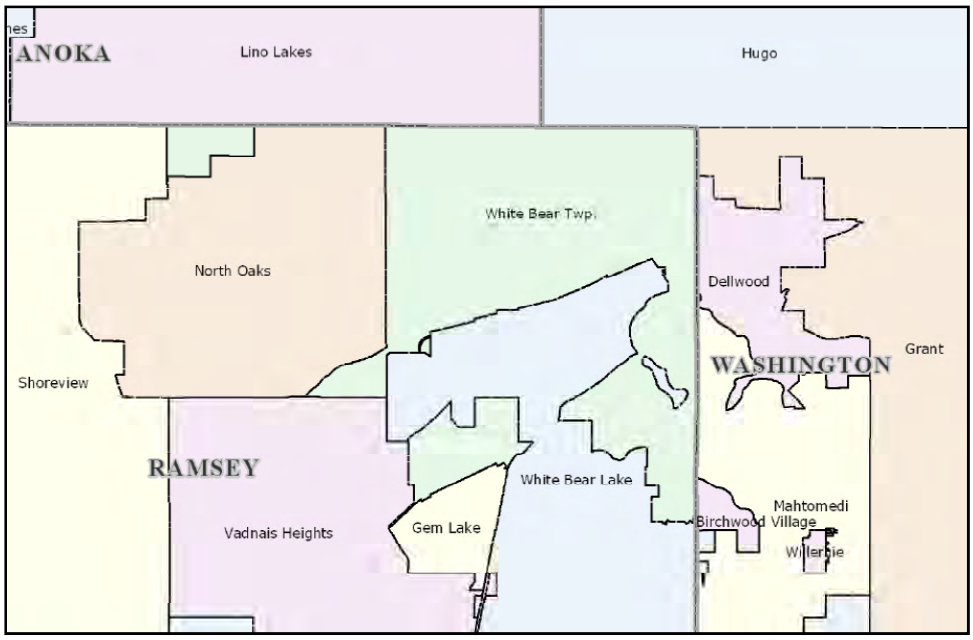
VLAWMO and Rice Creek Watershed District (RCWD) are the designated Local Government Units responsible for administering the Wetland Conservation Act within White Bear Township. VLAWMO and RCWD also manage the public ditch system in the area. RCWD manages permitting within its portion of the Township. The Township requests that RCWD continue to implement its rules and regulations and issue permits.

3. LAND AND WATER RESOURCE INVENTORY

3.1 Location, History, and Growth Trends

White Bear Township is located in the northeast corner of Ramsey County, approximately 10 miles north of St. Paul. It shares borders with 11 neighboring communities and two other counties. The Township is traversed by significant transportation routes I35E and TH61. Approximately one third of White Bear Township is park land. Other predominant land uses are single family residential and commercial-industrial development.

Figure 3-1: White Bear Township and Neighboring Communities



Source: Metropolitan Council

Organized in 1858, the original Township consisted of 36 square miles and included the present Township and substantial portions of the cities of White Bear Lake, Vadnais Heights, Gem Lake, Maplewood, Little Canada, and North Oaks. The present Township is made up of five non-contiguous areas and by population is the largest Township in Minnesota. The Township's land and water area is approximately 7,000 acres.

White Bear Township is a developed community, having had significant growth in the 1980s. Today there are approximately 220 acres of undeveloped land in the Township suitable for development. Future growth will be accommodated by redevelopment as well as development of vacant land. The Township's population is anticipated to grow slightly through the year 2030 as shown in Table 3-1.

Table 3-1: White Bear Township Growth Trends

Year	Population	Households
1960	6,175	1,764
1970	5,666	1,716
1980	5,921	1,850
3.2 1990	9,242	3,205
2000	11,293	4,010
2010	12,300	4,450
2020	12,800	4,800
2030	12,700	4,850

Source: U.S. Census, Metropolitan Council, White Bear Township

3.3 Topography

White Bear Township is characterized by level to gently rolling topography interspersed with lakes and wetlands. A few areas of the Township are characterized by steep slopes (greater than 12%), generally located along large lake and wetland depressions. Notable steep areas include the shore areas of Bald Eagle Lake, and in the vicinity of Tamarack Lake and Fish Lake, which are within the Tamarack Nature Center, part of the Ramsey County park system. Topographic mapping of the Township has been prepared by the United States Department of the Interior Geological Survey as part of the White Bear Lake East and White Bear Lake West Quadrangle Maps. The 10-foot contour intervals from these maps, and areas with potentially steep slopes, are shown in Figure 3-3.

3.4 Soils

The USDA Soil Conservation Service (SCS) issued the ***Soil Survey of Washington and Ramsey Counties*** in 1980. The publication provides soil location maps and information on the physical properties of soils found in Washington and Ramsey Counties.

The nature of soils comprising the top layer of unconsolidated material in a watershed is important because soil properties are a primary factor in determining the volume of runoff associated with a given rainfall event. The SCS Soil Survey assigns soil types to a hydrologic group depending on the soils ability to infiltrate water during long-duration storms. The four hydrologic soil group classifications are described below.

- Group A soils have low runoff potential and high infiltration rates even when thoroughly wetted. These consist of deep, well-drained sands or gravels.

- Group B soils have moderate infiltration rates and the potential for runoff. They consist of moderately-deep to deep, and moderate to well-drained soils.

- Group C soils have low infiltration rates and generally impede the downward movement of water. These soils have more moderately-fine to fine textures and provide greater amounts of runoff volumes when thoroughly wetted.

- Group D soils have very low infiltration rates and very high runoff potential. These soils are associated with clays with high swelling potential and soils with a high permanent water table.

For soils assigned to a dual hydrologic group (A/D, B/D, C/D), the first soil type is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes. In White Bear Township, the areas classified as A/D coincide with wetlands in many cases.

The soils in the majority of the Township are classified in hydrologic group A, B, or A/D, as shown on Figure 3-4. Hydrologic soil group classification data are not available in several locations in the Township. Land disturbing activities can change a soil's physical properties; therefore, actual conditions of a particular site may vary somewhat from the hydrologic soils.

3.5 Climate and Precipitation

White Bear Township's climate is greatly influenced by its location near the center of the North American continent. Polar air masses dominate during the winter season resulting in cold, dry weather. Warm and moist air masses, originating from the Gulf of Mexico, share predominance during the summer with tropical air masses from the desert southwest resulting in warm days and nights. The spring and fall seasons are transition periods, characterized by alternating intrusions of air from various sources. The diverse nature of the air masses impacting Minnesota's climate leads to seasonal temperature extremes, with greatest levels of precipitation in the summer months.

The National Weather Service station at Chanhassen has published climatic summaries. The summary of precipitation is reported in Figure 3-2.

Figure 3-2: Normal Monthly Precipitation

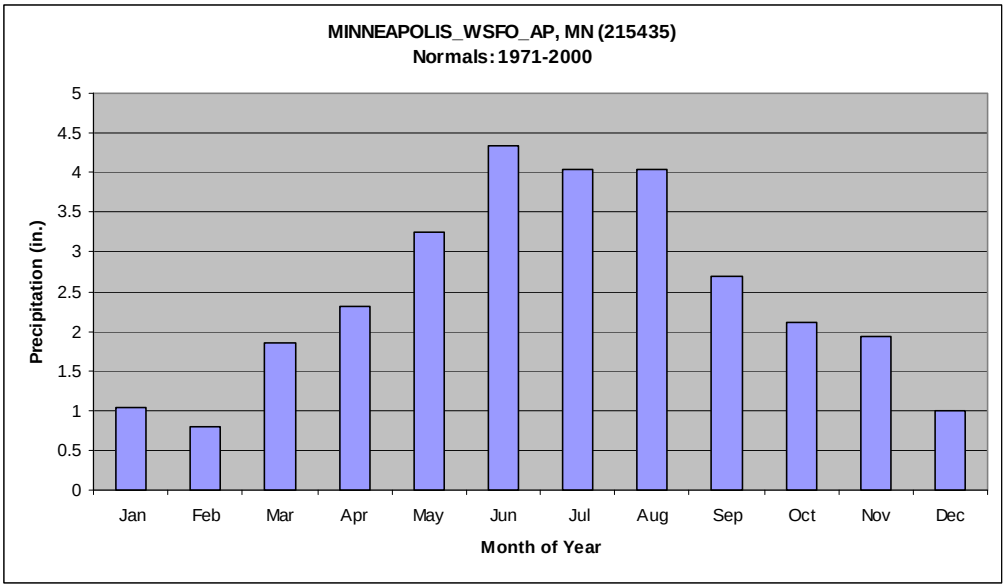


Figure 3-3: Topography

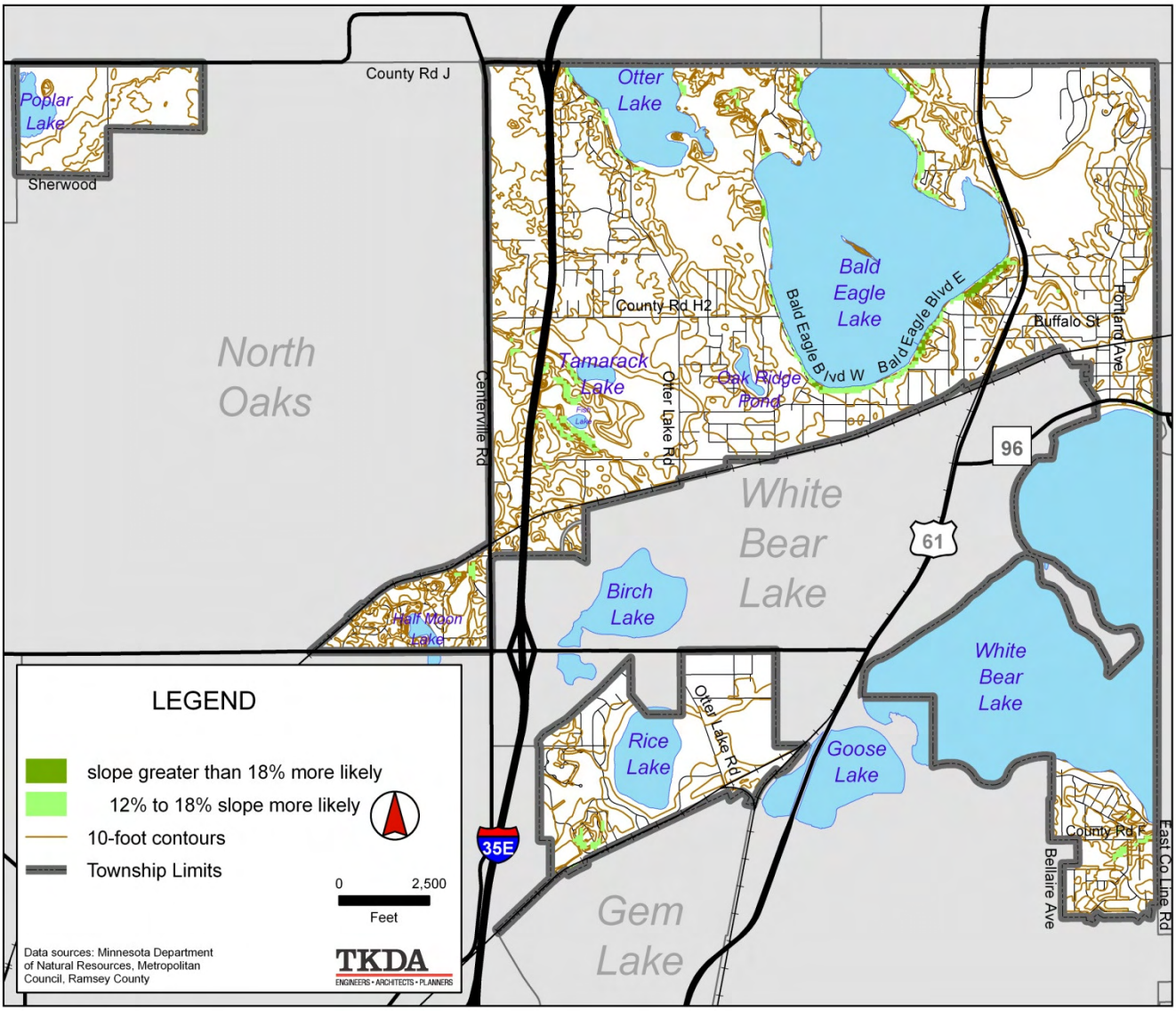
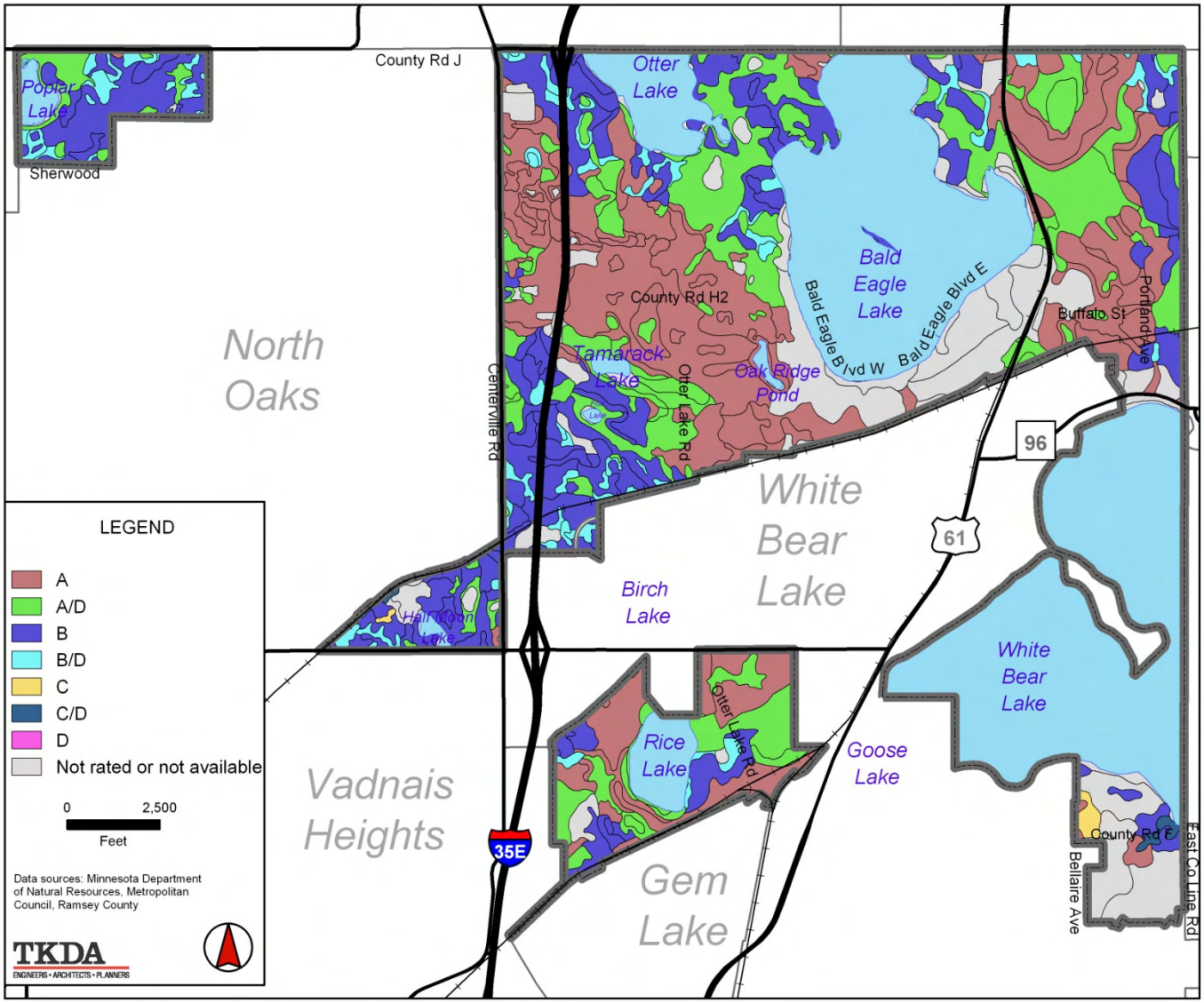


Figure 3-4: Soils



3.6 Lakes

Lakes located wholly or partially in White Bear Township are Bald Eagle Lake, Otter Lake, Poplar Lake, Rice Lake, Tamarack Lake, White Bear Lake, Half Moon Lake, Fish Lake, and Oak Ridge Pond. Birch Lake and Goose Lake are nearby waterbodies that have shoreland management areas that fall within the Township limits. Protected waters (basins and drainage systems) are shown on Figure 3-5. Flows generally leave White Bear Township from the north end of Bald Eagle Lake, moving north to Clearwater Creek. Flows from the southwest area of the Township flow southwesterly to Lambert Creek. Because White Bear Township is a fully developed community, there will not be an increase in volume or rate of runoff entering lakes due to land development.

Table 3-2: Lakes

Lake Name	Protected (Public) Waters Inventory ID
Bald Eagle Lake	62-2 P
Otter Lake	2-3 P
Poplar Lake	62-44 P
Rice Lake	62-32 W
Tamarack Lake	62-21 W
White Bear Lake	82-167 P
Ox Lake (Half Moon Lake)	62-25 W
(Unnamed) Oak Ridge Pond	62-23 W
(Unnamed) Fish Lake	62-22 W

The White Bear Township Zoning Ordinance, Shoreland Management Overlay District contains standards for property within 1,000 feet of each lake's ordinary high water mark. The Shoreland Management Overlay District also applies to the portions of White Bear Township that are within 1,000 feet of Birch Lake and Goose Lake, which are located in the City of White Bear Lake. The Minnesota Department of Natural Resources reviews projects within the Shoreland Overlay District of classified lakes.

The following state and regional designations are applicable to lakes located in the Township.

- Bald Eagle Lake and Otter Lake are on the Metropolitan Council's Priority Lakes List. These lakes are identified as priority lakes due to their high regional recreational value, as they each have boat access and an adjacent park. The Metropolitan Council uses the Priority Lakes List to

focus regional resources and for environmental reviews (such as an EAW). If an environmental review is being completed for a proposed project, and that project may impact a priority lake, the environmental assessment would include a nutrient budget analysis.

- Bald Eagle Lake is listed as an Impaired Water by the MPCA due to nutrient enrichment and Mercury contamination.
- Bald Eagle Lake and White Bear Lake meet the state's criteria for designation as infested waters due to Eurasian water milfoil.
- None of the lakes or other water resources within White Bear Township are listed as Outstanding Resource Value Waters, under Minnesota Rules 7050.0180.

3.7 Wetlands

The rolling to flat topography and wet soil conditions in White Bear Township result in extensive wetland areas. All eight wetland types are found within the Township. The predominant wetland types, in addition to Open Water (Type 5), are Shallow Marsh (Type 3) and Shrub Swamp (Type 6).

The Township's Comprehensive Plan identifies wetlands as valuable resources that provide many benefits to the Township and surrounding areas. Some of these benefits include groundwater recharge, filtration of sediments and nutrients, flood control, wildlife habitat, and scenic value.

Many wetland areas are protected via inclusion in the park and open space system. Roughly 65% of the classified wetland acreage in the Township is within the boundaries of park properties, including Tamarack Nature Center, Bald Eagle-Otter Lake Regional Park, Benson Farmstead and Poplar Lake Park. Development has already encroached on some of the wetland areas, but most remain relatively undisturbed. Remaining privately owned wetlands are concentrated in the northeast segment of the Township, east of Highway 61, and the area west of I-35E. The triangle-shaped segment of the Town (bordered by the Minneapolis/St. Paul and Sault St. Marie Railroad, and County Road 96 and Centerville Road) is also dotted with many small wetland areas.

The White Bear Township Zoning Ordinance, Conservation Wetlands Overlay District requires a permit prior to any development or construction that would potentially affect the wetland area. Activities such as filling, dredging or construction that would alter or infringe on the wetland are strongly discouraged, and are only permitted where the impact would be limited.

Rice Creek Watershed District (RCWD) and Vadnais Lake Area Water Management Organization (VLAWMO) are responsible for administering the Wetland Conservation Act in White Bear Township. The Township requests that the watersheds continue to maintain WCA authority.

VLAWMO completed a Comprehensive Wetland Management Plan in 2001 and incorporated elements of that document in its Comprehensive Water Management Plan,

adopted in 2007. The WMO requires that all projects affecting wetlands complete a more detailed assessment, using the most current version of the Minnesota Routine Assessment Methodology (MNRAM).

RCWD Rules require that applicants complete a Functions and Values Assessment using a WCA-accepted methodology, if there is at least one acre of wetland impact requiring replacement. RCWD Rules incorporate the provisions of WCA and in some cases are stricter than WCA requirements. WCA exemptions for qualifying activities are recognized by the District, though these activities do require a RCWD permit. District Rules require 1:1 replacement for activities that are not regulated under WCA but that change the quantity, quality, or biological diversity of a wetland.

3.8 Drainage Systems

Flows from the southwest area of the Township flow southwesterly to County Ditch 14 (Lambert Creek). Flow moves from Goose Lake and County Ditch 13 (Dillon Ditch) to Rice Lake and Grass Lake, then continuing via County Ditch 14 to Vadnais Lake. County Ditch 11 flows from White Bear Lake to Bald Eagle Lake. Judicial Ditch 1 flows from the east to Bald Eagle Lake and Otter Lake. From Bald Eagle Lake, flow exits the Township to the north and on to Clearwater Creek. Because White Bear Township is a fully developed community, there will not be an increase in volume or rate of runoff entering the drainage system due to land development. The Watersheds have authority over the ditch system in their respective areas.

There are no designated trout streams within White Bear Township.

Table 3-3: Ditch Information

Name	Authority
Judicial Ditch 1	RCWD
County Ditch 11	RCWD
County Ditch 14 (Lambert Creek)	VLAWMO
County Ditch 13 (Dillon Ditch)	VLAWMO

3.9 Impaired Waters

As part of the federal Clean Water Act administered by the Environmental Protection Agency (EPA), the Minnesota Pollution Control Agency (MPCA) is required to publish a list of impaired waters, known as the 303(d) list. Impaired waters are lakes, wetlands or streams that do not meet federal water quality standards or do not fully support the waterbody's designated uses.

In White Bear Township, Bald Eagle Lake, White Bear Lake, Judicial Ditch 1, and Lambert Creek are identified as impaired waters. There are no identified impaired wetlands within White Bear Township. Clearwater Creek, Peltier Lake, and Centerville Lake are impaired waters located outside of White Bear Township's limits that receive drainage from the Township.

For each impaired waterbody, the MPCA is required to conduct a study to determine the allowable Total Maximum Daily Load (TMDL) for each pollutant that exceeds the standard. Adopted TMDL studies include implementation measures that local government and other actors will take to reduce the identified pollutant(s) from various point sources and non-point sources.

Table 3-4: Impaired Waters

Waterbody	Watershed organization	Pollutant	TMDL Plan status
Bald Eagle Lake	RCWD	Excess Nutrients, Mercury (state-wide TMDL)	Underway. Mercury TMDL approved 2007
White Bear Lake	RCWD	Mercury (state-wide TMDL)	Approved 2007 by EPA
Lambert Creek	RCWD	Fecal Coliform	Underway
Ramsey/Washington Judicial Ditch 1	RCWD	Low Dissolved Oxygen	Not underway; expected start date of 2013
Waterbodies located within other municipalities, and receiving drainage from White Bear Township			
Clearwater Creek (located in Hugo, Lino Lakes, and Centerville)	RCWD	Biota	Not underway; expected start date of 2013
Peltier Lake (located in Lino Lakes and Centerville)	RCWD	Phosphorous, Mercury	Underway
Centerville Lake (located in Lino Lakes and Centerville)	RCWD	Phosphorous	Underway

Source: MPCA Report of All TMDL Projects, Updated April 2009

Figure 3-5: Protected Waters Inventory and Drainage systems

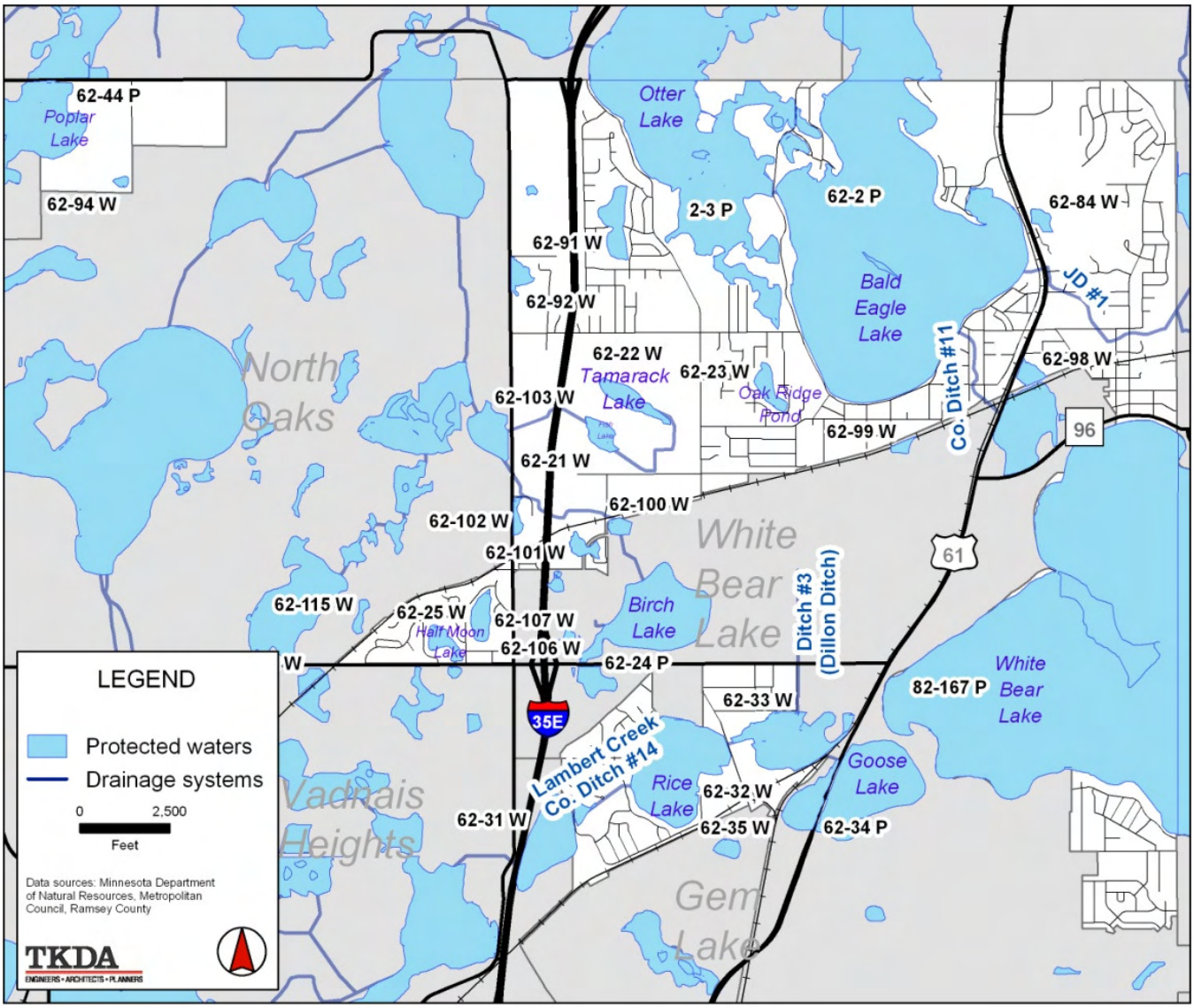


Figure 3-6: National Wetland Inventory

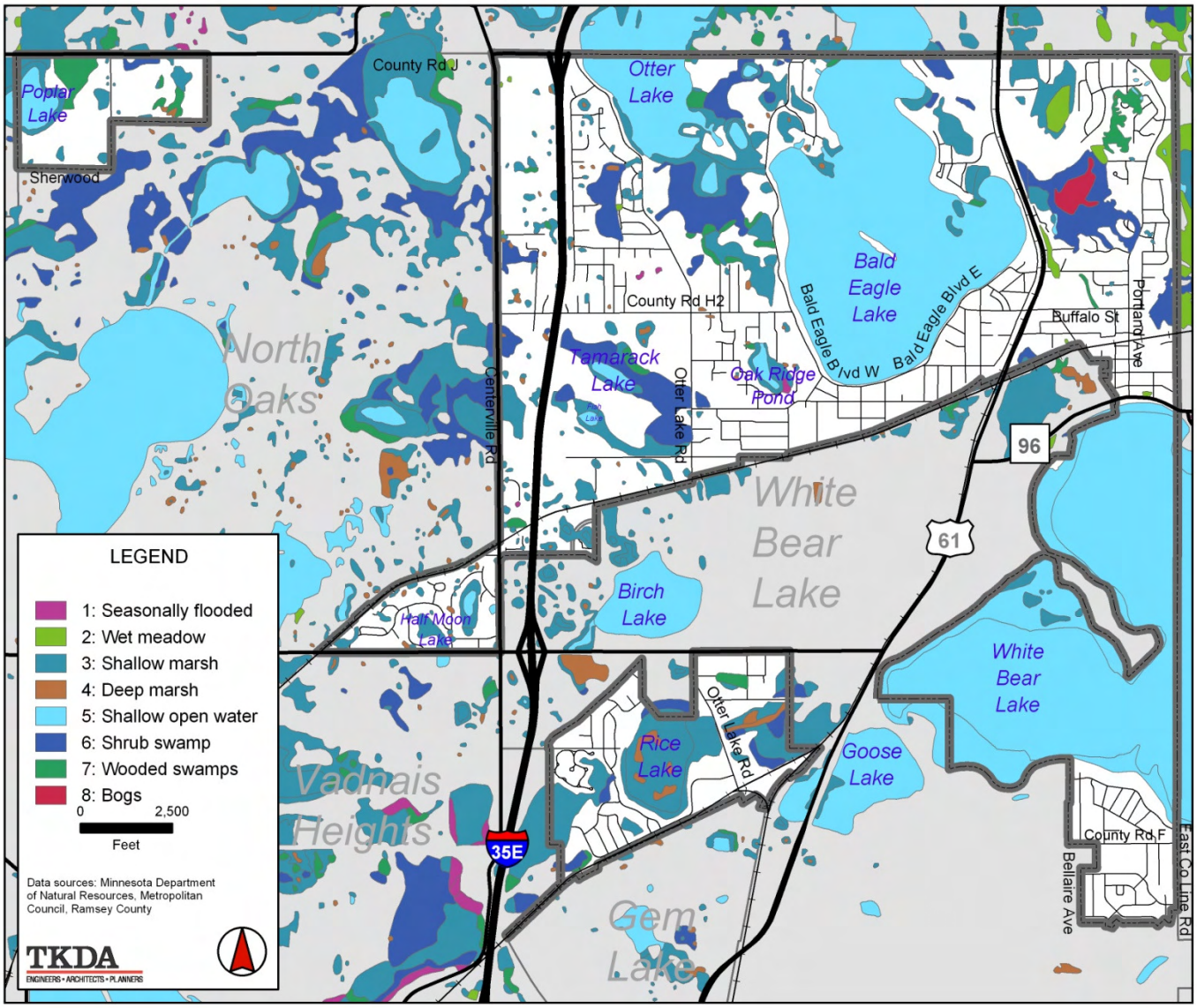
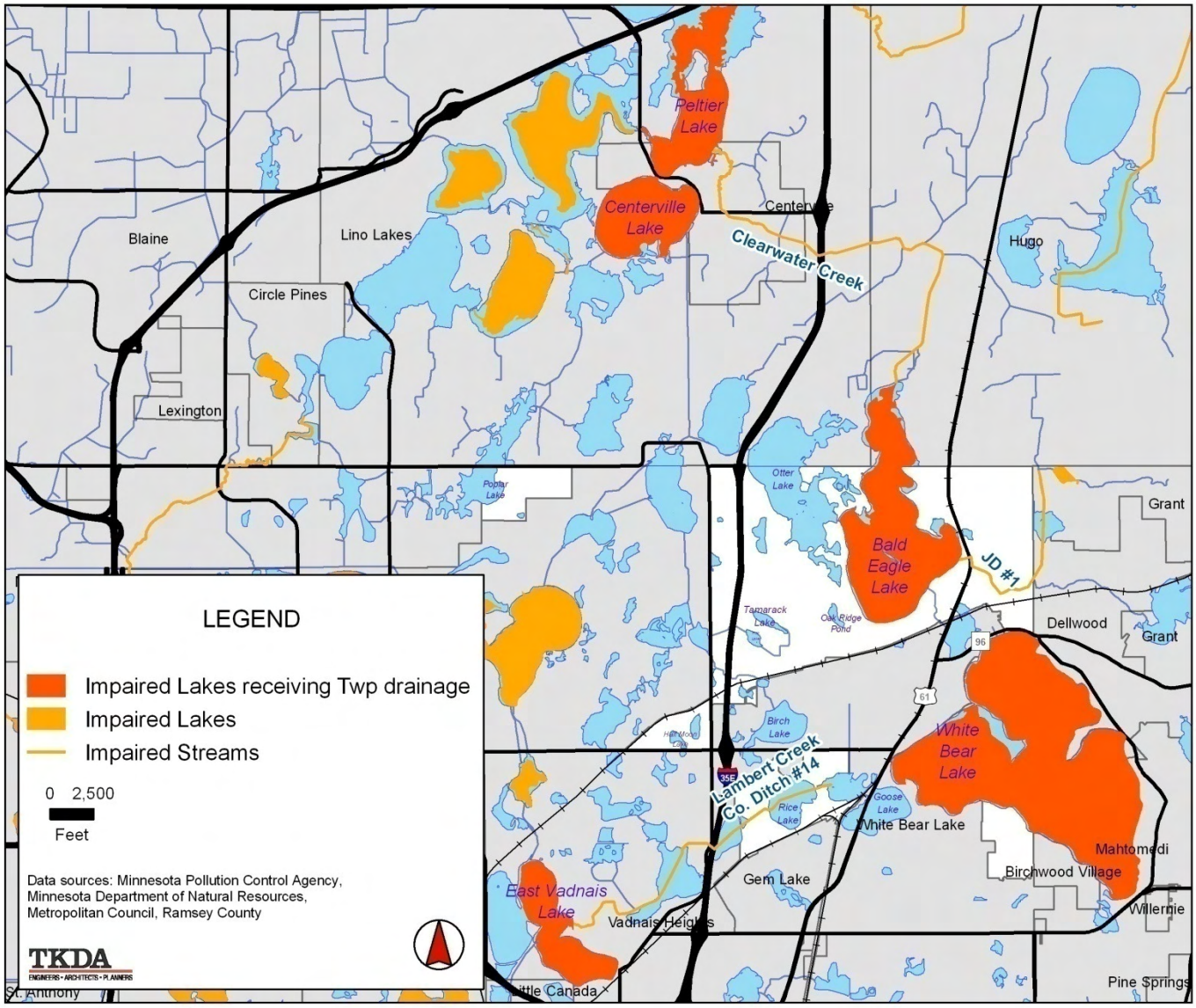


Figure 3-7: Impaired Waters



3.10 Floodplains

Land use regulations define the floodplain as the area covered by the flood that has a one percent chance of occurring each year, also known as the 100-year flood. Floodplains are divided into two districts: the floodway and flood fringe. The floodway includes the river channel and nearby land areas which must remain open to discharge the 100-year flood. The flood fringe, while in the floodplain, lies outside the floodway. Regulations usually allow development in the flood fringe but require flood-proofing or raising to the legal flood protection elevation.

In 1968, Congress created the National Flood Insurance Program (NFIP) to make flood insurance available to property owners at federally subsidized rates. The NFIP required communities to adopt local laws to protect lives and future development from flooding. Federal Emergency Management Agency (FEMA) first must formally notify a community that it has special flood hazard areas (SFHA) before it can join the NFIP. FEMA notifies communities by issuing a Flood Hazard Boundary Map (FHBM). This map shows the approximate boundaries of the community's 100-year floodplain. Each participating community has a Flood Insurance Study (FIS). The FIS includes a floodplain map depicting the community's flood hazard areas. The FIS and floodplain map for White Bear Township were completed in 1985.

The Minnesota Department of Natural Resources is currently working with FEMA to conduct a flood insurance restudy and update the Flood Insurance Rate maps (FIRMs) for the area. This process will include opportunities for the Township and the public to review any draft changes to the FEMA flood zones.

Designated FEMA floodplain areas in White Bear Township correspond with significant wetland areas and shoreland areas. Figure 3-8 shows the 1985 FEMA Flood Zones and 100 year Floodplain. The Township expects to adopt new FEMA floodplain maps in June, 2010. The Township has a Floodplain Management Ordinance to protect and manage these areas.

3.11 Groundwater

White Bear Township is characterized by a shallow groundwater table with most upland areas having a depth to groundwater of 6 to 10 feet. The water table is at or near the surface in most low areas, as evidenced by the Township's many lakes and wetlands.

Groundwater sensitivity to pollution is a concern in areas where soils and bedrock are highly permeable. Under these conditions, surface pollutants can seep quickly to the groundwater. The Minnesota Geological Survey has established a groundwater sensitivity rating system, classifying areas by the amount of time it would take for water-borne pollutants to percolate through the ground and reach the aquifer. High sensitivity areas are highly permeable and would allow for rapid contamination of the groundwater. The majority of the Township lies within areas classified as high or moderate sensitivity, as shown on Figure 3-9.

The Town depends on groundwater for its water supply. White Bear Township completed its Water Supply and Emergency Preparedness Plan and submitted it to the State of Minnesota in October, 2007. The Water Supply and Emergency Preparedness plan

includes policies and actions taken in order to provide a reliable and safe water supply. The relevant policies contained within the Water Supply Plan are incorporated into this Surface Water Management Plan.

White Bear Township is in the process of completing a Wellhead Protection Plan. Part I was approved December 21, 2007, and is included here as Appendix A. Work has begun on Part II, which will address Wellhead Protection goals, policies, and implementation.

3.12 Native Plant Communities and Significant Natural Areas

The original vegetation of the Township prior to settlement by Europeans included areas of oak openings and barrens, wet prairie, and Big Woods (oak, maple, basswood, and hickory forest). Some remnants of these native plant communities remain today. Native prairie communities are found along the railroad corridor traversing the Township. Benson Farmstead, the Township green space located to the south of Benson Airport and east of Bald Eagle Lake, contains native wetland prairie and forested wetland.

The Minnesota Department of Natural Resources identified areas throughout the Metropolitan Region that are likely high quality natural areas. Tamarack Nature Center, Bald Eagle-Otter Lake Regional Park, and Poplar Lake Park contain the great majority of the areas considered to be Regionally Significant Ecological Areas. These high quality natural resources are illustrated in Figure 3-10.

Rare and sensitive species present, or with suitable habitat present, in the Township include Blanding's Turtle, Bullfrog, Great Egret, and Coniferous Wetlands. The Minnesota Nature Heritage Program performed a rare and sensitive species analysis, and the findings of that analysis are summarized in the 2030 Comprehensive Plan, Physical Development Framework and Plan.

Figure 3-8: Floodplains

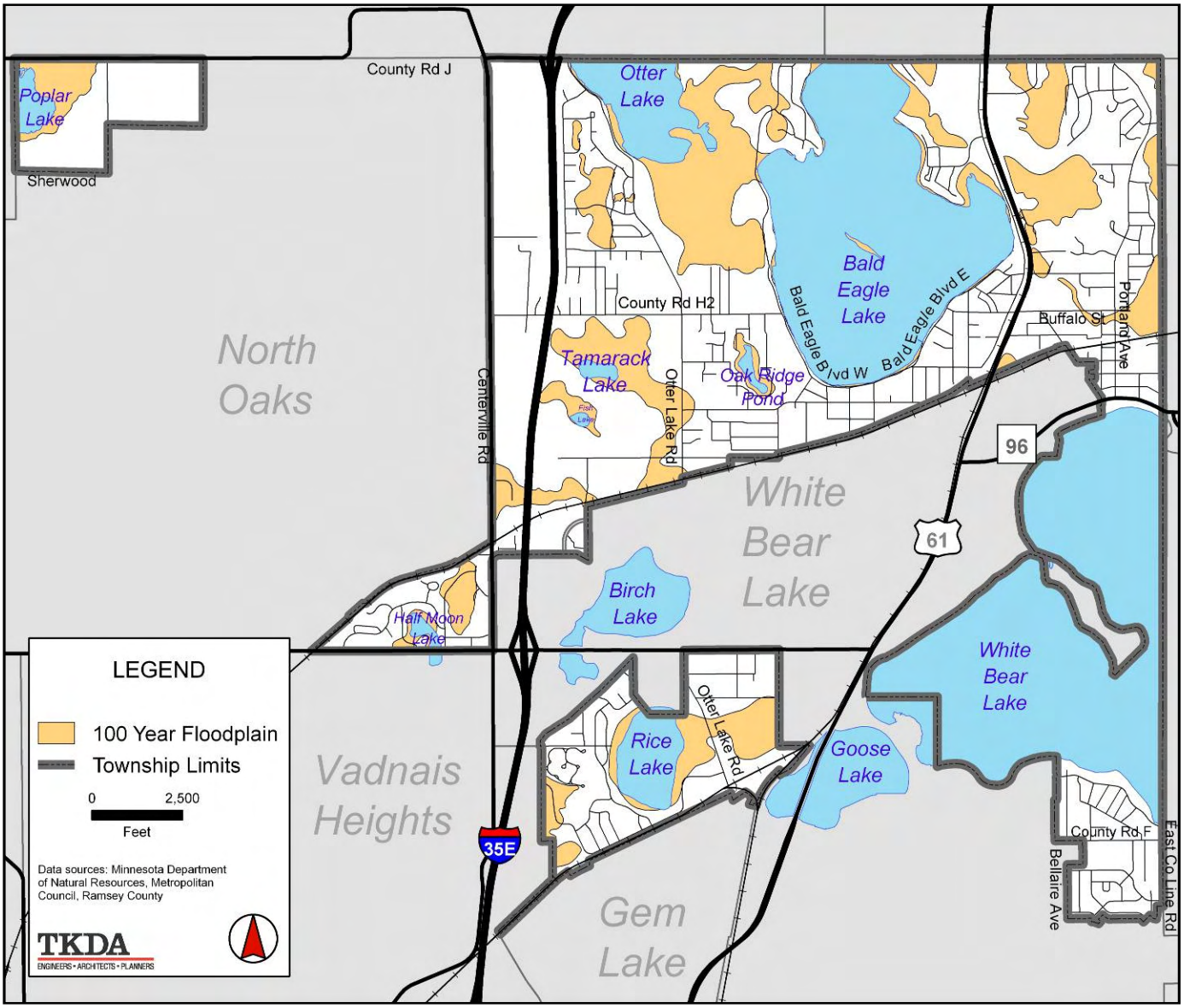


Figure 3-9: Groundwater Sensitivity

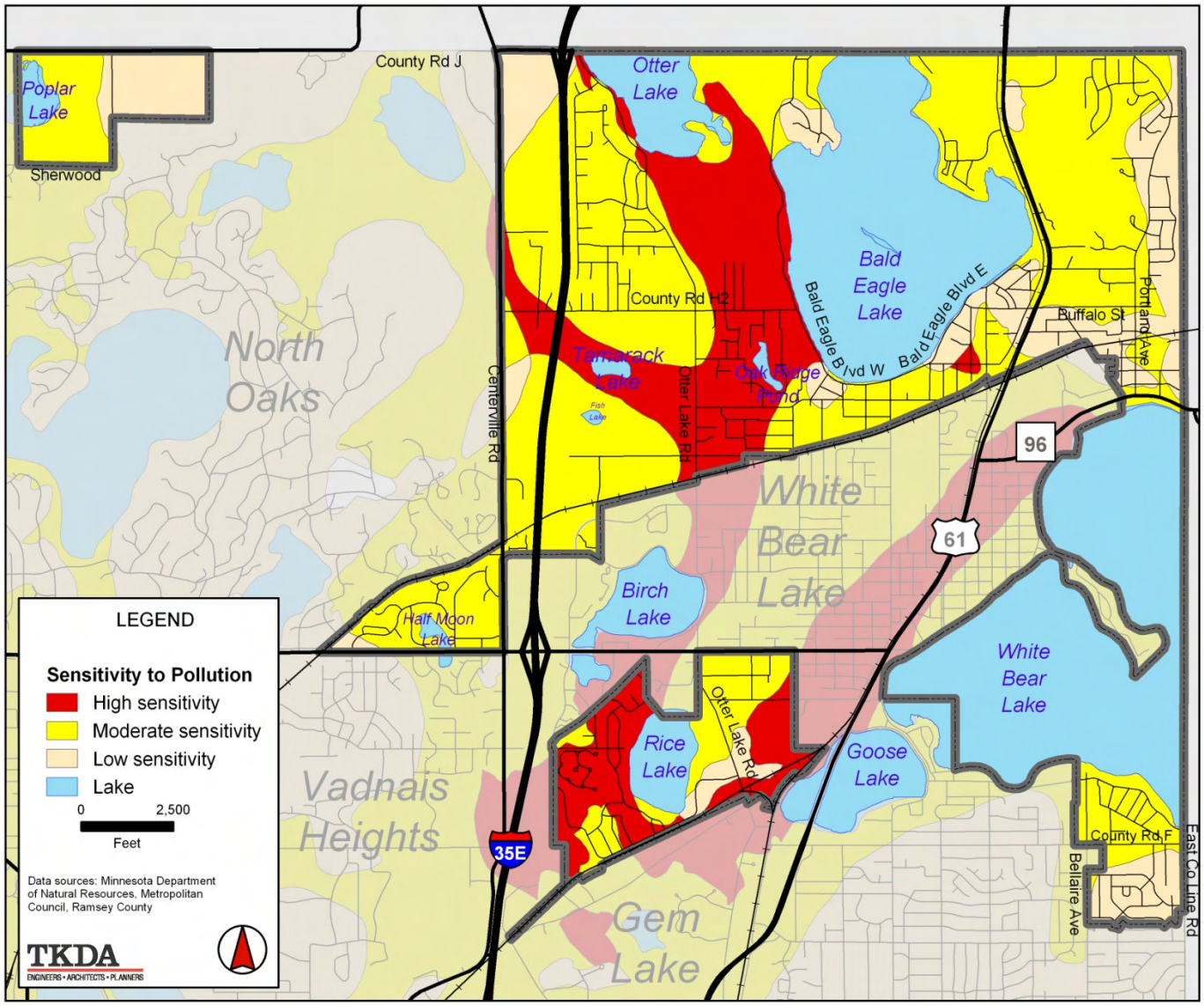
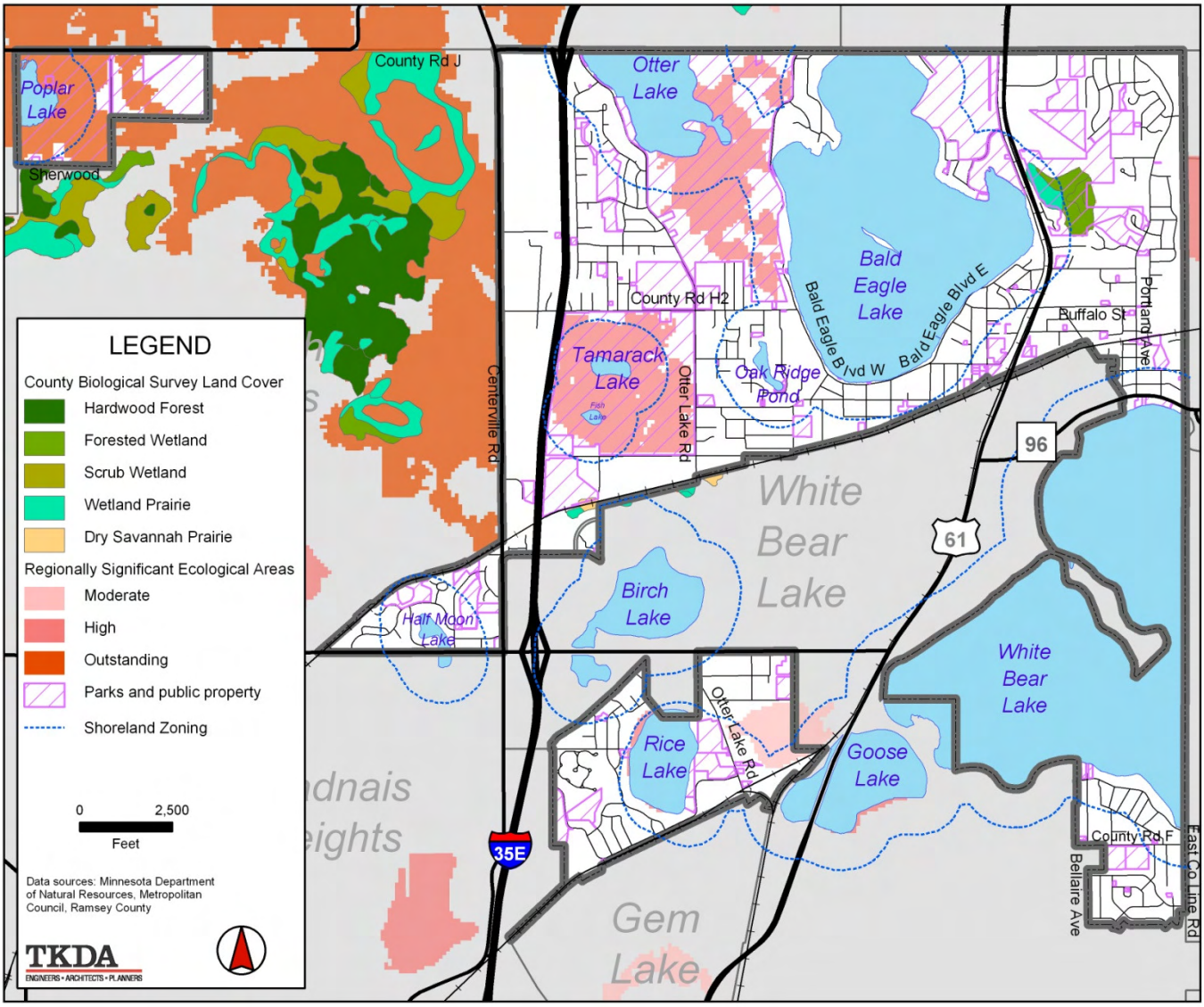


Figure 3-10: Natural Areas



Land Use

The predominant development pattern in White Bear Township is single family residential. Parks and open space are also a significant land use in the Township. Commercial and industrial land uses are focused on significant transportation corridors.

Table 3-5: Existing and Planned Land Use

Land Use	Existing (acres)	2030 Planned Land Use (acres)
Within Metropolitan Urban Services Area (MUSA)		
Residential - single family (3 units per acre)	1618	1698
Residential - multiple family (6 units per acre)	193	199
Residential - multiple family (10 units per acre)	0	2
Commercial	48	52
Industrial	214	337
Airport	37	37
Public	1499	1499
Roadways and Rail	640	640
Open Water	2390	2390
Environmental Protection: wetlands and shorelands	61	61
Public-Semi Public	30	30
Vacant: Developable	--	0
Residential - Low Density (3 units per acre)	75	
Residential PUD - Low Density (3 units per acre)	6	
Residential PUD - Medium Density (6 units per acre)	4	
Residential PUD - High Density (10 units per acre)	2	

Commercial	4	
Industrial	129	
Outside MUSA		
Residential - Single Family	14	14
Ramsey County Poplar Lake Park Reserve	293	293
TOTAL LAND AND WATER AREA	***7,252***	***7,252***

Source: White Bear Township

The Township's land use plan contains six major development categories: Low density residential, medium density residential, Residential PUD (high, medium and low density), commercial, industrial and public/community uses. The Township has approximately 220 acres of developable or underutilized vacant land, mostly located on the west side of the community adjacent to North Oaks lying between Centerville Road and I-35E. The remaining developable land is expected to be developed during the 2030 planning period. Land use patterns are expected to remain largely unchanged through year 2030.

Figure 3-11: Existing Land Use

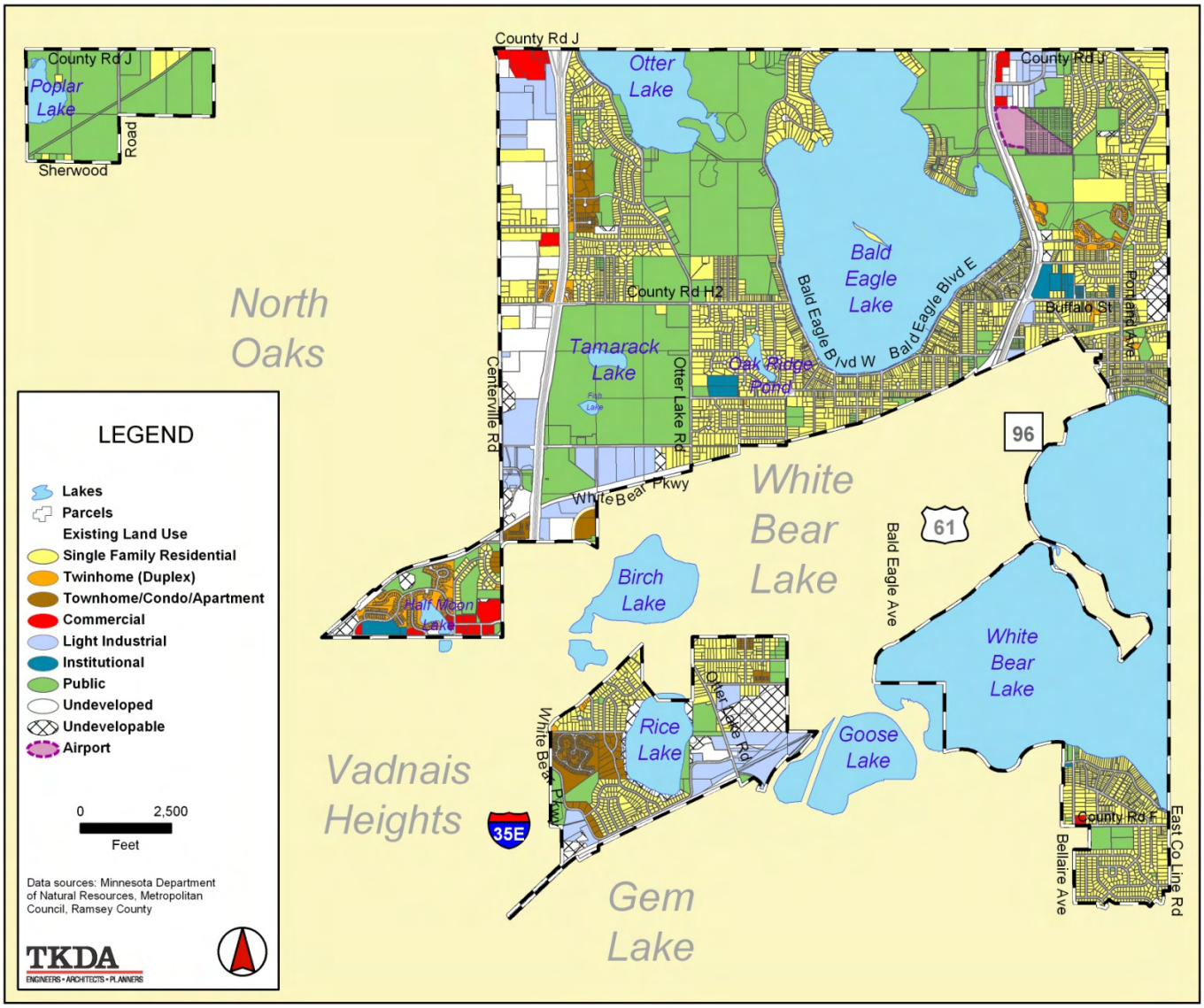


Figure 3-12: 2030 Land Use

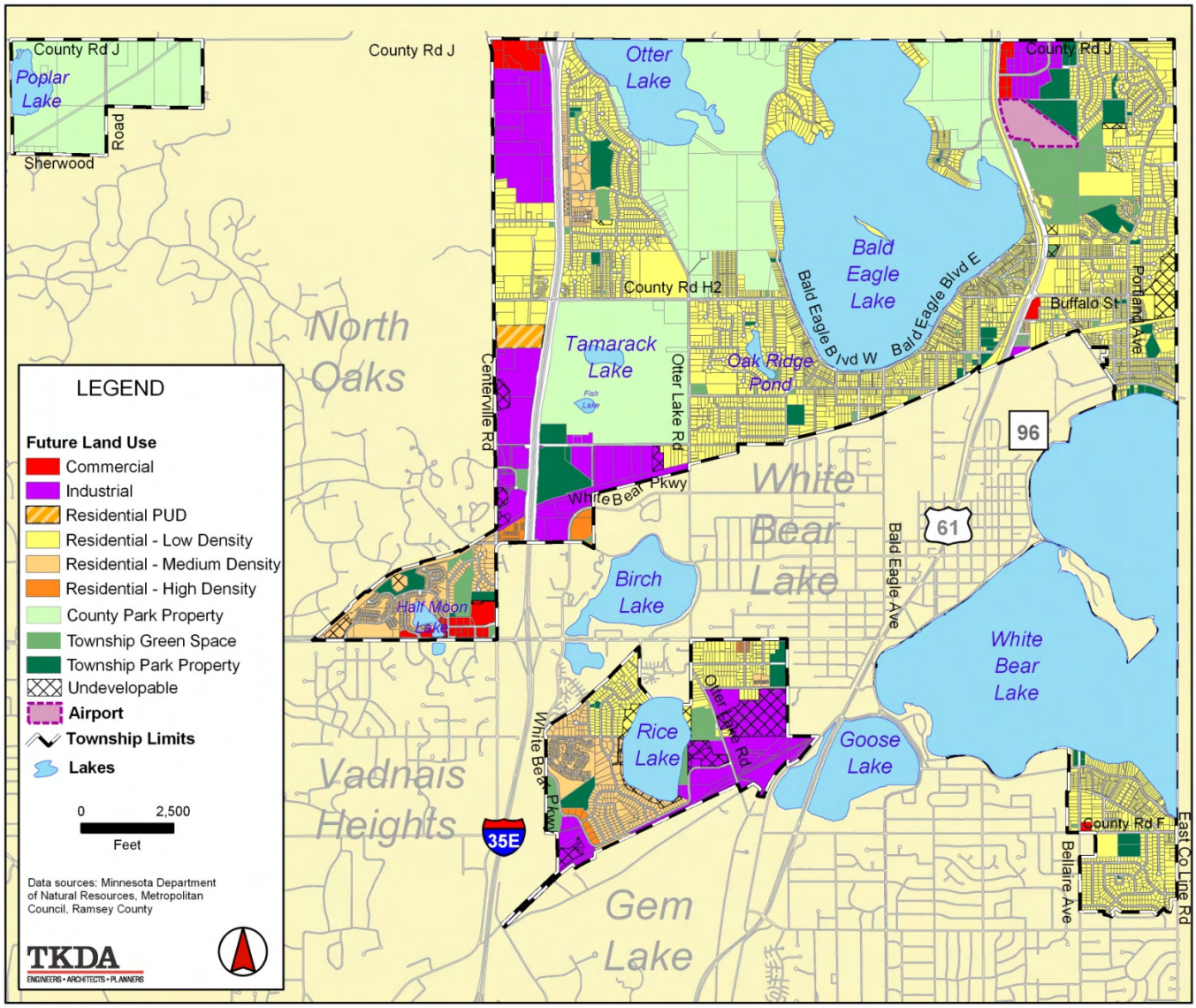
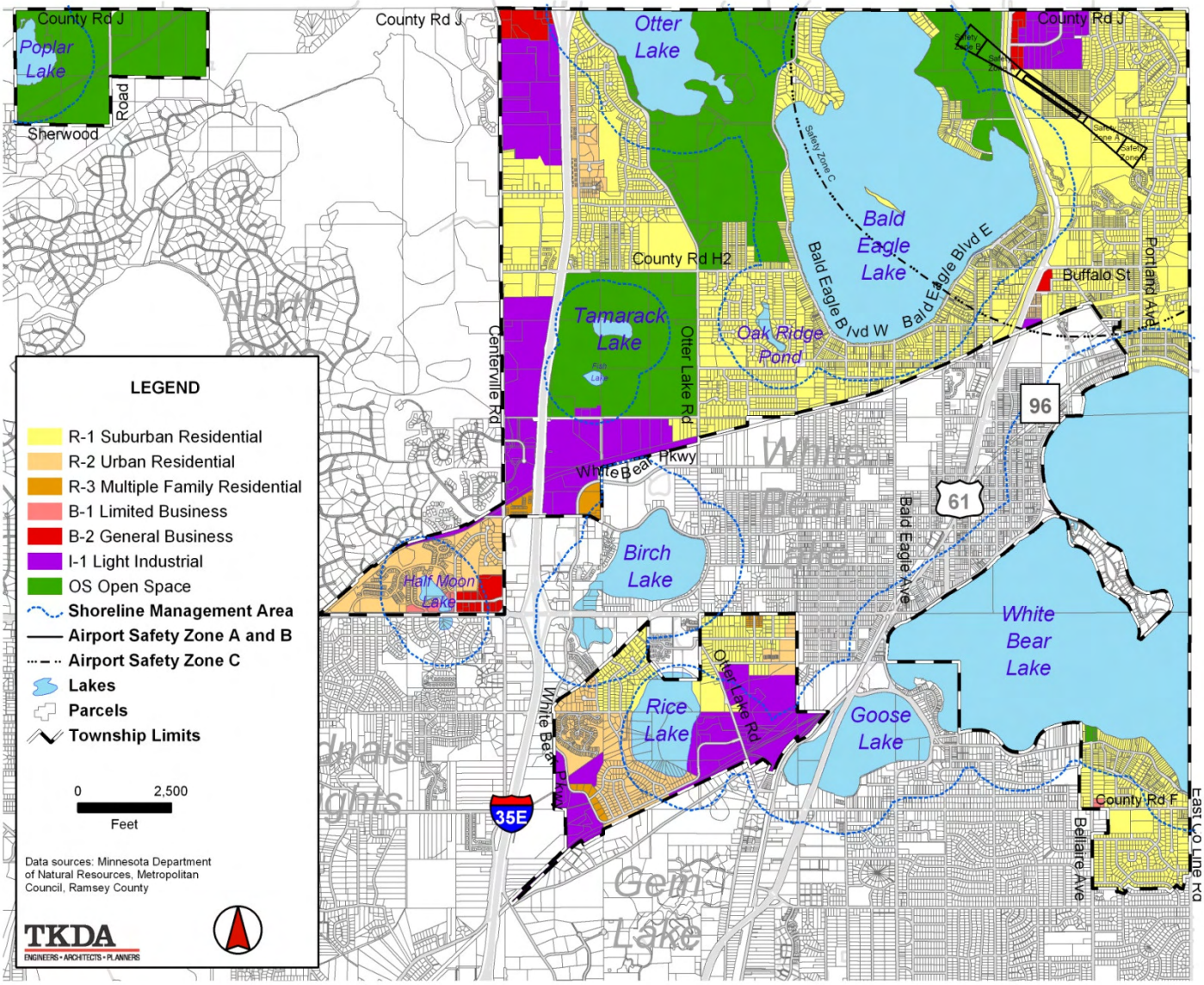


Figure 3-13: Zoning Map



4. REGULATORY SETTING

4.1 White Bear Township

The Town Engineer, Public Works Department and Planning/Community Development Department carry out the Town's policies of water resources management. The departments coordinate with Rice Creek Watershed District, Vadnais Lake Area Watershed Organization, and other outside agencies in water resource management.

The Public Works Department maintains the Township's public infrastructure and parks and green spaces. The department provides monitoring and maintenance of storm sewers and storm water ponds. The department is responsible for planning, administration, design, and inspection of infrastructure improvements. In early spring, the department does street sweeping as part of its pollution prevention activities.

The Planning/Community Development Department and Building/Inspection Department manage comprehensive planning, zoning controls, building permits, and Township Ordinances. This Local Surface Water Management Plan will be adopted as an addendum to the Township's 2030 Comprehensive Plan.

1. Township Ordinances

   White Bear Township's Ordinances provide standards and regulations to protect water resources. Ordinance 8 contains provisions regulating sites less than one acre in size. Township Ordinances related to surface water management and protection are listed below.

- Erosion and Sediment Control (Building Code: Ordinance 8, Section 5-36)
- Subdivision (Ordinance 15)

  Parks, Playgrounds, Open Space and Storm Water Holding Areas Design Standards (Section 10)

- Refuse (Ordinance 31)
- Zoning (Ordinance 35)

  "O-S" Open Space District (Section 6)
  "C-W" Conservation Wetland District (Section 6)
  "S-M" Shoreland Management (Section 8)

- Parks, Recreation and Open Space (Ordinance 45)
- Floodplain Management (Ordinance 57)
- Storm Water Drainage Utility (Ordinance 64).

2. Township Storm Water Facilities and Management

White Bear Township's storm water conveyance and treatment systems consist of pipes, culverts, storm water ponds, and other best management practices. The White Bear Township Storm Water System Map is shown on Figure 4-1. A full-size copy of the map is included in Appendix G.

The Township operates its drainage system as a storm water utility. The storm water utility funds are used for the maintenance and improvements to the drainage system. Approximately 50% of the fund is utilized for maintenance and 50% for capital improvements. Capital improvements are drainage improvements constructed within existing neighborhoods to solve existing drainage problems. Also included are studies and reports related to drainage. The Town's Utility Commission annually prioritizes projects identified by public request, the Town Engineer, and Public Works. The improvements can generally be completed in that same year from the available budget.

Prior to construction of new Township drainage improvements, a feasibility study is prepared by the Township Engineer. Included in the feasibility study is the preliminary design of storm drainage facilities, a preliminary cost estimate, and proposed financing package for those facilities.

Tabular inventories and corresponding maps of the Town's existing storm water facility structures and storm water management ponds are included in Appendix C. Appendix B lists completed Comprehensive Storm Drainage Plan reports.

The Township's Public Works Department is responsible for maintenance of Township storm water facilities. Storm water system inspections and maintenance are conducted in accordance with the Small Municipal Separate Storm Sewer Systems (MS4) permit, pollution prevention and good housekeeping requirements (V.G.6), and the implementation tools described in this plan. The Town annually inspects all 9 of its structural pollution control devices, and 20% of its outfalls to receiving waters and sediment ponds.

The Township implements its Storm Water Pollution Prevention Plan (SWPPP), as discussed later in this plan under State Agencies, Minnesota Pollution Control Agency. Land use and development applications to the Township, such as a subdivision request, must include drainage plans. The Township's standards for drainage plans and forms used for drainage review are included in the Township's Ordinances.

Private property owners also contribute to the ongoing maintenance of storm water management facilities. Table 4-1 lists the responsibilities of the Township's departments and of property owners.

Table 4-1: Responsibilities for Storm Water Facility Maintenance

Party	Responsibility
Town Engineer	• Approve developer's plans or designs Town plans for drainage facilities that emphasize ease of maintenance. • Recommends final acceptance of subdivision improvements and release of developer's security only after all turf is growing vigorously and there are no visible signs of erosion.
Code Enforcement	• Require homebuilders to erect and maintain silt fence until lawn is established to prevent sediments from filling drainage ways and ponds. • Protect the access to and the integrity of drainage facilities when reviewing permits for excavation, landscaping, fences, retaining walls, and accessory buildings.
Public Works	• Make an annual inspection of scheduled drainage facilities such as storm aprons, safety grates, culvert, weirs, ditches, emergency overflow paths, swales, and ponds. Check for broken or missing parts, obstructions, sediment, or woody grown that would interfere with the public's interest in good drainage. • Notify appropriate agency (County, Watershed District, etc.) if any deficiencies are found that are not under Township jurisdiction. • Make repairs of all deficiencies under Township jurisdiction found by inspection. • Responds to inquiries by public about maintenance. • Makes the initial determination whether public maintenance or private maintenance is appropriate.
Property Owner	• Mows the drainage easement (except native wetland vegetation) for the control of weed, woody growth, and thick grasses which would interfere with drainage. • Prevents soil from eroding into ponding easement, drainageway, or storm sewer. • Promptly removes any soil, plant material, structures, and debris which interfere with drainage.

3. Surface Water Quality Management

One important element of water quality management in the Township is control of non-point source pollution. As development occurs, potential water quality impacts of non-point source pollution increase significantly. The reduction and control of these pollutants is essential to maintaining the quality of the Township's lakes and wetlands as well as downstream water bodies.

Improvements in the water quality of the Township's water resources resulting from a reduction of non-point loadings can best be realized through land management practices which effectively control surface water runoff and reduce wind and water erosion problems. The control of non-point source pollution is conducted using accepted engineering practices directed toward managing source areas and

controlling pollutant movement. The control of non-point source production areas is achieved through best management practices (BMP) throughout the Township. BMPs are practices, techniques, and measures that prevent or reduce water pollution from nonpoint sources by using the most effective and practicable means. BMPs include, but are not limited to, ordinances and official controls, structural and nonstructural controls, and operation and maintenance procedures.

The Township requires that all land-disturbing activities implement BMPs using accepted engineering practices as outlined in the "Ramsey County Erosion and Sediment Control Handbook" and the Minnesota Pollution Control Agency's "Protecting Water Quality in Urban Areas."

Non-point source control from urban areas will be accomplished chiefly through the application of wet detention ponding techniques. Such systems should follow current design criteria for wet detention basins. White Bear Township's design criteria for storm water management facilities is included in Appendix E. Performance data for wet detention pond operations have shown suspended solids removals up to 85-95% and total phosphorous reductions of between 40% and 70%.

The Town will promote infiltration/filtration, taking into consideration the unique factors of each site in cooperation with the watershed organization. Soil conditions, depth to groundwater, safety considerations, snow removal, and maintenance are all factors to be considered.

Point source pollutants are discharged to receiving surface water at a specific point from a specific identifiable source, such as a discharge of treated sewage from a waste water treatment plant. Point source discharges of wastewater to the surface waters of the State are regulated under the Minnesota Pollution Control Agency's National Pollutant Discharge Elimination System (NPDES) permit program. The Township implements its NPDES permit, as discussed later in this plan under State Agencies, Minnesota Pollution Control Agency.

4.2 Watershed Management Organizations

The State of Minnesota adopted the Minnesota Watershed District Act in 1955, establishing watershed districts to regulate land use planning, flood control and other conservation issues. In 1982, the State approved the Metropolitan Surface Water Act, Minnesota Statutes 103B. This act requires all metropolitan area local governments to address surface water management through participation in a Water Management Organization (WMO). A WMO can be organized as a Watershed District (WD), a joint powers agreement (JPA) among municipalities, or as a function of county government.

White Bear Township is divided into multiple drainage basins that flow to two separately managed watersheds: Rice Creek Watershed District and Vadnais Lake Area Water Management Organization. Figure 4-2 shows the two watershed management organizations with jurisdiction in the Township.

1. Rice Creek Watershed District (RCWD)

Rice Creek Watershed District was formed in 1972. RCWD covers approximately 186 square miles and is composed of 28 communities: Arden Hills, Birchwood Village, Blaine, Centerville, Circle Pines, Columbia Heights, Columbus, Dellwood, Falcon Heights, Forest Lake, Fridley, Grant, Hugo, Lauderdale, Lexington, Lino Lakes, Mahtomedi, May Township, Mounds View, New Brighton, Scandia, Roseville, Shoreview, Spring Lake Park, Saint Anthony, White Bear Lake, White Bear Township, and Willernie.

The original RCWD Plan for water management was prepared in 1974. A "second generation" Plan was completed in 1990, in compliance with the Metropolitan Surface Water Management Act (Minnesota Statutes 103B). The Plan was updated in 1994, 1997, 2000, and 2010. RCWD is a permitting agency with its General Rules adopted February 13, 2008.

RCWD is the permitting agency within its portion of White Bear Township. The Township requests that RCWD continue to implement its rules and regulation and issue permits within the Township.

RCWD has been authorized by the Minnesota State Legislature to act as the local government unit responsible for administering the Wetland Conservation Act. RCWD does not have a local wetland-banking program and relies on the state program for mitigation purposes. It uses methods and procedures outlined in the WCA to determine replacement of wetland values in mitigation proposals.

RCWD is the ditch authority for Judicial Ditch 1 and County Ditch 11. RCWD has the authority to establish, improve or repair these drainage systems and similar activities related to drainage.

2. Vadnais Lake Area Water Management Organization (VLAWMO)

VLAWMO was formed in 1983 through a joint powers agreement. VLAWMO covers approximately 25 square miles and is composed of 7 member entities: North Oaks, Gem Lake, Lino Lakes, Vadnais Heights, White Bear Lake, and White Bear Township.

VLAWMO originally adopted its Watershed Management Plan in 1987. A second-generation Plan was approved by the Minnesota Board of Water and Soil Resources and adopted by VLAWMO in 1995. The current Plan (third-generation) was adopted by VLAWMO in 2007.

Like RCWD, VLAWMO also has been authorized by the Minnesota State Legislature to act as the local government unit responsible for administering the Wetland Conservation Act.

Within White Bear Township, VLAWMO has jurisdiction over County Ditch 14.

Figure 4-1: MS4 Storm Water System

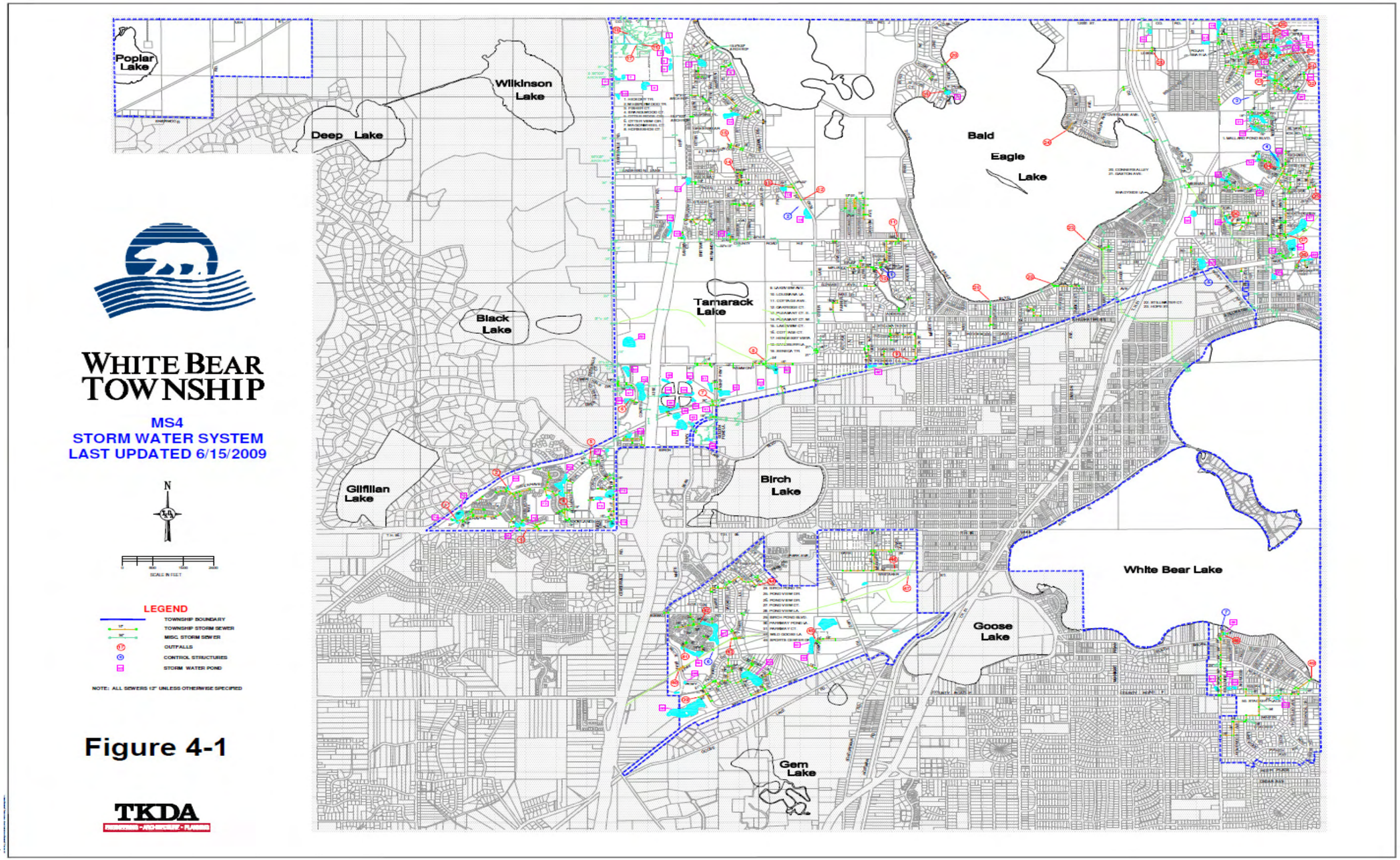
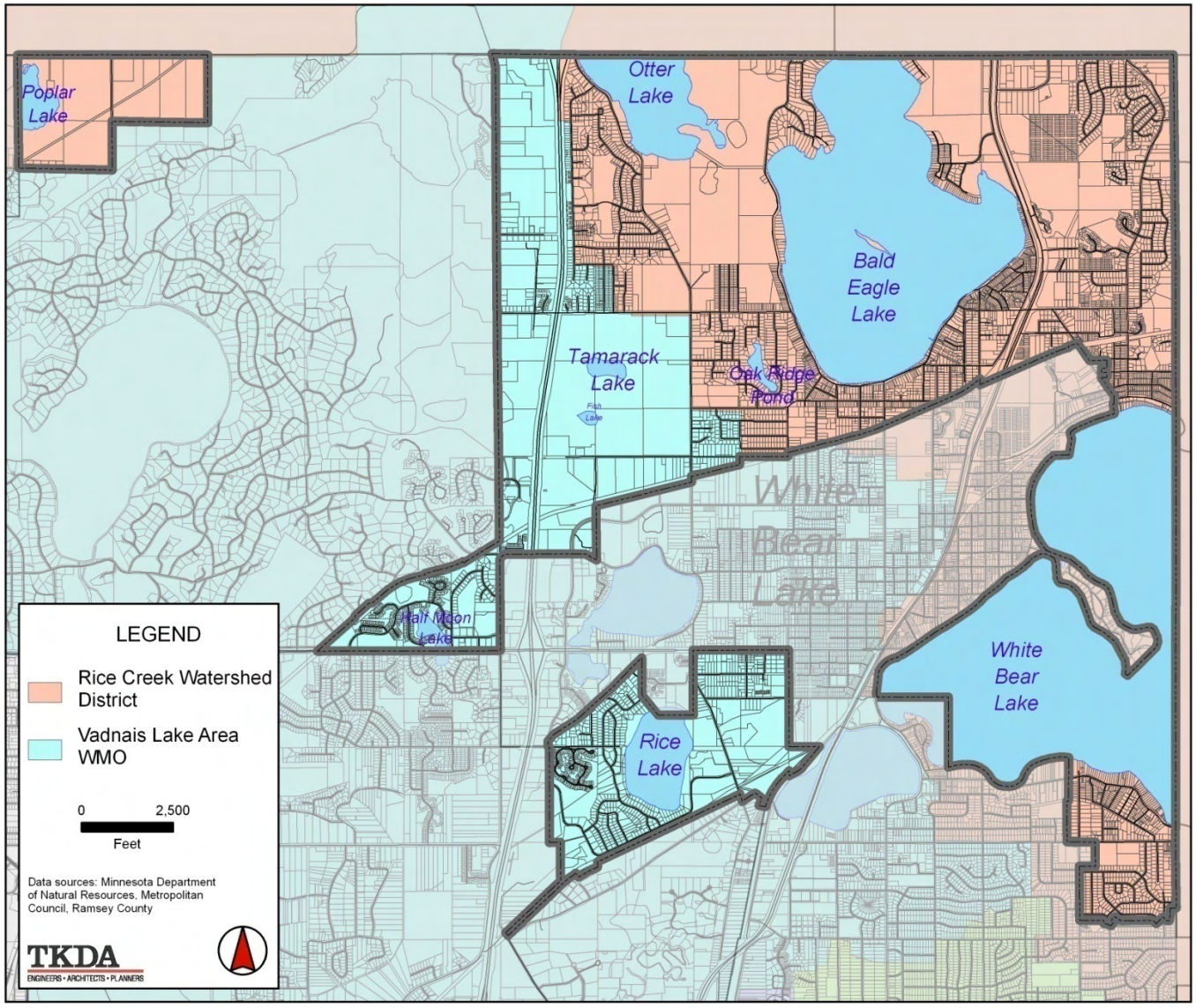


Figure 4-2: Watershed Management Organizations



4.3 County and Regional Government

1. Ramsey County

   Ramsey County updated its Groundwater Quality Protection Plan in 2009. The plan describes groundwater protection issues, identifies goals and policies for groundwater protection, and implementation measures. The plan was created in partnership with local governments, watersheds, and state agencies.

   Ramsey County Department of Parks and Recreation, as an implementing agency for the Regional Park System, owns two properties located within White Bear Township: Bald Eagle-Otter Lake Regional Park and Poplar Lake Park Reserve.

2. Ramsey Conservation District/Soil and Water Conservation District (SWCD)

   SWCDs are established under Chapter 103C of the Minnesota Statutes. The purpose of these Districts is to promote programs and policies which can conserve the soil and water resources within their territorial limits. Programs of the Ramsey Conservation District include erosion control inspections, rain gauge monitoring, and conservation capital improvement projects.

3. Metropolitan Council

   The Metropolitan Council, created in 1963, is the regional governmental body responsible for planning within the seven-county (Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington) Minneapolis-St. Paul metropolitan area. It has important responsibilities, which include:

   - Transportation and Transit
   - Wastewater Collection and Treatment
   - Housing, Re-development, and Urban Growth
   - Regional Parks and Open Space
   - Water Resources Management

   Metropolitan Council activities specific to water resources include:

   - Region-wide Surface and Ground water Planning and Non-point Source Pollution Abatement
   - Industrial Wastewater Management
   - Sewage Collection and Treatment
   - Priority Lakes List: includes Bald Eagle and Otter lakes located in the Township

   Regional water resources planning guidance of the Metropolitan Council is presented in the “Water Resources Management Policy Plan” adopted May 25, 2005. The Plan

identifies broad region-wide objectives for water management. The Metropolitan Council also has authority to review the Township's Comprehensive Plan.

4.4 State Agencies

1. State Board of Water and Soil Resources (BWSR)

   BWSR was created by State Legislature in 1986. BWSR's duties include oversight programs and funding of State Soil and Water Conservation Districts, formation and guidance of watershed districts, and the direction and assistance to counties in developing their Comprehensive Water Plans. BWSR is responsible for implementation of the Wetland Conservation Act (WCA). BWSR reviews and approves water management plans and project activity of watershed districts and soil and water conservation districts.

2. Minnesota Pollution Control Agency (MPCA)

   The MPCA was created by State Legislature in 1967. The MPCA has both regulatory and enforcement authority relative to potential actions which could affect the quality of the ground waters and surface waters of the State. Since future Township projects will likely involve water quality considerations, the MPCA may become an active participant in these projects. The MPCA regulates the management of wastewater, storm water, and solid waste in White Bear Township.

   The MPCA is required by the federal Clean Water Act to publish a list of impaired waters. For each waterbody on the list, the MPCA is required to conduct a study to determine the allowable Total Maximum Daily Load (TMDL) for each pollutant that exceeds the standard. Section 3.10 of this Plan discusses impaired waters within White Bear Township and nearby impaired waters receiving drainage from the Town.

   Another important function of the MPCA is implementing the National Pollutant Discharge Elimination System (NPDES) program. This program regulates not only traditional wastewater discharges but also construction activities and storm water.

   The MPCA NPDES Phase II general permit establishes conditions for discharging storm water, and specific other related discharges, to waters of the State. This permit is required for discharges that are from Small Municipal Separate Storm Sewer Systems (MS4).

   White Bear Township is classified as a mandatory MS4. As required for MS4s, White Bear Township has a Storm Water Pollution Prevention Plan (SWPPP) to reduce the discharge of pollutants from its storm sewer system. The SWPPP covers the required six minimum control measures, identifies best management practices (BMPs), and identifies measurable goals associated with each minimum control measure. An annual report on the implementation of the SWPPP is provided to the MPCA. White Bear Township's MS4 permit, SWPPP, and latest MS4 permit annual report are included as appendices D, E, and F.

3. Minnesota Department of Natural Resources (DNR)

The DNR has permit authority for any change in cross-section or work below the Ordinary High Water (OHW) level of regulated water bodies. The DNR is also actively involved in helping local units of government administer shoreland and floodplain management ordinances and standards. Currently, the DNR is undertaking a shoreland rules update project. The Township anticipates cooperating with the DNR to update the local shoreland ordinance to ensure consistency with any changes to the rules.

4. Minnesota Department of Health (MDH)

   The MDH manages programs to protect the public health, including implementation of the Safe Drinking Water Act (SDWA). It has permit authority and regulatory authority for monitoring water supply facilities. These facilities include water wells, surface water intakes, water treatment, and water distribution for public use. The MDH also is responsible for the development and implementation of the Wellhead Protection Program.

5. Minnesota Environmental Quality Board (EQB)

   The EQB is comprised of five citizen members and the heads of ten state agencies that play an important role in Minnesota's environment and development. The EQB develops policy, creates long-range plans and reviews proposed projects that may significantly influence Minnesota's environment. The EQB establishes the rules for the environmental review process conducted through Environmental Assessment Worksheets and Environmental Impact Statements (EAWs and EISs).

6. Minnesota Department of Transportation (MNDOT)

   Within the Township, Mn/DOT administers several state highway systems. Since highway systems cross drainage patterns of natural and artificial waterways, there is opportunity for frequent interaction between the Township and Mn/DOT. Township projects that need storm water structures through Mn/DOT-regulated highways require coordination and approval by Mn/DOT.

4.5 Federal Agencies

1. U.S. Environmental Protection Agency (USEPA)

   The EPA develops and enforces regulations that implement environmental laws enacted by congress. Responsibilities of the EPA within Minnesota have largely been delegated to the MPCA. The NPDES Program and Impaired Waters List are both the result of the Clean Water Act (CWA), administered by the EPA.

2. U.S. Army Corps of Engineers (USACE)

   The USACE can have permit and regulatory authority over projects in the Township under Section 404 of the Clean Water Act. Wetlands are considered waters of the United States and are regulated by the U.S. Army Corps of Engineers (USACE) under the Clean Water Act (CWA). Section 404 authorizes the USACE to issue permits for the placement of fill into all wetlands of the United States.

3. Federal Emergency Management Agency (FEMA)

   FEMA manages federal disaster mitigation and relief programs, including the National Flood Insurance Program (NFIP). This program includes floodplain management and flood hazard mapping. FEMA published the Flood Insurance Rate Map (FIRM) in White Bear Township in 1985, and a process to revise the map is currently underway.

4. Natural Resource Conservation Service (NRCS)

   The Natural Resources Conservation Service (formally called the Soil Conservation Service), is a division of the U.S. Department of Agriculture. The NRCS provides technical advice and engineering design services to local conservation districts across the nation. The ***Soil Survey of Ramsey County*** was issued by the NRCS in 1980. The NRCS also developed hydrologic calculation methods that are widely used in water resources design.

5. U.S. Geological Survey (USGS)

   The USGS provides mapping and scientific study of the nation's landscape and natural resources. USGS maps provide the basis for many local resource management plan efforts.

6. U.S. Fish and Wildlife Service (USFWS)

   The mission of the USFWS is to conserve, protect, and enhance the nation's fish, wildlife, plants and habitat. The USFWS developed the National Wetlands Inventory (NWI) in 1974 to support federal, state, and local wetland management work.

5. GOALS AND POLICIES

Overall Goal: The Township is committed to a goal of non-degradation of the water resources within the Township, and will work with local watershed management organizations, and County and State agencies to achieve this goal.

1. Lakes Goal: Protect and preserve the quality of local lakes.

   Policies:

   a. The Township will implement its land use plan and ordinances to protect shoreland areas and lake water quality.

   b. The Township will work with RCWD and VLAWMO to achieve the lake management goals contained in the watersheds' plans, standards and rules.

   c. The Township will use the findings of the Bald Eagle Lake TMDL study to guide development review and to help address the target pollutants identified in the TMDL study, when that study is completed.

   d. The Township will use the development review process and implement its SWPPP to help protect waters on the regional Priority Lakes List. Those lakes are Bald Eagle and Otter Lakes.

2. Wetlands Goal: Protect and preserve wetlands to maintain or improve their function and value.

   Policies:

   a. The Township will support RCWD and VLAWMO requirements for wetland protection and their administration of WCA, to ensure no net loss of wetland functions and values.

   b. The Township will apply the applicable RCWD and VLAWMO policies and performance standards for wetlands within each watershed. The Township will update its ordinances with the most recent watershed and township requirements for buffers, standards for pre-treatment of storm water, and other wetland protection and management standards.

   c. The Township will require that a wetland delineation be completed prior to development activities or public projects, including a field delineation and report detailing the findings of the delineation.

   d. The Township will require that developers complete a Functions and Values Assessment for any wetland that has not been assessed by RCWD and VLAWMO. This assessment may be completed at the time that development is proposed that may affect a wetland located within the Township. The assessment shall use the MNRAM 3.0 methodology (or most recent version of MNRAM), and shall be submitted to the Township along with the wetland delineation report. Wetland buffers and management standards of the watershed organizations will be enforced based on the completed assessment.

e. The Township will identify and implement opportunities to enhance the functions and values of degraded wetlands within the Township, as a part of park projects, infrastructure projects, or other projects.

3. Streams, Creeks and Ditches Goal: Maintain, or where practical, improve water quality, provide wildlife habitat and protect the resource value of streams, creeks, and ditches.

Policies:

a. The Township will cooperate with RCWD and VLAWMO to maintain, or where practical, improve water quality and natural resources associated with streams by managing land use, local infrastructure, and enforcing the Township's erosion control and storm water management requirements.

b. The Township will use the findings of the Lambert Creek and Judicial Ditch14 TMDL studies to guide development review and to help address the target pollutants identified in the TMDL studies, once the studies are completed.

4. Floodplains Goal: Manage floodplains to provide protection for public and private property.

Policies:

a. The Township will enforce the floodplain and shoreland elements of its Zoning Ordinance, and update these elements as required by state or federal agencies. It will continue to use its ordinance to regulate floodplain alterations, development within floodplains, and minimum building elevations.

b. The Township will use FEMA FIRM maps to manage floodplains.

5. Erosion and Sediment Control Goal: Facilitate erosion control and reduce impacts to wetlands and water bodies from sedimentation.

Policies:

a. The Township will update its ordinances to be consistent with its Phase II NPDES Construction and MS4 permit requirements, and consistent with watershed rules. The ordinances will be updated after adoption of the 2030 Comprehensive Plan and this Local Surface Water Management Plan.

b. The Township will work with local watersheds, contractors, and developers to implement construction site erosion and sediment control best management practices.

6. Water Quality Goal: Maintain, or where practical improve, the water quality of surface water features within the Township.

Policies:

a. The Township will require water quality and infiltration Best Management Practices for development and redevelopment that will result in Total Suspended Solids (TSS) reduction and Total Phosphorous (TP) reduction to the greatest extent practicable and consistent with RCWD Rules or the VLAWMO Watershed Management Plan, depending upon where the proposed project is located.

b. The Township will require the use of water quality BMPs including infiltration, taking into consideration site limitations such as soil conditions, depth to groundwater, safety, snow removal, and maintenance issues.

c. The Township will use its ordinances to require soil ripping, and to recommend soil amendment, after mass grading is completed for all soil types.

d. The Township will use its ordinances to require effective water quality treatment of storm water prior to discharge into lakes and creeks.

e. The Township will implement its SWPPP and NPDES MS4 permit, and continue to complete its annual MS4 report identifying how the Township is meeting the permit conditions.

f. The Township will require the use of National Urban Runoff Program (NURP) for the design of new storm water ponds.

g. The Township will cooperate with the Total Maximum Daily Load (TMDL) study of the Impaired Waters within White Bear Township: Bald Eagle Lake, Lambert Creek, and Judicial Ditch 1. The Township will cooperate with the TMDL study of Impaired Waters located downstream of Bald Eagle Lake and receiving drainage from the Town: Clearwater Creek, Peltier Lake, and Centerville Lake.

h. The Township will use the findings of the TMDL studies to guide development review, to help address the target pollutants identified in the studies, and will incorporate the findings of the TMDL studies into a future update of the LSWMP.

i. When projects are proposed in areas where soils are known to be contaminated, BMPs other than infiltration will be required. Proposed projects in areas with suspected soil contamination, particularly when located within the Drinking Water Supply Management Area High Vulnerability Areas (Wellhead Protection Plan, Part I), must complete soil tests to confirm contamination status before infiltration is permitted,

7. Water Quantity Goal: Control the rate of storm water runoff from development to reduce downstream flooding and erosion.

Policies:

a. The Township will use its ordinances to control peak runoff so that land-altering activities do not increase peak storm water flow from the site for a 2-year, 10-year, and 100-year precipitation event.

b. The Township will update its ordinances to require that for new projects, that water quality BMPs infiltrate and/or retain the runoff volume generated by a 2-year precipitation event. BMP options will take into account factors such as soils, depth to groundwater, and contaminants.

8. Groundwater Goal: Protect groundwater resources and groundwater dependent resources.

Policies:

a. The Township will complete and implement its Wellhead Protection Plan.

b. The White Bear Township Drinking Water Supply Management Areas (DWSMAs) will be displayed on maps used by the Planning Department, in order to raise awareness of the critical link between land use and the vulnerable drinking water supply.

c. The Township will require pretreatment for infiltration practices based on their location within the Groundwater Impact Zone identified in the Wellhead Protection Plan, and discourage or prohibit use of infiltration practices where the use of these practices is likely to cause the transport of contaminants into the groundwater.

d. The Township will promote water conservation before seeking approvals to construct new wells or increases in authorized volumes of water.

e. The Township will use water meters on all accounts and bill for water use based upon consumption.

9. Natural Resources Goal: Participate in conservation or creation of key natural areas with respect to habitat, wildlife, or recreation.

a. The Township will participate in protecting key natural areas with multiple benefits including groundwater recharge.

b. The Township will integrate key natural areas into local plans for recreation or habitat improvement.

c. The Township will cooperate with Ramsey County, neighboring communities, watersheds, and other levels of government to protect natural resources.

10. Implementation Goal: Implement the Township's Local Surface Water Management Plan.

Policies:

a. The Township will periodically update its Local Surface Water Management Plan through a process of assessing problems, prioritizing the problems, identifying solutions, and identifying corrective actions.

b. The Township will use its annual budget setting process and Utility Commission process to identify funding for water resources related projects.

c. The Township will enforce its ordinances to protect water resources and to implement its Local Surface Water Management Plan.

d. The Township will provide storm water education materials and programs to the public.

6. ASSESSMENT OF ISSUES

The Rice Creek Watershed District and Vadnais Lake Area Water Management Organization plans provide discussion and analysis of issues affecting each organization and the geographic areas they serve. This Plan incorporates both the broad-reaching issues that involve the Township as partner to the watershed, as well as location-specific issues relevant to White Bear Township. After discussion of each issue, the plan identifies how White Bear Township plans to approach the issue.

6.1 Rice Creek Watershed District (RCWD) area

The RCWD Plan discusses emerging issues, issues by management category (examples include lakes and wetlands), and by sub-area planning regions. The following issues selected for discussion in this Plan are those where the Town has a specific role in addressing the issue.

1. Emerging issues as they relate to White Bear Township include:

    a. **TMDLs.** Completed and approved TMDLs typically result in a numeric target to address pollutant loading over the allowed amount. The RCWD Plan identifies that there may be opportunity for the Watershed to assist with TMDLs through cost-share programs and with technical support.

    Township Approach: White Bear Township is participating in the TMDL study now underway for Bald Eagle Lake, and will be involved in those TMDLs planned for Lambert Creek and Judicial Ditch 1. A TMDL study is currently underway for both Peltier Lake and Centerville Lake, impaired waters located in the cities of Centerville and Lino Lakes. Policies of this Plan include that the Township will use the findings of completed TMDL studies to guide development review and to help address the target pollutants of both impaired waters located in the Township and those receiving drainage from the Township.

    b. **Alternative Volume Control Methods.** The RCWD rules support low impact development methods, including infiltration of storm water. The RCWD Plan states that some areas of the District are not appropriate for infiltration, due to soil characteristics, high groundwater table, or contamination. The RCWD Rules have some flexibility to allow for alternatives in certain demonstrated circumstances.

    Township Approach: Some portions of White Bear Township are likely inappropriate for infiltration for the reasons listed above. The Town will continue to work with the Watershed through the development review process, to identify situations where alternatives volume control methods are appropriate.

    c. **Declining Regional Groundwater and the Effect on Groundwater Dependent Natural Resources.** Regionally, there is concern that aquifers are being depleted, negatively affecting water supply and groundwater dependent natural resources. The District anticipates addressing this issue through further study and revision to its rules, if applicable.

Township Approach: White Bear Township gets its water supply from groundwater. It is the goal of the Town to protect groundwater resources and groundwater dependent resources. The Town has recently shifted from charging a flat fee for water use to water metering. Water metering should encourage users to conserve water. The Township is completing its Wellhead Protection Plan, which will identify Drinking Water Supply Management Areas and policies regarding groundwater protection and infiltration.

2. Management Category Issues

a. **Education, Data and Information.** RCWD supports the sharing of information and data across units of government. The Watershed seeks to collaborate with local governments in implementing their MS4 permits, to develop a toolkit of shared educational materials.

Township Approach: Sharing of education materials will help the Township to best implement its MS4. White Bear Township will participate when the Watershed convenes the collaborative.

b. **Lakes.** The RCWD Plan recommends that the Watershed continue development of lake-specific management plans. Management strategies for each lake will depend of unique factors such as lake depth, surrounding land use, and presence of invasive species. Management plans exist for Bald Eagle Lake (2002) and White Bear Lake (1999).

Township Approach: The Township would be a stakeholder in the Watershed's process to develop or update a management plan prepared for any local lake.

c. **Wetlands.** RCWD and VLAWMO are the Local Government Unit (LGU) responsible for Wetland Conservation Act (WCA) enforcement within the Township.

Township Approach: The Township requests that the Watersheds continue in this role.

d. **Public Drainage Systems and Waterways.** The watershed organizations are responsible for inspection and maintenance of public ditches in White Bear Township. One of the issues the RCWD Plan discusses is ownership, maintenance responsibility, and operations of drainage systems that solely function as a storm water outlet for municipalities. It states that the Watershed will investigate ownership strategies and develop an approach for the transfer of drainage systems.

Township Approach: The Township requests that the Watersheds continue their jurisdiction over the public ditches. The public drainage systems within White Bear Township drain a large land area covering multiple municipalities. It would be complex to transfer control from the Watershed, and the benefits of oversight by a single unit of government would be lost if jurisdiction were transferred to municipalities.

e. **Open Space.** The RCWD Plan indicates that opportunities exist for partnership with other units of government in implementing park and open space plans that may affect water resource management.

Township Approach: There is an extensive park and open space system within White Bear Township. The Township would be receptive to potential partnerships with the RCWD as the Town implements its park and open space plan. It is the policy of the Township to cooperate with watersheds and other levels of government to protect natural resources.

f. **Excess Runoff.** The RCWD Plan states that the Watershed will collaborate with other units of government in the development of floodplain boundaries and base flood elevations. This action would be beneficial to White Bear Township for implementing its regulations.

Township Approach: White Bear Township regulates rate control in its Subdivision Ordinance. The Township will collaborate with the Watershed in the development of floodplain boundaries and base flood elevations.

3. Planning region: Clearwater Creek Area Issues

Most of White Bear Township is within the Clearwater Creek planning region, which reaches north and east into Anoka and Washington Counties. (Part of the Township, Poplar Lake County Park, is within the Middle Rice Creek planning area – but no issues specific to this parkland are identified.)

Section 3.4.2 of the RCWD Plan identifies the following general issues for the Clearwater Creek Area:

a. Preservation of White Bear Lake water quality.

b. Improvement of water quality of Bald Eagle Lake.

c. Evaluation of the hydrologic connection between Otter and Bald Eagle Lakes.

d. The potential need to provide outlets from land-locked lakes.

e. The need to develop emergency response plans for buried pipelines.

Township Approach: White Bear Township will be involved as one of the stakeholders in the Watershed's initiatives to address these issues where applicable to the Township portion of the Clearwater Creek planning region.

6.2 Vadnais Lake Area Water Management Organization (VLAWMO) area

The VLAWMO Plan was adopted in 2007. The Plan identifies goals for the organization, and prioritizes issues by sub-watershed. White Bear Township falls within the sub-watersheds Lambert Creek and Tamarack/Wilkinson.

1. Development.

   a. **Urban Development pre-BMPs.** White Bear Township was developed before Best Management Practices (BMPs) were practiced.

      Township Approach: New development and redevelopment occurring in White Bear Township will include BMPs. The Township will direct potential developers to VLAWMO's website for standards within the VLAWMO Water Management Policy.

   b. **New Development.** New development in the Township is not of significant concern for the WMO. Little of White Bear Township remains undeveloped, outside of undevelopable wetland areas.

      Township Approach: There are approximately 220 acres of undeveloped land in the Township that is suitable for development. If development is proposed, the Township will review the development proposal for conformance with its ordinances to address water resource protection. The Township will direct potential developers to VLAWMO standards.

2. Sensitive resources.

   a. **Tamarack Lake and Fish Lake.** Watershed analysis shows declining water quality of Tamarack Lake. The VLAWMO is currently creating Sustainable Management Plans for Tamarack and Fish lakes in partnership with the Tamarack Nature Center of Ramsey County.

   b. **Invasive species.** Birch Lake, which drains north into White Bear Township, contains Eurasian Water Milfoil. The VLAWMO Plan characterizes the problem as localized.

   c. **Rice Lake.** The Lambert Creek wetlands are rated as high priority by VLAWMO. Minnesota County Biological Survey identifies Rice Lake as a having significant biodiversity.

      Township Approach: The Township supports VLAWMO's leadership in monitoring and indentifying protection measures for sensitive resources. The Township will seek WMO involvement in Township decisions potentially affecting these sensitive resources.

3. Flooding Prevention.

   Township Approach: Methods used by the Township to prevent flooding include enforcement of its floodplain and shoreland ordinances, enforcement of its erosion and sediment control requirements, and certifying that the low floor elevation of new construction in flood-prone areas meets the required elevation.

4. Implementation of VLAWMO's Storm Water Standards (VLAWMO Plan - Strategy 2.A). These standards include construction erosion control, redevelopment projects, post construction water quality, peak runoff rate control, and runoff volume control.

Township Approach: The specific storm water standards will be included in the Township's update of its surface water management and erosion and sediment control ordinances.

5. Implementation of VLAWMO's Erosion control strategy for small sites in shoreland areas (VLAWMO Plan - Strategy 2.G).

   Township Approach: The Township's ordinance update will include standards for soil disturbance of areas less than one acre, consistent with the standards in the VLAWMO Plan – Strategy 2.G.

6. Implementation of the VLAWMO Wetland Management Plan (VLAWMO Plan - Strategy 4.B).

   Township Approach: White Bear Township's Zoning Ordinance, Conservation Overlay District will be updated to implement the VLAWMO and RCWD wetland management plans standards for subdivision requests involving Public Waters-Wetlands and wetlands. If an assessment is needed, a functions and values assessment must be conducted by the applicant using MNRAM 3.0 or the most current version.

6.3 Additional issues

The following issues are items where the Township is the lead, though the watersheds or other organizations may be involved. The plan describes the proposed action the Township plans to take to address the issue.

1. **Surface Water Management and Erosion and Sediment Control Ordinance.**

   Proposed Action: The Township will adopt a new surface water management and erosion and sediment control ordinance to implement this Surface Water Management Plan. Currently, Township requirements for erosion and sediment control and surface water management are located within multiple ordinances. There is a need to consolidate standards into a single ordinance, simplifying conformance on the part of property owners and enforcement on the part of the Township. The new ordinance will include the watersheds' standards discussed above for volume and rate control, erosion and sediment control, construction erosion control, water quality, and other storm water standards.

2. **MS4 Permit.**

   Proposed Action: The Township will continue to implement its MS4 permit.

   Key sections of the permit which address issues referenced by the Rice Creek Watershed District Plan, include:

   a. Public information and education plan (Public Education and Outreach, V.G.1)

   b. The Township will adopt a local ordinance prohibiting illicit discharges or other non-storm water discharges from entering White Bear Township's storm water system (Illicit Discharge Detection and Elimination, V.G.3)

c. Control and management of post-construction storm water (Post Construction Storm Water Management, V.G.5)

d. Storm water system inspection and maintenance schedule, street sweeping, snow plowing, salt and snow storage, and public land maintenance (Pollution Prevention/Good Housekeeping for Municipal Operations, V.G.6)

7. IMPLEMENTATION

7.1 Capital Improvement

White Bear Township addresses water resource-related capital improvements through its Utility Commission and through the setting of the annual budget. The Utility Commission advises the Town Board on storm water issues. The Commission annually prioritizes capital improvements identified by public request, the Town Engineer, and Public Works.

The Town collects a storm water utility fee to fund projects that correct drainage problems in existing neighborhoods. The Township does not have a 5-year Capital Improvement Program.

7.2 Township Ordinances

The Township will update the following ordinances to implement this Plan:

- The Township will complete a new surface water management and erosion and sediment control ordinance to consolidate standards from existing ordinances, watershed standards, and MS4 SWPPP into a single ordinance.
- The Township will adopt an ordinance prohibiting illicit discharges or other non-storm water discharges from entering White Bear Township's storm water system.
- Zoning Ordinance, Conservation Wetland District (Ordinance 35, Section 6) will be updated to implement watershed wetland standards.

Other Township ordinances related to surface water management:

- Building Code (Ordinance 8)
- Subdivision (Ordinance 15)

  Parks, Playgrounds, Open Space and Storm Water Holding Areas Design Standards (Section 10)

- Refuse (Ordinance 31)
- Zoning (Ordinance 35)
- Parks, Recreation and Open Space (Ordinance 45)
- Floodplain Management (Ordinance 57)

- Storm Water Drainage Utility (Ordinance 64)

7.3 Surface Water Management Plan Review and Adoption Process

The Surface Water Management Plan is submitted to RCWD and VLAWMO, and submitted to the Metropolitan Council. Once the Plan is accepted, the Township formally adopts the Plan.

7.4 Plan Amendments and Updates

Substantive revisions to the goals and objectives or the adoption of new or revised standards or rules may require an amendment to this plan.

Possible future amendments to the Plan may include:

- ✓ Completed TMDLs
- ✓ Wellhead Protection Plan, Part II
- ✓ Information from RCWD and VLAWMO plan amendments, if made in the future.

The inclusion of these efforts into the Surface Water Management Plan will help facilitate the Township's comprehensive water resource planning efforts.

The following steps will be completed should any plan amendment be made.

1. The Township will prepare the proposed amendment.

2. The Township will conduct a public hearing. In addition to normal hearing notice procedure, the Township will provide notice to the Metropolitan Council, VLAWMO, and RCWD.

3. After the hearing and any revisions to the draft amendment, the Town will submit the amendment to the Metropolitan Council, VLAWMO, and RCWD.

4. The watershed organizations will have 60 days to complete their review and approve or disapprove the amendment. The Metropolitan Council will have 45 days to review and comment.

5. After approval of the amendment by the watershed organizations, the Township will adopt the amendment.

APPENDIX A

REPORT

WELLHEAD PROTECTION PLAN
PART I *(Revised)*

WHITE BEAR TOWNSHIP, MINNESOTA

Date: March 31, 2009
Project No. 13707.000

TKDA
ENGINEERS ▪ ARCHITECTS ▪ PLANNERS

444 Cedar Street, Suite 1500
Saint Paul, MN 55101-2140

(651) 292-4400
(651) 292-0083 Fax
www.tkda.com

WELLHEAD PROTECTION PLAN
PART I
WHITE BEAR TOWNSHIP, MINNESOTA
PROJECT NO. 13707.000

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II Municipal Well Logs

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PUBLIC WATER SUPPLY PROFILE

PUBLIC WATER SUPPLY

NAME White Bear Township

ADDRESS 1281 Hammond Road, White Bear Township, MN 55110

TELEPHONE NUMBER (651) 727-2750

E-MAIL wbt@ci.white-bear-township.mn.us

FAX NUMBER (651) 426-2258

WELLHEAD PROTECTION MANAGER

NAME Mr. Bernie Bullert

Toltz, King, Duvall, Anderson and Associates, Inc. (TKDA)

ADDRESS 444 Cedar Street, Suite1500, St. Paul, MN 55101

TELEPHONE NUMBER (651) 292-4400

E-MAIL bernie.bullert@tkda.com

FAX NUMBER (651) 292-0083

CONSULTANT

NAME Mr. Bernie Bullert, TKDA

ADDRESS 444 Cedar Street, Suite1500, St. Paul, MN 55101

TELEPHONE NUMBER (651) 292-4400

E-MAIL bernie.bullert@tkda.com

FAX NUMBER (651) 292-0083

GENERAL INFORMATION

UNIQUE WELL NUMBER(S) 226570, 226571, 676446, 224679, 226572, 151596, 596636

SIZE OF POPULATION SERVED Approximately 11,800

COUNTY Ramsey County

DOCUMENTATION LIST

STEP	DATE PERFORMED
Date MDH Notice Given (4720.5310, subp. 3)	
Mandatory Completion Date (4720.5310, subp. 3)	June 28, 2008
Plan Manager Designated (4720.5300, subp. 2)	
Plan Notice Sent to Local Units of Government (LUG) and MDH (4720.5300, subp. 3)	
Scoping 1 Meeting Held (4720.5310, subp. 1)	June 28, 2006
Scoping Decision Notice Received (4720.5310, subp. 2)	July 20, 2006
Aquifer Test Plan (ATP) Submitted (4720.5320, subp. 1)	2001
ATP Approval Review Notice Received From MDH (4720.5320, subp. 2)	
Delineation and Vulnerability Assessment (DVA) Submitted (4720.5205, 4720.5210)	July 23, 2007
DVA Approved Review Notice Received from MDH (4720.5330, subp. 2)	December 21, 2007
Revised Delineation and Vulnerability Assessment (DVA) Submitted (4720.5205, 4720.5210)	March 31, 2009
DVA Approved Review Notice Received from MDH (4720.5330, subp. 2)	
WHPA and DWSMA Area Delineation and Vulnerability Assessment Submitted to LUGs (4720.5330, subp. 6)	
Public Information Meeting Held (4720.5330, subp. 7)	
Meeting with LUGs Held (4720.5300, subp. 3)	

WELLHEAD PROTECTION PLAN
PART I
WHITE BEAR TOWNSHIP, MINNESOTA
PROJECT NO. 13707.000

I. EXECUTIVE SUMMARY

This Report documents the delineation of Wellhead Protection Areas (WHPA) for the drinking water supply wells operated by White Bear Township (Township). Wellhead protection helps to prevent man-made contaminants from entering drinking water supply wells. Areas have been delineated in accordance with Minnesota Rules, Parts 4720.5100 to 4720.5590, which are under the jurisdiction of the Minnesota Department of Health (MDH). Leggette, Brashears & Graham, Inc. (LBG) was contracted by TKDA to complete the groundwater flow model and the associated WHPA delineation for this report. The WHPAs were delineated using MODFLOW (a numerical groundwater flow model) and the particle-tracking module, MODPATH. Findings in this Report are the result of collaboration between the Township, TKDA, LBG, and the MDH.

The Township is located on the west side of White Bear Lake in the north eastern portion of Ramsey County. The geologic units of interest in the vicinity of the Township and surrounding area consist of Quaternary-Aged glacial deposits that are underlain by Paleozoic-Aged bedrock including the St. Peter Sandstone, Prairie du Chien Group, Jordan Sandstone, and the underlying lower confining St. Lawrence Formation. Township Well Nos. 2A and 3 through 6 are completed in the Prairie du Chien and Jordan aquifers, and Well No. 1 is completed only in the Jordan aquifer with some possible contribution from below the St. Lawrence. Well No. 2 is now designated for emergency use only.

In eastern Ramsey and western Washington Counties, ground water is encountered in the Quaternary and bedrock aquifers, with the flow direction being generally from northeast to southwest toward the Mississippi River, which serves as a local and regional hydrologic discharge point for the flow systems. A model was developed by Ramsey Soil and Water Conservation District (RSWCD) personnel in 2003 to represent the unconsolidated, St. Peter, Prairie du Chien, and Jordan aquifers. The local model domain was divided into a three-dimensional, non-uniform grid with 376 rows, 414 columns, and 4 active layers.

The particle-tracking package, MODPATH, was used in conjunction with the calibrated flow model to create the 10-year time-of-travel pathlines necessary for partially delineating the WHPAs for the Township wells. Due to fracture flow conditions in the Prairie du Chien aquifer, a fracture analysis was also completed following MDH guidelines and composite capture zones were delineated. The composite capture zones were used to delineate the final WHPA for each well. A combined pumping rate from all wells of approximately 6,725 m3/day (1,235 gallons per minute [gpm] or 1.78 million gallons per day) was applied based on 2001 to 2005 water usage and the projected water demand, following the Minnesota Department of Health (MDH) guidelines.

In accordance with MDH guidance documents, the vulnerability of each Township well was based on the following six categories: Minnesota Department of Natural Resources (DNR) geologic sensitivity rating, casing integrity, casing depth, pumping rate, isolation distance from contaminant sources, and chemical and isotopic information. As a result of this rating system, all Township wells are considered vulnerable due to either tritium detections or total well vulnerability scores in excess of 45 points. The associated vulnerability in the vicinity of the Township wells and across the Drinking Water Supply Management Area (DWSMA) is very low to high.

A complete description of the modeling is detailed later in this Report. From the modeling results, a WHPA was delineated for all of the Township's wells. A DWSMA was established by overlaying the WHPAs over a map of the area. Property lines, roadways, and major bodies of water were used to delineate this area. Figure No. 2 shows the locations of all seven Township wells, Figure No. 12 shows the WHPA, and Figure 13 shows the final DWSMA.

II. DATA ELEMENTS AND ASSESSMENT (4720.5200)

A. REQUIRED DATA ELEMENTS

1. Physical Environment Data Elements

Physical data includes natural and man-made features that may have an influence on areas surrounding the wellhead, and ultimately the well itself. Whether or not an aquifer is confined throughout the area determines the value to the WHP effort of using specific elements.

a) Precipitation. Recharge was considered in some areas of the model. More discussion on this will be included in the modeling section of this report.

b) Geology. Data gathered from well logs and regional studies were used to construct a geologic map along with descriptions of the geology including aquifers, confining layers, recharge areas, discharge areas, and any sensitive areas.

c) Soils. Soil characteristics influenced the subsequent delineation of the wellhead protection areas.

d) Water Resources. Water bodies, watershed areas, and their characteristics did not influence the subsequent delineation of the wellhead protection areas due to their disconnect with the bedrock aquifers.

2. Land Use Data Elements

Regardless of whether an aquifer is unconfined or not, land use is always a factor in determining and managing the DWSMA around the WHPA. Unconfined aquifers, however, are particularly vulnerable to land use factors since they can enable the downward migration of groundwater.

a) Land Use. Parcel boundaries, political boundaries, land surveys, and land use maps were used to establish a Drinking Water Supply Management Area for the Township wells.

b) Public Utility Services. Maps of transportation routes, storm and sanitary sewers, water supply systems, petroleum and gas pipelines, and construction and maintenance records of public water supply wells were used to establish a DWSMA. This data will also be used in Phase II planning activities.

Well logs and pumping records were used for modeling and the vulnerability assessments.

3. Water Quantity Data Elements

Levels in lakes and streams can have an impact on an aquifer that is unconfined if there is a geologic connection between the two. From the review of geologic cross sections and select well logs, it does not appear that surface waters are in direct connection hydraulically with the bedrock aquifer. However, surrounding high capacity wells in the same aquifer can influence each other if the withdrawal rate is large enough.

a) Surface Water Quantity. Surface water bodies did not influence the subsequent delineation of the wellhead protection areas, but were still included in the model.

b) Groundwater Quantity. A list of high capacity wells in the area was obtained and is shown in Tables 1 and 2. Twenty other wells, besides the seven Township wells, were identified within the model domain. See Figure 2.

4. Water Quality Data Elements.

Water quality is an indication of aquifer vulnerability.

a) Surface Water Quality. Since surface water in the vicinity of the Township is not in direct hydraulic connection with the subject bedrock aquifers, water quality was not reviewed.

b) Groundwater Quality. A summary of groundwater bacteriological tests and chemical tests, both organic and inorganic, has been

included as part of the Vulnerability Assessment of the wells. Tritium has been detected in Township Wells 1 and 6 and has not been tested for in the other wells. Tritium is an indicator of vertical migration travel time and aquifer vulnerability. The presence of tritium indicates that some portion of the water entered the aquifer(s) after 1953. Nitrate was also detected at low concentration in Well No.5 and not detected in the remaining wells.

B. ASSESSMENT OF DATA ELEMENTS

1. Use of the Wells

The Township wells provide all the water for the distribution system for White Bear Township and portions of the City of North Oaks. The Township currently has six active water supply wells (Well Nos. 1, 2A, 3, 4, 5, and 6), located in and around the Township (Figure 1). In the future, Well No. 2 is to be for emergency use. Well No. 2A was constructed to replace Well No. 2 and the past pumping data for Well No. 2 was applied to Well No. 2A as no change in its use is anticipated. Well construction details and well logs are in Appendix II. Past and projected pumping rates are presented in Table 1.

2. Quality and Quantity of Water Supplying the Public Water Supply Wells

Water samples are regularly obtained from the Township wells and tested for regulated contaminants. Report summaries from the past five years show no reports of contamination in a Township well. Well Nos. 1 and 6 have tested positive for tritium with the other wells not tested. Nitrate was detected at low concentration in Well No. 5 and tested for but not detected in the remaining wells.

Pumping records submitted to the Minnesota Department of Natural Resources were used to identify the extraction rates of the Township wells. Pumping data for the Township's six wells is included in the Appendix.

3. The Land/Groundwater Uses in the Drinking Water Supply Management Area

Land and groundwater uses within the DWSMA may have effects on the aquifer used by Township wells. The vulnerability assessment section of this report provides more detail on the subject of land use conclusions.

III. WELLHEAD PROTECTION AREA AND DRINKING WATER SUPPLY MANAGEMENT AREA DELINEATION (4720.5205)

A. BOUNDARIES, WELLHEAD PROTECTION AREA MAP

A Map of the WHPA is shown in Figure 12.

B. DOCUMENTATION

1. Physiographic and Hydrogeologic Setting

The geology in the vicinity of the Township consists of Quaternary-Aged glacial and post-glacial deposits that are underlain by Paleozoic-Aged bedrock. The glacial deposits consist of Superior Lobe sand and silt lacustrine deposits, till, and outwash. These are underlain by Pre-Late Wisconsinan Keewatin and Grantsburg Sublobe till, outwash and sandy lacustrine sediment. The Superior Lobe, due to its higher sand content, is generally not considered an effective hydraulic barrier. However, the underlying till deposits are an effective barrier as are the uppermost bedrock Glenwood or basal St. Peter shales.

Bedrock geology is presented in plan view on Figure 3 with unconsolidated and bedrock geology presented in cross section on Figure 4. Several buried bedrock valleys expose the surface of the St. Peter Sandstone and Prairie du Chien Group.

Ground-water flow in the uppermost bedrock aquifers generally to the southwest as shown by Figure 5, which is consistent with previously published data in the Ramsey County Geologic Atlas (MGS, 1992). The map of the Prairie du Chien–Jordan potentiometric surface was created from water level data obtained from the Minnesota County Well Index (CWI). Since the water level measurement dates varied by decades, a polynomial regression was used using Surfer 7 to contour the dataset.

An extensive discussion on regional and local geology and hydrogeology is also presented in Appendix I in the Draft Part I Wellhead Protection Plan Submittal (RSWCD,2003).

Well Nos. 2A and 3 through 6 are completed in the Prairie du Chien and Jordan Aquifers. Well No. 1 is completed in the Jordan sandstone only. Well No. 2 is only for emergency use.

2. Delineation Criteria.

The following discussion represents a summary of the five criteria for delineating the WHPA, which are specified in MR 4720.

a) Time of Travel. Pathline analysis, using a 10-year time of travel, were used when simulating ground-water movement in the Prairie du Chien and Jordan aquifers which supply all Township wells. In addition, the fracture flow delineation method developed by the MDH (MDH, 2005) was implemented to calculate fixed radii and upgradient extension delineations for each well.

b) Aquifer Transmissivity. The transmissivity (T) of an aquifer is defined as the rate at which water is transmitted through a unit width of aquifer under a hydraulic gradient. It equals the hydraulic conductivity multiplied by the aquifer thickness. An aquifer pumping test was performed in 2001 using Township Well No. 3, which lies between White Bear and Bald Eagle Lakes. Township Well Nos. 4 and 6 (west and east, respectively) were used as observation wells. Several interpretations of the data were made, but the range of values recommended by MDH indicated transmissivities in the area range from 5,185 to 6,193 m2/d. This translates to a hydraulic conductivity of between 76.6 and 91.5 m/d for the combined Prairie du Chien - Jordan aquifer. The value for the Prairie du Chien and Jordan aquifers used in the Minnesota Pollution Control Agency's Metro Model is 12 m/d (Seaberg and Hansen, 2000). These two values would provide the range used for the Prairie du Chien - Jordan aquifer in the flow model.

c) Daily Volume of Water Pumped. The daily volume selected for each well used in the WHPA was based on MR 4720.5510,

subpart 4 and MDH guidelines, which state that volumes used in the WHPA delineation can be determined from either 1) the projected use of each well as a percent of the total system, or 2) the greatest annual volume of water used over the previous 5 years, whichever is greater. Historical usage from 2001 to 2005 was used to determine the pumping rates for each well to delineate the WHPA. The Township's historical pumping records from 2001 to 2005 indicate that the sum of the maximum annual usage for each well was 649.1 million gallons per year (mgy) (approximately 2.46 million cubic meters per year [m^3/yr]) based on the maximum rates for each well over the 5-year period, or approximately 1.78 million gallons per day (mgd) (approximately 6,725 cubic meters per day [m^3 /day]). The projected pumping rates for each well used in the model are listed in Table 1.

d) Hydrologic Boundaries. Hydrologic boundaries that affect the delineation criteria are:

(1) Surface water features. The Mississippi River is the local and regional discharge point of the flow systems of interest, therefore, the River affects the direction of ground-water flow and was included in the regional flow model as a constant-head boundary. Area lakes near the Township Wells were included as river boundaries and lakes near the edge of the local model were included as constant-head boundaries.

(2) Geological boundaries. Well records from the CWI, as well as information from county geologic atlases were used in the development of the conceptual hydrogeologic model and in the vulnerability assessments.

(3) High capacity wells. LBG obtained ground-water appropriation permit data from the Minnesota Department of Natural Resources (DNR) and determined there are 20 high capacity wells other than the Township's wells located

in the model domain, whose pumping could influence ground-water flow and/or create negative boundary conditions. These wells were included in the model using their historical maximum pumping rates from the previous 5 years (2001 to 2005), as obtained from the DNR Water Appropriations Permit Program website (www.dnr.state.mn.us/waters/watermgmt_section/appropriations/wateruse.html). The high-capacity wells are illustrated on Figure 2, and summarized in Table 2.

(4) Overland Drainage. Surface runoff is directed toward local streams, wetlands and lakes.

3. Delineation Method.

The ground-water flow field was determined by using MODFLOW. Simulated heads were compared to static water levels obtained from the calibration data sets used in earlier models. Static levels from 1,075 wells screened in various geologic units were used for calibrating the ground-water flow model.

a) Ground-Water Flow Models. The models used in this project were originally developed by the Ramsey Soil and Water Conservation District (RSWCD) in 2003 and these were based on even earlier models. The draft report discussing their development can be found in Appendix I. The previous modeling effort used two models; a large, regional-scale model with distant and well-defined natural boundaries and a smaller, local-scale model. The purpose for this 'telescopic mesh refinement' is to use the large model with the well-defined boundaries to establish the boundaries for the smaller, more refined, local model. For the purposes of this study, the regional-scale model was not modified and minor modifications were made to the local model to improve accuracy, achieve a better calibration, and incorporate updated information in the form of more recent pumping rates and any new wells that may have been installed since 2003. The regional and

local model domains are presented on Figure 6. The local model domain was divided into a three-dimensional, non-uniform grid with 376 rows, 414 columns, and 4 active layers. The model grid in the vicinity of the Township wells is presented on Figure 7.

(1) Boundary Conditions. Modifications to the model's boundary conditions included minor changes to the constant-head conditions applied to the northeastern bounds to more accurately reflect ground water levels in that area. Also, the lakes in the area of the wells were changed from constant-head cells to river cells so as to better simulate the interaction between ground water and surface water in these areas. A re-analysis of the 2001 pumping test results necessitated a change in the hydraulic conductivity values for the Prairie du Chien and Jordan aquifers in the area of interest. Finally, all of the high-capacity wells were redefined using the highest pumping rate for the period 2001-2005, with any post-2003 wells added.

(2) Discretization of Aquifer Properties. Discretization of aquifer properties involves assigning initial values to each cell in the model domain. Hydraulic properties input for this model included horizontal components for hydraulic conductivity (kx and ky), vertical hydraulic conductivity (kz), specific yield (Sy), specific storage (Ss), and effective porosity (ne) (required for MODPATH to calculate linear flow velocity).

The initial hydraulic conductivities for the model were those that were used in the original RSWCD model. Some of the conductivity values in the surficial drift aquifer were changed to better reflect actual conditions and improve the calibration. The values for the Prairie du Chein and Jordan aquifers were also modified to reflect the pumping test

results. The porosity values for the Prairie du Chien and Jordan aquifers were reduced from a global 0.30, to 0.056 for the Prairie du Chien and 0.25 for the Jordan.

4. Delineation Results.

a) Calibration and Uncertainty. The goal of numerical model calibration is to obtain a reasonable correlation between the simulated model results and observed field data. The calibration process is completed by running several steady-state simulations and comparing calculated heads to the measured head data at known calibration points within the model domain. For the local model calibration, 1,075 well locations were used for comparison. These wells are private or municipal and are completed in the glacial sediments and bedrock units.

Figure 8 presents the calibration wells and simulated potentiometric contour map for steady-state conditions in the Prairie du Chien - Jordan aquifer. Flow direction is variable, but generally flows to the southwest. Using the head values from the 1,075 calibration well locations, an error analysis on the steady-state model was performed. Figure 9 presents a plot of the results of this analysis indicating that the overall root mean squared (RMS) error for the unconsolidated and bedrock aquifers is approximately 4.9 percent. Most of the wells are completed in the St. Peter Sandstone, and Prairie du Chien and Jordan aquifers (layers 3 and 4). In general, a RMS of approximately 10 percent or less is acceptable (National Ground Water Association, 1998).

The calibration data (Figure 9) shows a reasonably close correlation between measured and calculated head values. While the model is based on a large amount of data, the head measurements used in the calibration are single measurements that are listed on each well record, and were collected during different seasons over several decades.

More extensive observation data collected within the same general time period, and more accurate, site-specific T values throughout the model domain could improve calibration and model confidence.

In areas where fracture flow is likely, the uncertainty can be unacceptably high. To address this situation, the MDH had developed a procedure to minimize the uncertainty associated with fracture flow conditions. As defined in the MDH guidance (MDH, 2005), delineation techniques were used to determine fixed radii and upgradient extensions for each of the Township wells.

A sensitivity analysis was begun as part of the modeling effort, but it became apparent that any changes in the modeled capture zones for the wells would still fall completely within the calculated capture zones from the fracture analysis.

b) WHPA Delineation. With the flow fields calibrated, a ground-water pathline analysis and fracture flow analysis were performed to delineate the capture zones and ultimately the WHPA.

The pathline analysis consisted of using MODPATH, a flowpath calculation program, to trace the 10-year capture zone for each of the wells by backtracing 20 flow paths from the wells for a 10-year period (Figure 10).

Township Well Nos. 2A and 3 through 6 are wells that are open to both a porous media aquifer, the Jordan, and a solution weathered or fractured aquifer, the Prairie du Chien. This requires a fracture flow analysis as described by the MDH (MDH, 2005). Township Well No. 1 is open only to the Jordan aquifer; however, the Jordan aquifer is hydraulically connected to the Prairie du Chien with a high likelihood of leakage between the two. This requires a slightly different fracture flow analysis. Both of these analyses are essentially calculations that establish a radial capture zone based on the 10-year volume of water pumped.

Special considerations had to be made for Well Nos. 3 and 6, whose initial fixed radii overlapped. This radial zone is then extended upgradient in the direction of ground-water flow (also plus or minus 10 degrees) to create a conservative wellhead capture area to account for the uncertainties related to fracture flow (Table 3 and Figure 11).

After both the pathline analysis and fracture flow analysis were completed, the capture zones delineated for each method were merged with one another. This concatenation created a final composite WHPA capture zone (Figure 12) for use in delineating the DWSMA.

5. Conjunctive Delineation.

A conjunctive delineation involving the consideration of surface waters in making the final wellhead protection area delineation was not considered necessary for White Bear Township. The reason is that the Township's wells are completed in either the Jordan sandstone, cased at depths of about 300 to 365 feet or in the combined Prairie du Chien – Jordan aquifer, cased at depth of about 175 to 260 feet. While there are significant areas in the DWSMA that are not covered by the St. Peter sandstone, most areas offer some degree of hydraulic separation between the bedrock and the ground surface by clayey till (L-score ranging from 1 to 24), or offer hydraulic separation simply by the distance to bedrock through the unconsolidated materials. An increased depth to bedrock translates to sufficient increases in travel time through the unconsolidated materials; resulting in significant potential attenuation of pathogens and nitrates. MDH water quality support this assertion that no systemic pathogen or nitrate contamination has been reported for White Bear Township (except for a low level nitrate detection of 0.69 mg/l at Well 5 in April 2005) since 1993, when these data started to be archived in computer databases.

Accordingly, the setting offers sufficient hydraulic though either geologic confining material or thickness of unconsolidated materials to render a conjunctive delineation unnecessary (Figure 1 in Appendix IV).

C. BOUNDARIES FOR THE DWSMA.

The criteria used to delineate the DWSMA (Figure 13) are based on public land survey features such as sections, half sections, and quarter sections that encompass the maximum time of travel simulated as defined in MR 4720.5100. In the case of this delineation, the DWSMA encompasses the concatenated capture zone presented on Figure 12. The 10- year pathlines and fracture flow delineation extend across White Bear and Bald Eagle Lakes, however, the DWSMA is not inclusive of the entire lakes because a conjunctive delineation was not necessary due to the lack of hydraulic connection between the lakes and the subject bedrock aquifers. Figure 1 in Appendix IV illustrates laterally extensive clay beneath both lakes.

IV. VULNERABILITY ASSESSMENT

A. WELL VULNERABILITY

The well vulnerability assessment was conducted in accordance with the MDH guidance document, *Assessing Well Vulnerability for Wellhead Protection* (MDH, 1997). A well's vulnerability is scored on a Vulnerability Assessment Worksheet based on the following six categories: DNR geologic sensitivity rating, casing integrity, casing depth, pumping rate, isolation distance from contaminant sources, and chemical and isotopic information.

The DNR geologic sensitivity rating is an empirical value determined by dividing the cumulative thickness of low permeability units (e.g. clay) above the aquifer by 10 (DNR, 1991). The resulting score is termed the "L-score". A higher L-score indicates more low-permeability material above the aquifer, and therefore a lower vulnerability. A low L-score represents higher vulnerability. For example, a rating of L-1 has a higher vulnerability than L-9, because there is less low-permeability material present above the aquifer. This type of assessment is defined by the DNR as Level 3. A Level 3 assessment was conducted for the Township wells since the aquifer is overlain by varying thicknesses of clay. As mentioned above, points are also assigned to casing integrity and depth, pumping rate, isolation distance to contaminant sources, and chemical data, in addition to the geologic sensitivity.

Vulnerability assessment worksheets and the total score of the six vulnerability categories for Well Nos. 1, 2A, and 3 through 6 are presented in Appendix III. Per MDH guidance, any well that receives an assessment rating of 45 points or greater is considered a vulnerable well. Well Nos. 2A, 3, 4, and 6 had vulnerability scores or 45 or greater. Well Nos. 1 and 5 had vulnerability scores of 10 and 40, respectively, but are still considered vulnerable due to the tritium detections in groundwater. Tritium was detected in Well Nos. 1 and 6. Tritium in ground water is a result of nuclear testing and is used as an indicator of post-1953 recharge. Nitrate was detected at low concentration in Well No. 5 and tested for but not detected in the remaining wells.

B. DRINKING WATER SUPPLY MANAGEMENT AREA VULNERABILITY

In the proposed DWSMA, the ground water that supplies the Township wells is from the Prairie du Chien - Jordan aquifer that underlies glacial deposits (Ramsey and Washington County Atlas Series, Atlas C-7 and C-5, respectively). The glacial deposits are composed of Superior Lobe sand and silt lacustrine deposits, till, and outwash. Deposits also consist of Pre-Late Wisconsinan Keewatin and Grantsburg Sublobe till, outwash and sandy lacustrine sediment. The Superior Lobe, due to its higher sand content, is generally not considered an effective barrier to the downward migration of contaminants from grade. Underlain deposits, however, do act as effective barriers where till is present or where Glenwood or basal St. Peter shales are present (Figure 4, and Figure 1 in Appendix IV).

Although the Township wells are constructed in the Prairie du Chien - Jordan aquifer, they may be receiving water laterally that has been recharged from the unconsolidated aquifer in the vicinity of the Township well field, where the Prairie du Chien Group is bisected by bedrock valleys (Figure 3). These erosional features are areas where the bedrock aquifer is in direct contact with the unconsolidated aquifer, therefore, in contact with relatively younger ground water as indicated by the tritium results.

The geologic sensitivity in the vicinity of the DWSMA was previously delineated in the Ramsey and Washington County Geologic Atlases. MDH reviewed 358 CWI lithology logs, and calculated L-scores for each well within the DWSMA with approximate delineations as illustrated on Figure 14. As discussed in Section IV-A the DNR geologic sensitivity rating is an empirical value determined by dividing the cumulative thickness of low permeability units (e.g. clay) above the aquifer by 10 (DNR, 1991). LBG reviewed select logs and concurred with MDH's results, indicating the geologic sensitivity differs from that previously delineated in the local county atlases. The L-score results ranged from 1 to 24; which, indicates much of the DWSMA is underlain by low-permeable material creating hydraulic separation from grade.

Geologic sensitivity was not completed beneath the lakes. As a result, a north-south cross-section was created to illustrate laterally extensive clay beneath both lakes (Figure 1 in Appendix IV), and cross-sections (Figure 4) from the Ramsey

and Washington County Atlas Series (Atlas C-7 and C-5, respectively) were reviewed and illustrated the same.

For the DWSMA vulnerability assessment, and pursuant to MDH guidance (MDH, 1997), all geologic sensitivity ratings were automatically increased by one classification due to the presence of tritium. As a result, the vulnerability in the vicinity of the Township wells and across the DWSMA ranges from very low to high (Figure 15).

V. CONCLUSIONS AND RECOMMENDATIONS

The WHPA delineations for the Township Wells were created using maximum pumping rates and conservative assumptions in the fracture flow delineation. These factors combine to 'build in' a safety factor, which is necessary when attempting to simulate natural systems and their inherent heterogeneity.

While the delineations are considered to be conservative and are based on the best available data, there is some information that could improve the quality of any future re-evaluations. Recommended future tasks include,

- Sample all of the Township Wells for tritium. This will indicate the relative age of the water each of the wells is producing and provide information as to its source.
- The Township Wells and White Bear and Bald Eagle Lakes be studied for stable isotopes of oxygen (O^{18}) and deuterium (H^2) to indicate the possible mixing of lake water with ground water.
- Lastly, studies should be conducted to assess the extent of the clay layer beneath the lakes to determine its full extent and effectiveness as a separating layer between the lakes and deeper ground water.

VI. REFERENCES

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Seaberg, J.K., Hansen, D.D. 2000, *Metropolitan Area Ground water Model Project Summary, Lower Aquifers Model, Layers 4 and 5 Model, Version 1.00*. Minnesota Pollution Control Agency.

TABLES

Table 1

Municipal Well Pumpage and Pumping Rates used in the WHPA Delineation
Part I Wellhead Protection Plan
White Bear Township, Ramsey County, Minnesota

Well	Aquifer	Casing Depth (feet)	Well Depth (feet)	Past Use (MGY)					Projected value used in the WHPA delineation analysis (MGY)	Projected value used in the WHPA delineation analysis (m3/d)
				2005	2004	2003	2002	2001	2006-2010	2006-2010
1	CJDN	365	445	21.2	30.4	52.2	41.9	55.9	**55.9**	579.3
2	CJDN	375	435	0.0	0.0	1.7	3.3	2.7	**3.3**	34.2
2A	OPDC-CJDN	299	420						**0.0**	0.0
3	OPDC-CJDN	200	372	36.9	13.8	38.7	6.7	26.2	**38.7**	401.1
4	OPDC-CJDN	263	408	12.9	1.7	6.4	0.9	6.5	**12.9**	133.7
5	OPDC-CJDN	230	412	280.1	296.4	231.8	238.5	231.9	**296.4**	3071.9
6	OPDC-CJDN	175	360	190.0	235.0	216.9	183.6	241.9	**241.9**	2507.1
Totals				541.1	577.3	547.7	474.9	565.1	**649.1**	6727.3

Notes:
*: Projected use is the maximum annual pumping volume between 2001 and 2005.
CJDN: Jordan
OPDC-CJDN: Prairie du Chien - Jordan
MGY: Million gallons per year
m^3/day: cubic meters per day
Values used in the WHPA delineation analysis represent the maximum value of the previous five years.
Maximum annual pumping volume for the municipal system for the past five years.
Projected annual and daily pumping volume for the municipal system.

Table 2

Appropriation Permit Wells in Model Domain -
Wellhead Protection Plan- Part I
White Bear Township, Ramsey County, Minnesota

Well	MN CWI Unique Well ID	Coordinates		Pumping Rate (2001-2005 Maximum)
		Easting	Northing	MGY
DELLWOOD HILLS GOLF CLUB 2	224611	501848	4994729	6.4
DELLWOOD HILLS GOLF CLUB 1	215930	501745	4994129	9.8
GEM LAKE HILLS INC	151584	497492	4990044	31.8
H B FULLER	151562	495939	4988090	49.3
MAHTOMEDI 5, CITY OF	433255	501697	4988635	111
MAHTOMEDI 4, CITY OF	208506	501844	4988585	132.8
MAHTOMEDI 3, CITY OF	208497	503922	4990807	103.6
MANITOU RIDGE GOLF CLUB A	127293	499902	4987223	33.9
M-FOODS DAIRY LLC	233149	497841	4989995	220.9
PINE TREE APPLE ORCHARD	450669	503641	4995514	5.9
VADNAIS HEIGHTS 2, CITY OF	127265	495736	4988191	167.8
VADNAIS HEIGHTS 1, CITY OF	112222	496846	4988186	160.9
VADNAIS HEIGHTS 4, CITY OF	127271	495042	4991212	192.3
VEECO INSTRUMENTS INC-COOLING	597075	495687	4993278	33.6
WHITE BEAR LAKE AREA SCHOOLS	655934	500201	4989535	4.9
WHITE BEAR LAKE AREA SCHOOLS 2	626779	499102	4992662	4.3
WHITE BEAR LAKE 4, CITY OF	226566	499552	4987778	606.7
WHITE BEAR LAKE 1, CITY OF	14005	499955	4987878	111.2
WHITE BEAR LAKE 3, CITY OF	205733	500157	4987778	472.8
WHITE BEAR YACHT CLUB	866165*	502091	4993073	18

Notes:
- Well pumping rates were downloaded from the MN DNR Water Appropriation Permit Program website. The five-year maximum rate was calculated from 2001 to 2005 data for the above listed wells.
- Coordinates are UTM, Zone 15, NAD83, and are from the MN County Well Index (CWI) except for * which is from the appropriation database.
MGY: Million gallons per year
MN CWI: Minnesota County Well Index
*: MN CWI Unique ID not available (may be 676449). This is the Appropriation Permit Number.

Table 3

Fracture Flow Fixed Radii and Upgradient Extension Calculations
Part I Wellhead Protection Plan
White Bear Township, Ramsey County, Minnesota

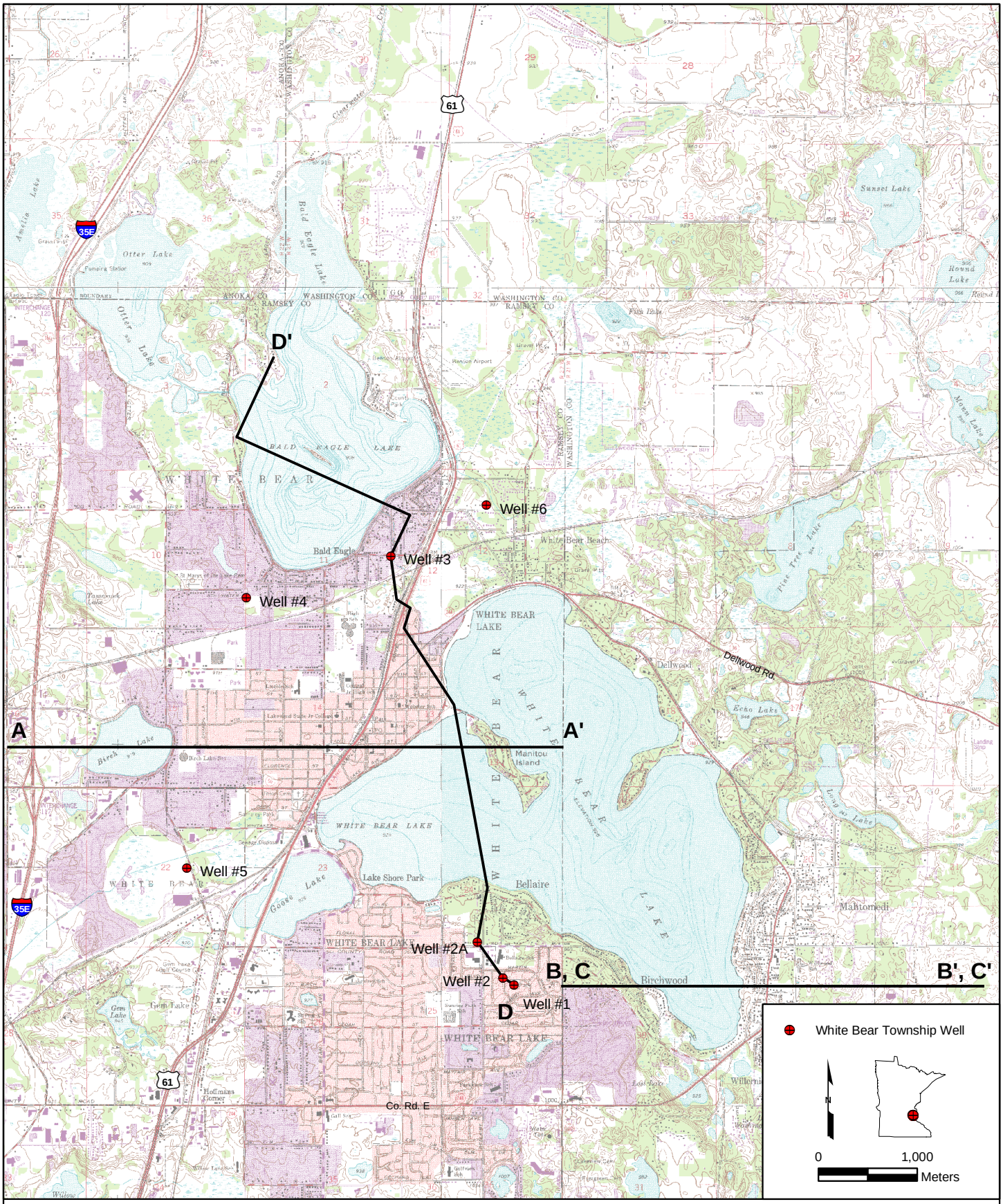
Well No.	Pumping Rate	Duration	Effective Porosity	Aquifer Thickness		Capture Zone Radius	Volume of Capture Zone for Revised Radius Calculations	Revised Capture Zone Radius	Upgradient Length to Radius Center (using revised Capture Zone)*	Primary Angle then +/- 10 degrees from this angle
	m3/d	days		ft	m	m	m3	m	m	degrees
1	41.1	3650	0.056	135	41.148	143.95	na	143.95	226.01	44
2A	34.2	3650	0.056	30	9.144	278.56	na	278.56	437.34	44.1
3	401.1	3650	0.056	82	24.9936	577.02	26143125	604.24	948.66	21.4
4	133.7	3650	0.056	52	15.8496	418.34	na	418.34	656.80	20.9
5	3071.9	3650	0.056	105	32.004	1411.17	na	1411.17	2215.54	31.8
6	2507.1	3650	0.056	97	29.5656	1326.39	163409196	1388.96	2180.67	31.5

Area of Well 3&6 Overlap	732293 m2
Overlap Aquifer Thickness	25 m
Volume of Well 3&6 Overlap	18307328 m3
Volume Well #3	26143125 m3
Volume Well #6	163409196 m3
Overlap volume apportioned to Well #3	2524953 m3
Overlap volume apportioned to Well #6	15782374 m3
Revised Well #3 volume	28668078 m3
Revised Well #6 volume	179191571 m3
Revised Well #3 radius	604 m
Revised Well #6 radius	1389 m

Notes:
m3/d: cubic meters per day
m: meters
m2: square meters
m3: cubic meters
ft: feet
na: not applicable
*: Equals Revised Capture Zone Radius multiplied by 1.57.

Reference: MDH, 2005. Guidance for Delineating Wellhead Protection Areas in Fractured and Solution-Weathered Bedrock in Minnesota, pp. 8-12.

FIGURES



Source: Centerville, Hugo, White Bear Lake East and White Bear Lake West 7.5-Minute USGS Quadrangles.

Prepared By:
LEGGETTE, BRASHEARS & GRAHAM, INC.

Professional Ground-Water and
Environmental Engineering Services
8 Pine Tree Drive, Suite 250
St. Paul, MN 55112
651-490-1405

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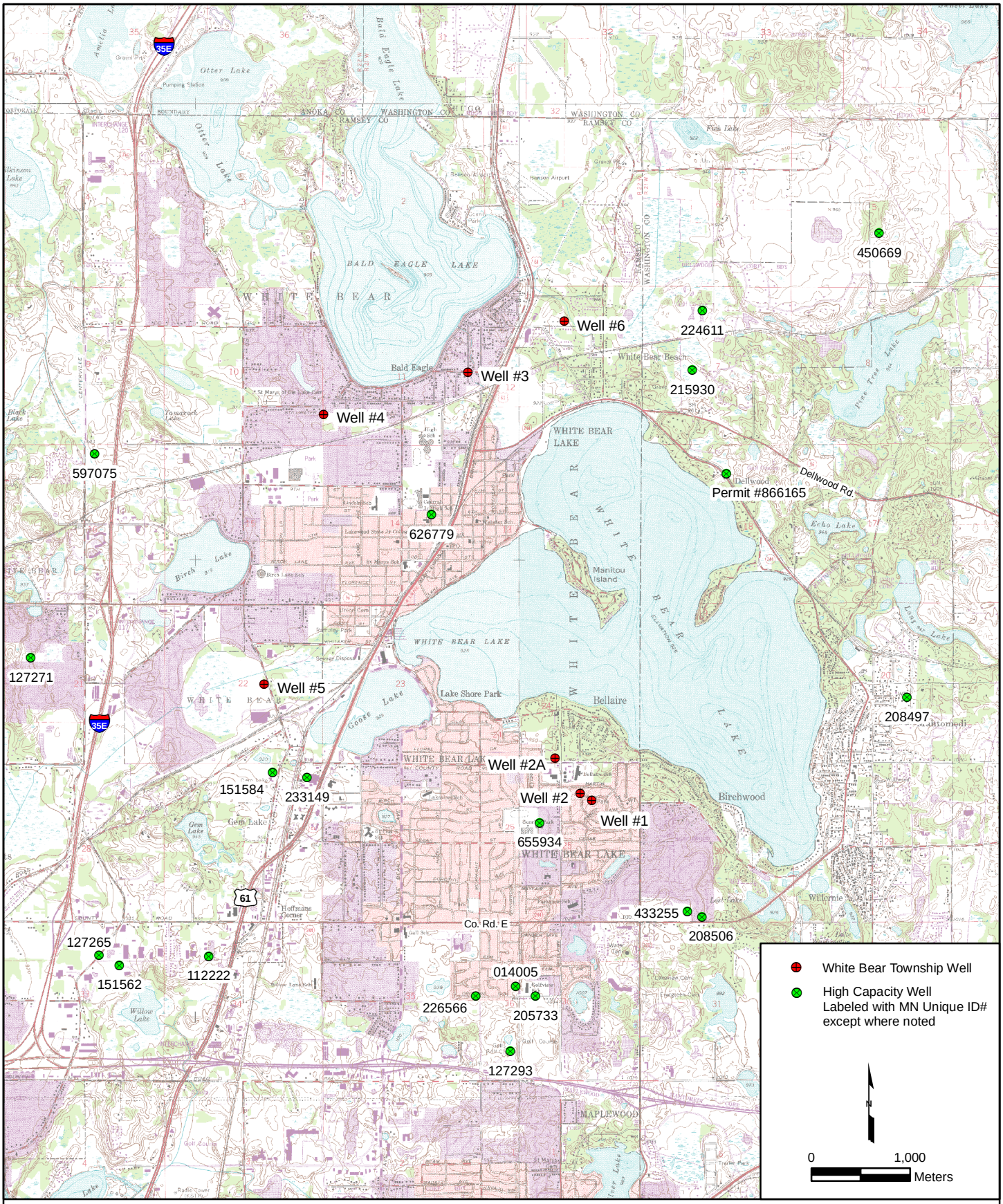
PART I WELLHEAD PROTECTION PLAN
WHITE BEAR TOWNSHIP, MINNESOTA

SITE LOCATION MAP AND
GEOLOGIC CROSS-SECTION LOCATIONS

FILE: G3WBT01Q.MXD	DATE: 06/14/2007	FIGURE: 1



Source: Centerville, Hugo, White Bear Lake East and White Bear Lake West 7.5-Minute USGS Quadrangles, and Bedrock Geology of the Twin Cities Metro Area (Misc. Map M-104, 2000).

Prepared By:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and
Environmental Engineering Services
8 Pine Tree Drive, Suite 250
St. Paul, MN 55112
651-490-1405

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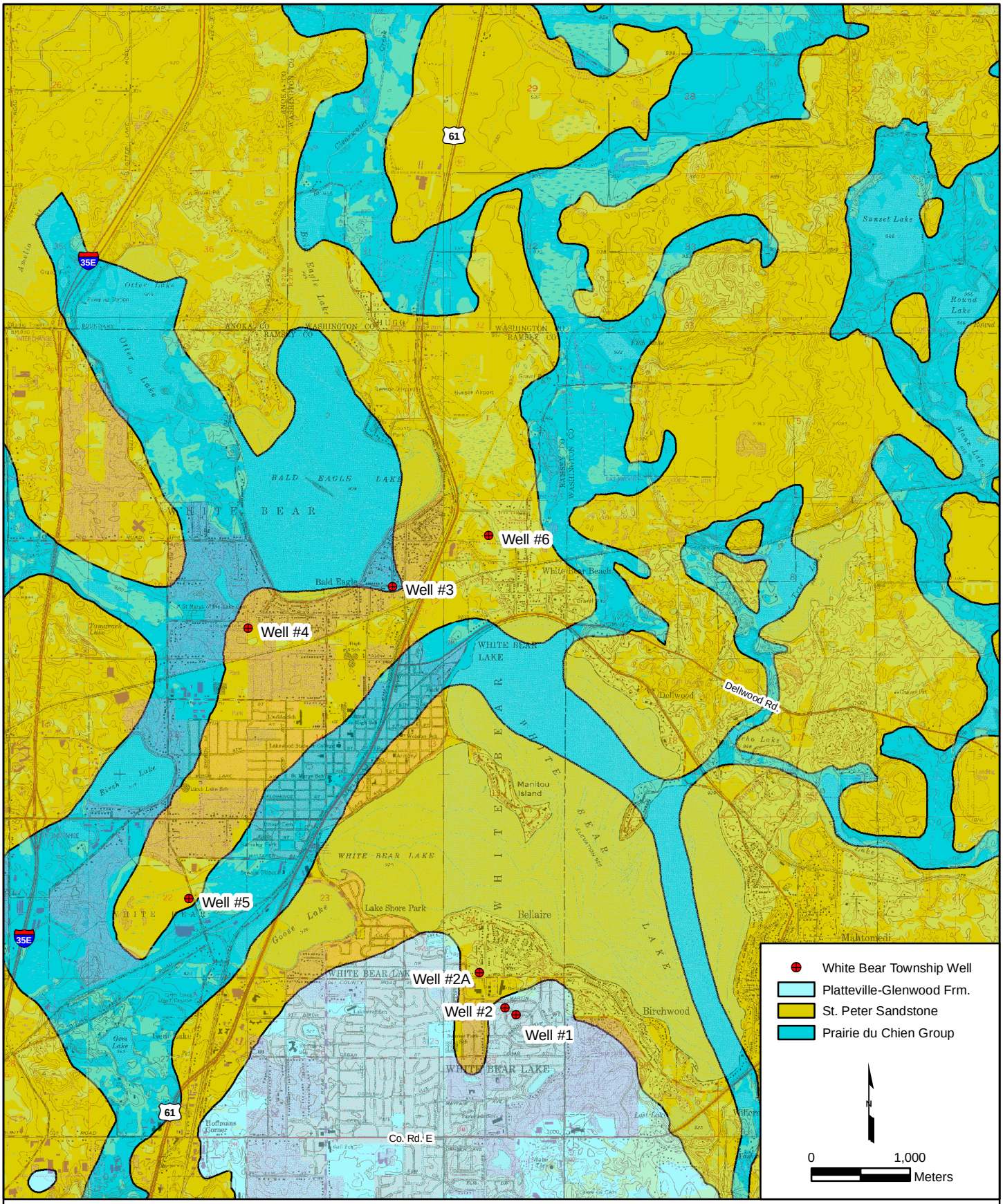
PART I WELLHEAD PROTECTION PLAN
WHITE BEAR TOWNSHIP, MINNESOTA

LOCATION OF TOWNSHIP AND SURROUNDING HIGH CAPACITY WELLS USED IN THE GROUNDWATER FLOW MODEL

FILE: G3WBT01K.MXD	DATE: 01/04/2007	FIGURE: 2



Source: Centerville, Hugo, White Bear Lake East and White Bear Lake West 7.5-Minute USGS Quadrangles, and Bedrock Geology of the Twin Cities Metro Area (Misc. Map M-104, 2000).

Prepared By:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and
Environmental Engineering Services
8 Pine Tree Drive, Suite 250
St. Paul, MN 55112
651-490-1405

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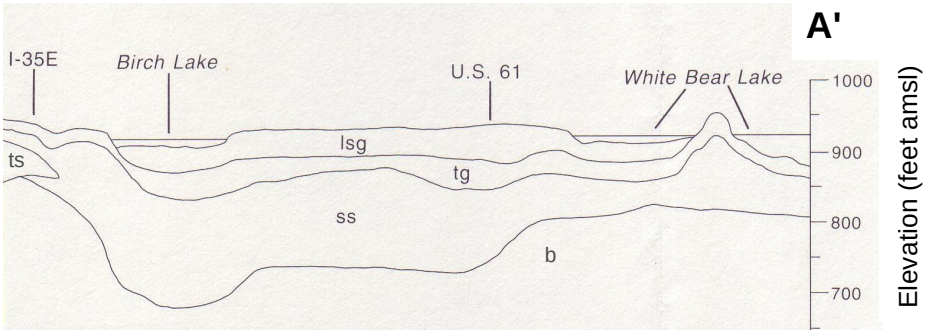
PART I WELLHEAD PROTECTION PLAN
WHITE BEAR TOWNSHIP, MINNESOTA

BEDROCK GEOLOGY MAP

FILE: G3WBT01I.MXD	DATE: 12/21/2006	FIGURE: 3

West A **East A'**



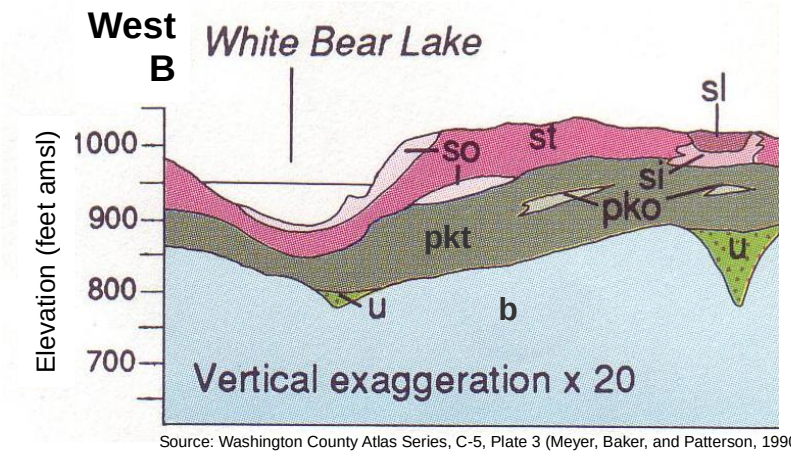
Source: Ramsey County Atlas Series, C-7, Plate 5 (Mossler and Cleland, 1992).

Grantsburg Sublobe Deposits
- lsg: Sandy Lake Sediment
- tg: Till

Superior Lobe Deposits
- ss: Metlwater Stream Sediment (medium to coarse sand with pebbles)
- ts: Till

Bedrock
- b: Ordovician and Cambrian Bedrock

West B **East B'**



Source: Washington County Atlas Series, C-5, Plate 3 (Meyer, Baker, and Patterson, 1990).

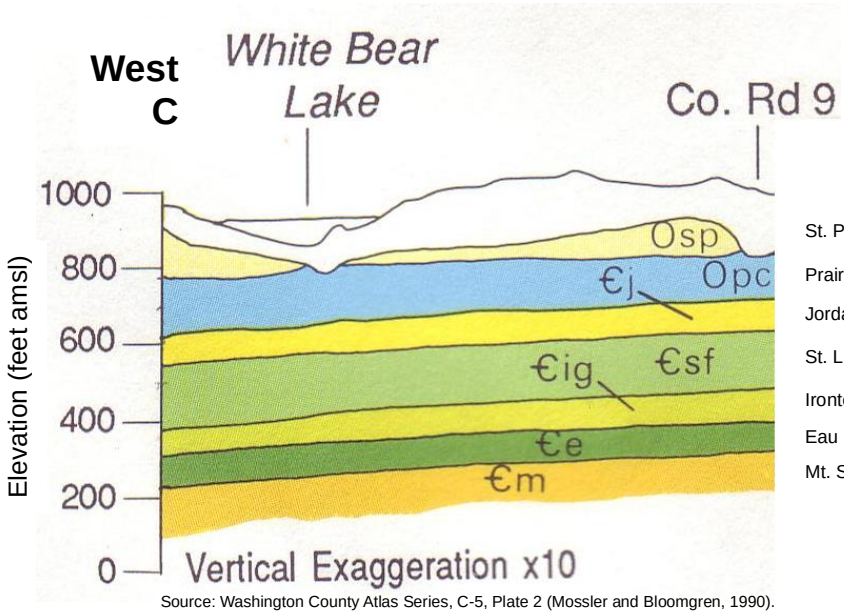
Superior Lobe Deposits
- si: Ice-Contact Stratified Deposits (sand, loamy sand, and gravel)
- sl: Lacustrine Sand and Silt
- so: Outwash (sand, loamy sand, and gravel)
- st: Glacial Till

Pre-Late Wisconsinan Keewatin Deposits
- pko: Outwash and Ice-Contact Deposits
- pkt: Glacial Till

Undifferentiated Sediment
- u: Deposits of Unknown Age

Bedrock
- b: Ordovician and Cambrian Bedrock

West C **East C'**



Source: Washington County Atlas Series, C-5, Plate 2 (Mossler and Bloomgren, 1990).

St. Peter Sandstone

Prairie du Chien Group

Jordan Sandstone

St. Lawrence Formation

Ironton & Galesville Sandstones

Eau Claire Formation

Mt. Simon Sandstone

Source: Ramsey and Washington County Atlas Series, C-7 and C-5, respectively.

Prepared By:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and Environmental Engineering Services
8 Pine Tree Drive, Suite 250
St. Paul, MN 55112
651-490-1405

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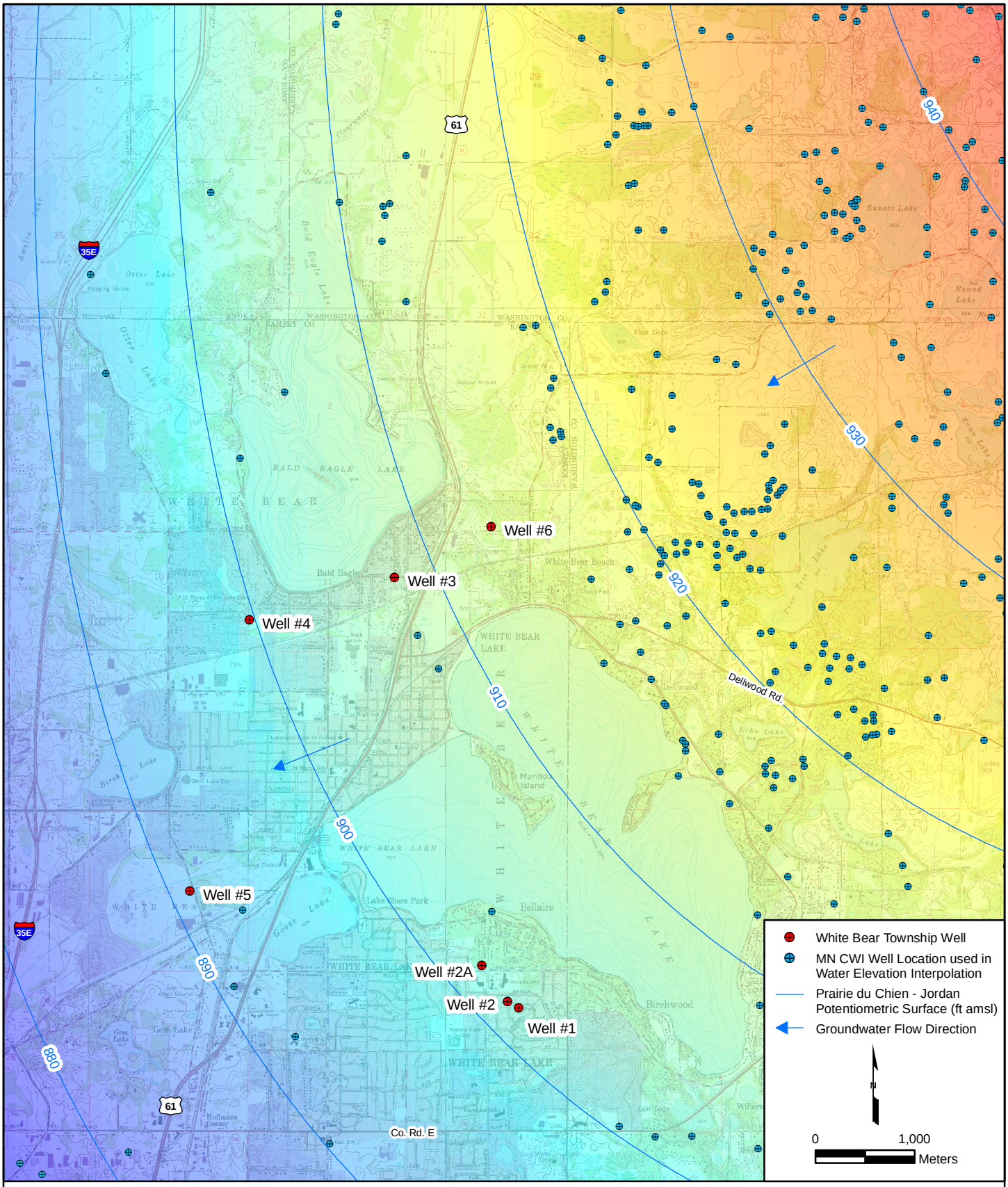
WHITE BEAR TOWNSHIP, MINNESOTA

GEOLOGIC CROSS-SECTIONS A-A', B-B', AND C-C'

FILE: G3WBT01O.MXD	DATE: 01/04/2007	FIGURE: 4



Source: Centerville, Hugo, White Bear Lake East and White Bear Lake West 7.5-Minute USGS Quadrangles, and MN CWI Prairie du Chien - Jordan water elevation surface created in Surfer 7.0 using a quadratic regression.

Prepared By:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and
Environmental Engineering Services
8 Pine Tree Drive, Suite 250
St. Paul, MN 55112
651-490-1405

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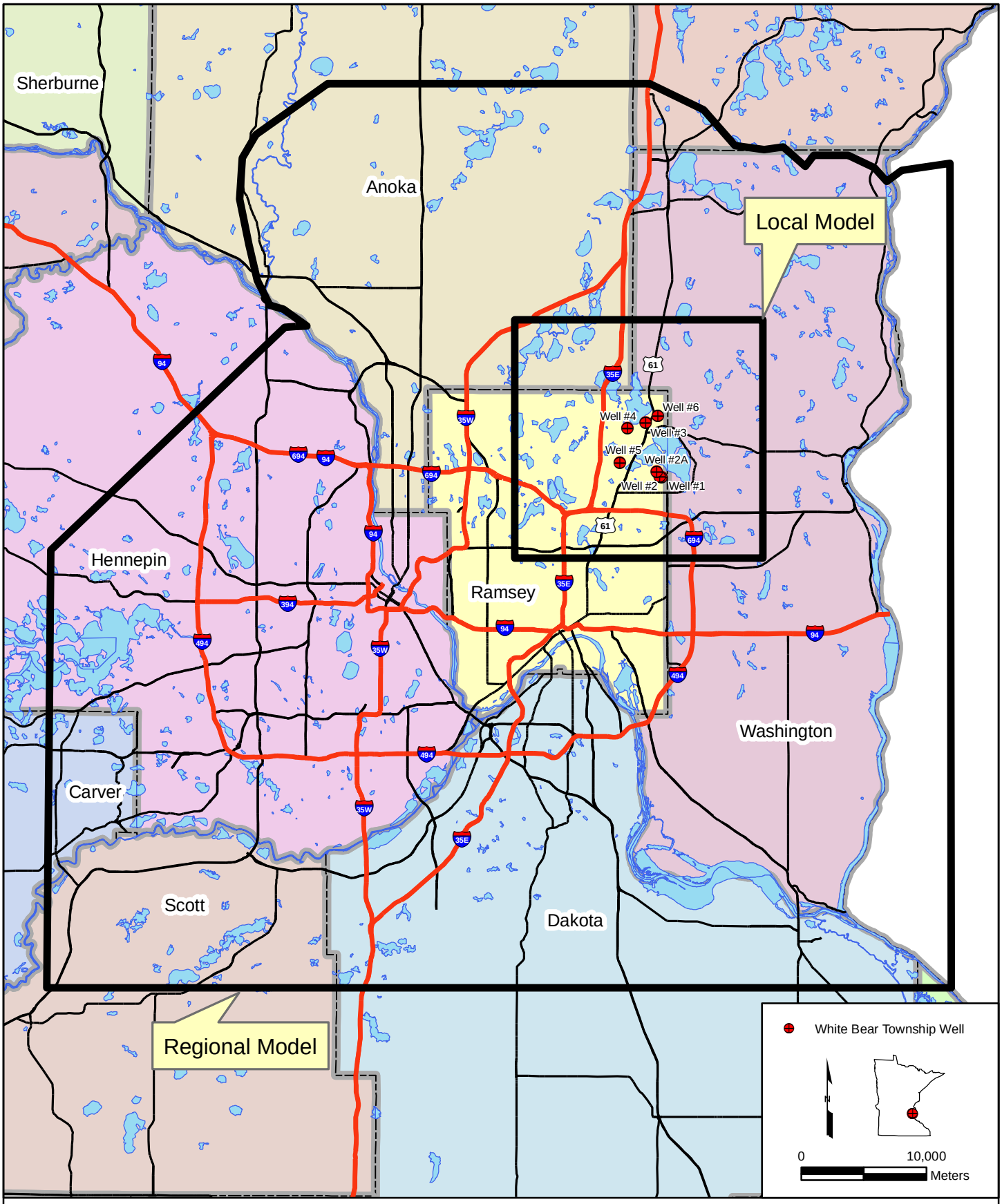
PART I WELLHEAD PROTECTION PLAN
WHITE BEAR TOWNSHIP, MINNESOTA

PRAIRIE DU CHIEN - JORDAN POTENTIOMETRIC SURFACE MAP

FILE: G3WBT01J.MXD	DATE: 01/04/2007	FIGURE: 5



Prepared By:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and
Environmental Engineering Services
8 Pine Tree Drive, Suite 250
St. Paul, MN 55112
651-490-1405

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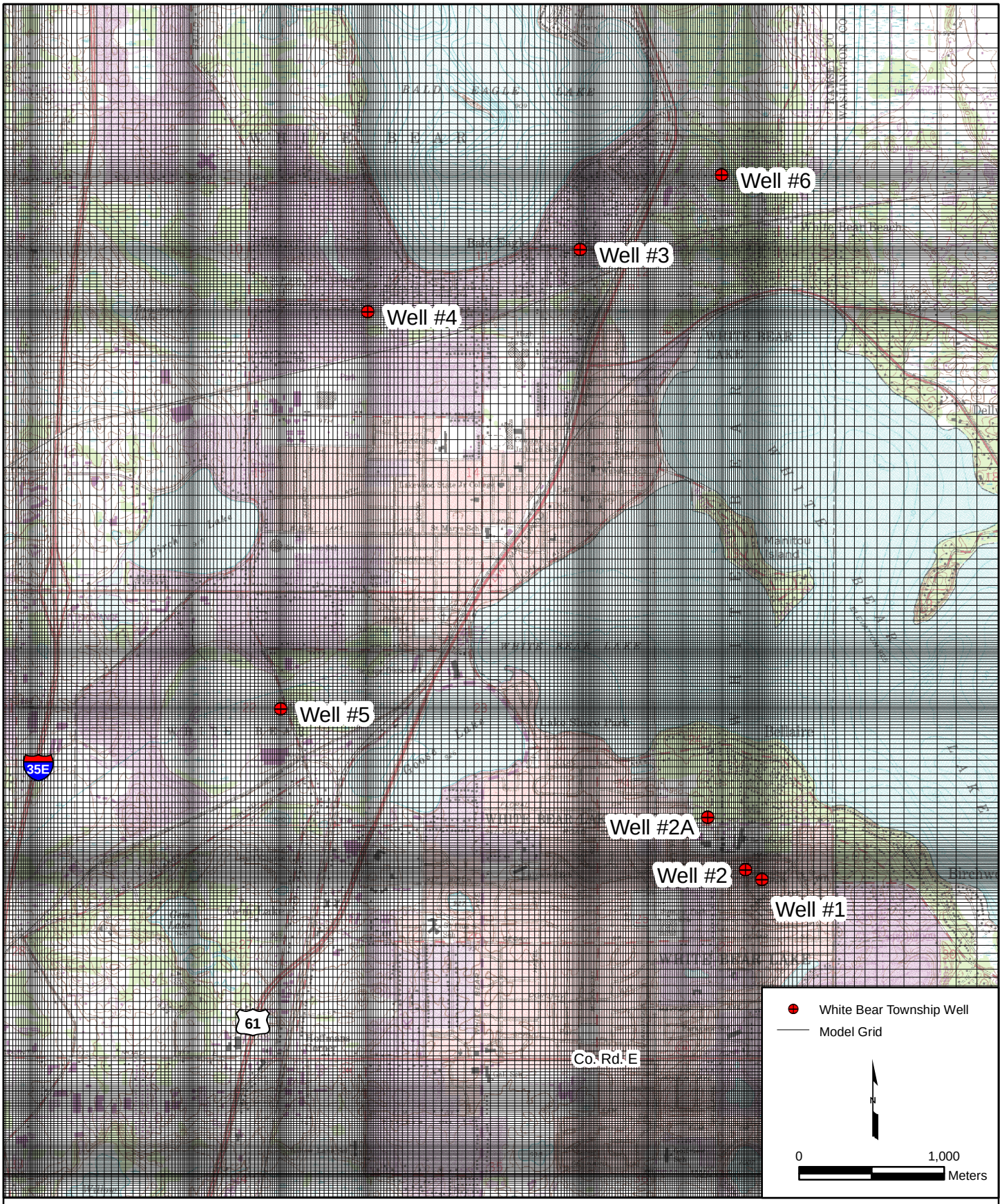
PART I WELLHEAD PROTECTION PLAN
WHITE BEAR TOWNSHIP, MINNESOTA

REGIONAL AND LOCAL MODEL DOMAINS

FILE: G3WBT01N.MXD	DATE: 01/04/2007	FIGURE: 6



Source: Centerville, Hugo, White Bear Lake East and White Bear Lake West 7.5-Minute USGS Quadrangles.

Prepared By:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and
Environmental Engineering Services
8 Pine Tree Drive, Suite 250
St. Paul, MN 55112
651-490-1405

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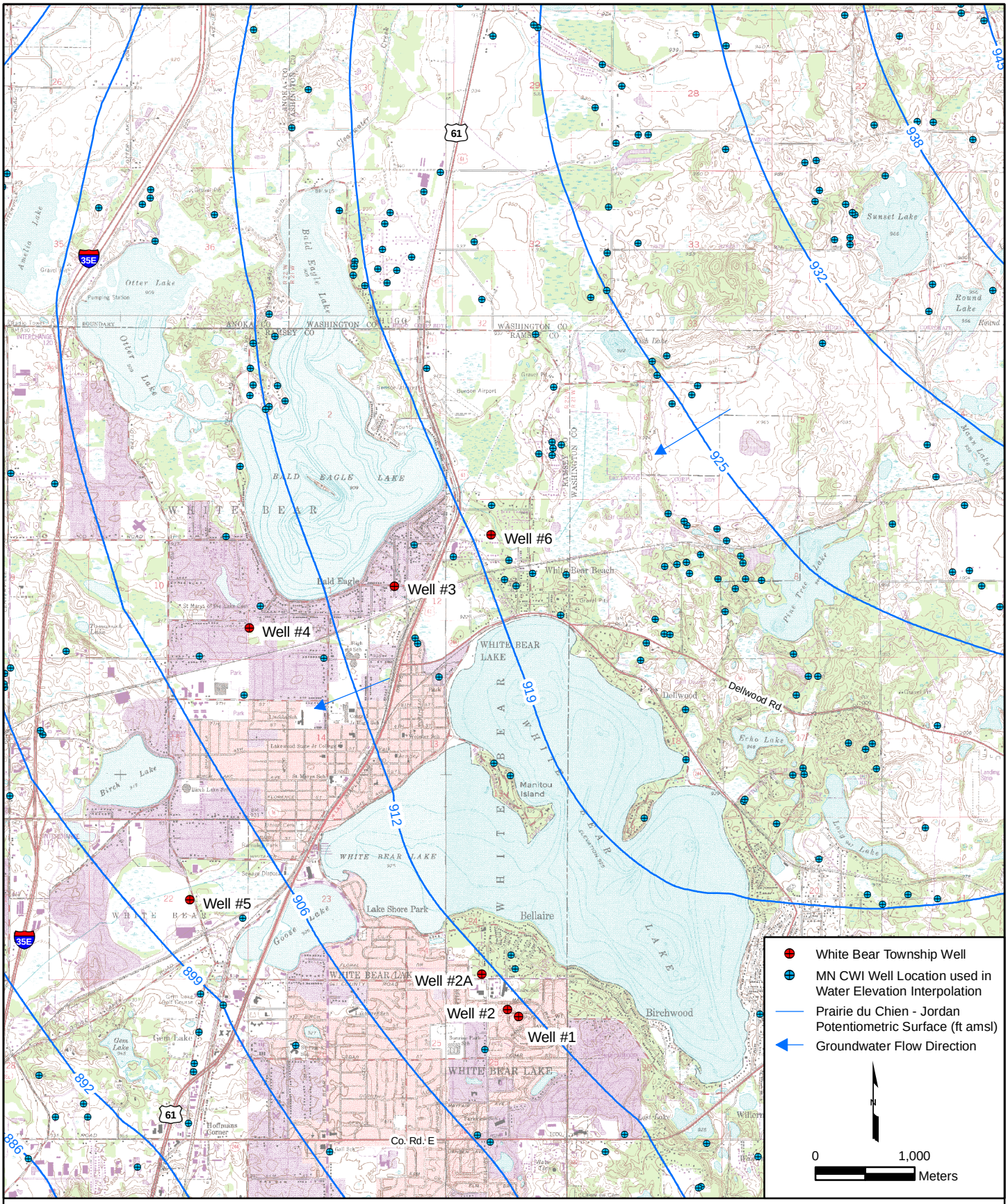
PART I WELLHEAD PROTECTION PLAN
WHITE BEAR TOWNSHIP, MINNESOTA

MODEL GRID IN VICINITY OF TOWNSHIP WELLS

FILE: G3WBT01M.MXD	DATE: 01/04/2007	FIGURE: 7



Source: Centerville, Hugo, White Bear Lake East and White Bear Lake West 7.5-Minute USGS Quadrangles

Prepared By:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and
Environmental Engineering Services
8 Pine Tree Drive, Suite 250
St. Paul, MN 55112
651-490-1405

TKDA / WHITE BEAR TOWNSHIP

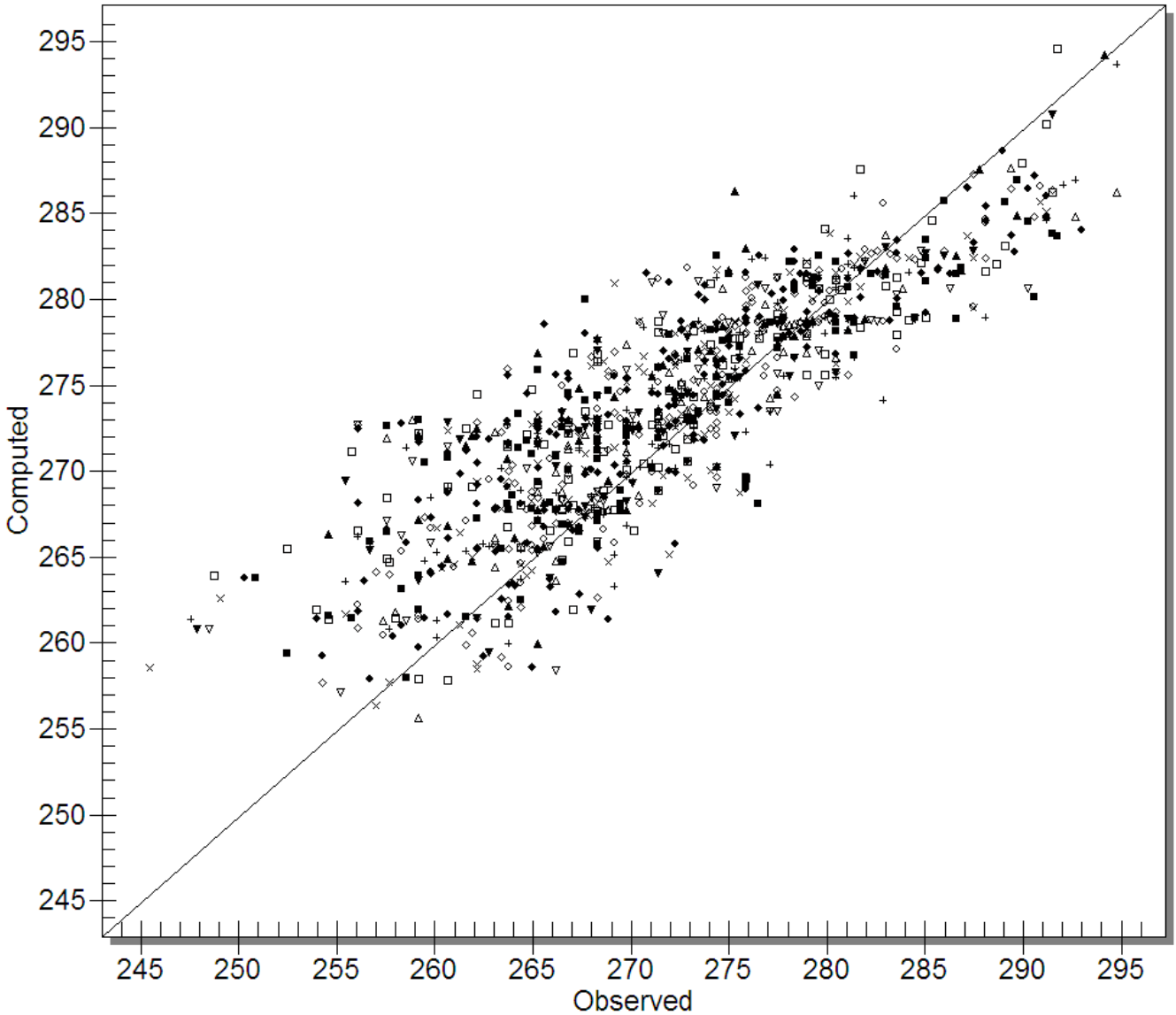
PART I WELLHEAD PROTECTION PLAN
WHITE BEAR TOWNSHIP, MINNESOTA

SIMULATED GROUNDWATER EQUIPOTENTIAL CONTOURS
AND CALIBRATION WELL LOCATIONS

FILE: G3WBT01L.MXD	DATE: 01/04/2007	FIGURE: 8

Computed vs. Observed Values

Head



Error Summary

Head

Mean Error:	2.067
Mean Abs. Error:	3.812
Root Mean Sq. Error:	4.973

Prepared By:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and
Environmental Engineering Services
8 Pine Tree Drive, Suite 250
St. Paul, MN 55112
651-490-1405

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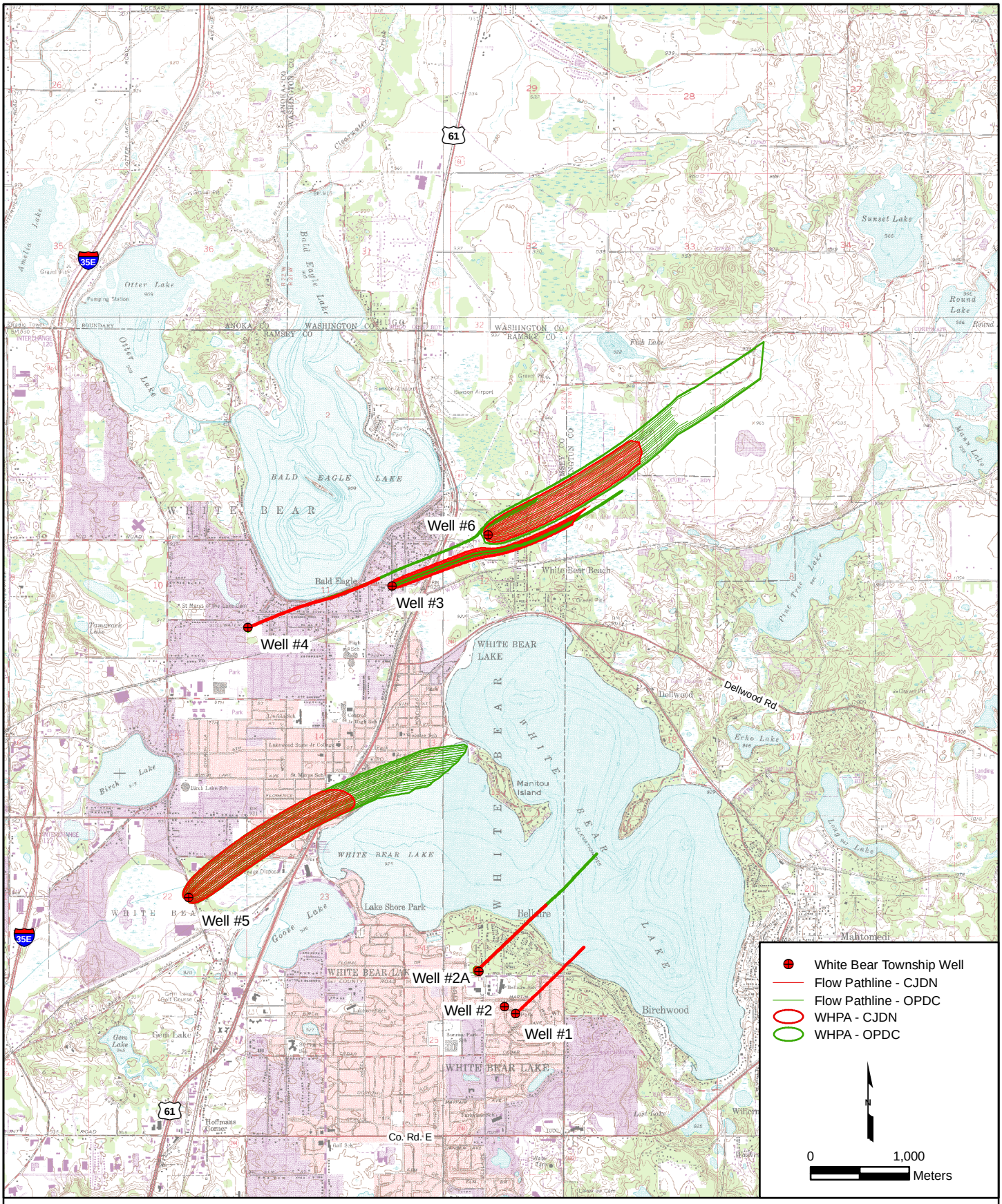
WHITE BEAR TOWNSHIP, MINNESOTA

STEADY-STATE MODEL CALIBRATION DATA
AND MODEL STATISTICS

FILE: G3WBT01G.MXD	DATE: 01/04/2007	FIGURE: 9



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Professional Ground-Water and
Environmental Engineering Services
8 Pine Tree Drive, Suite 250
St. Paul, MN 55112
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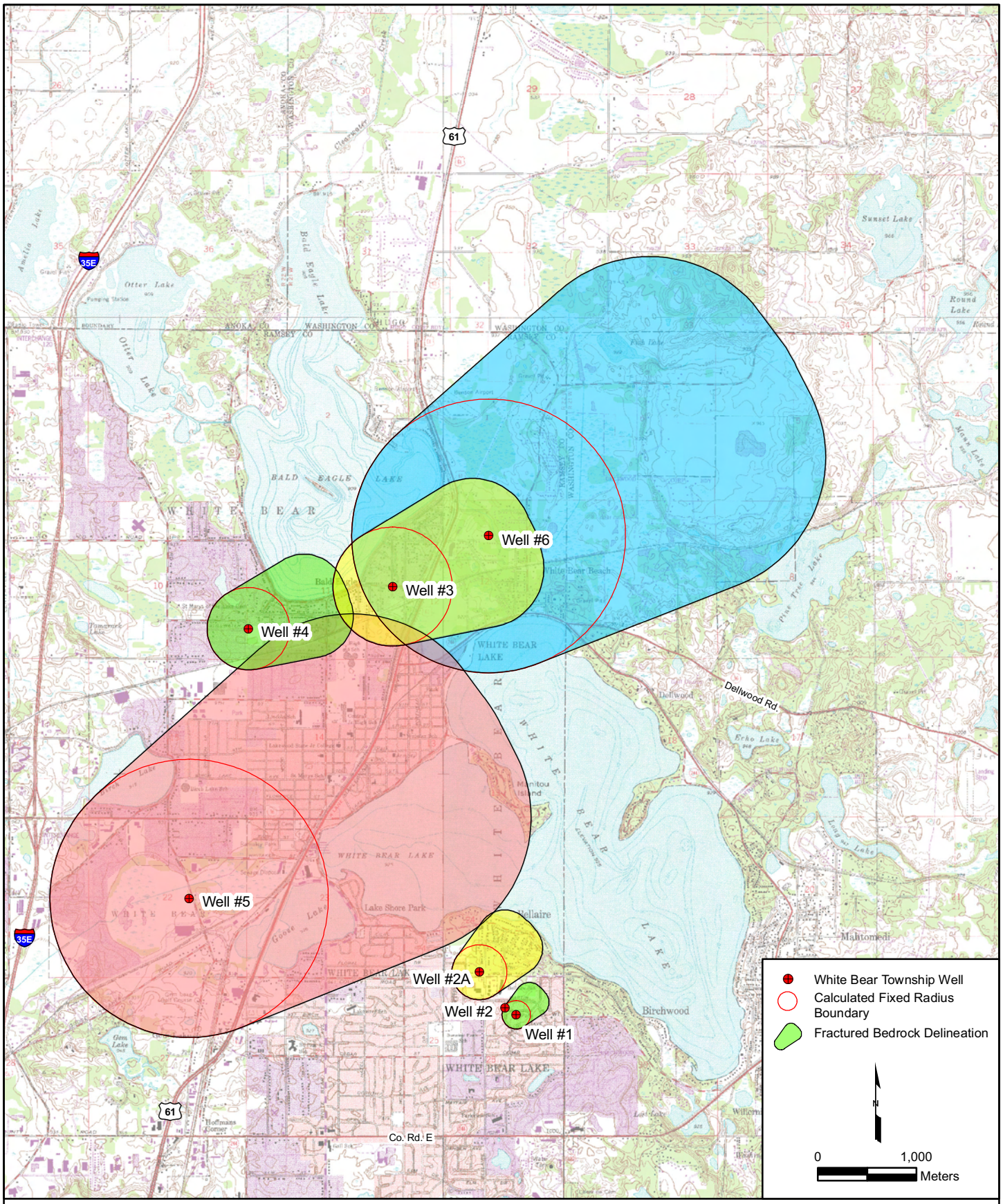
PART I WELLHEAD PROTECTION PLAN
WHITE BEAR TOWNSHIP, MINNESOTA

10-YEAR TIME-OF-TRAVEL PATHLINES

FILE: G3WBT01B.MXD	DATE: 01/04/2007	FIGURE: 10



Source: Centerville, Hugo, White Bear Lake East and White Bear Lake West 7.5-Minute USGS Quadrangles.

Prepared By:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and
Environmental Engineering Services
8 Pine Tree Drive, Suite 250
St. Paul, MN 55112
651-490-1405

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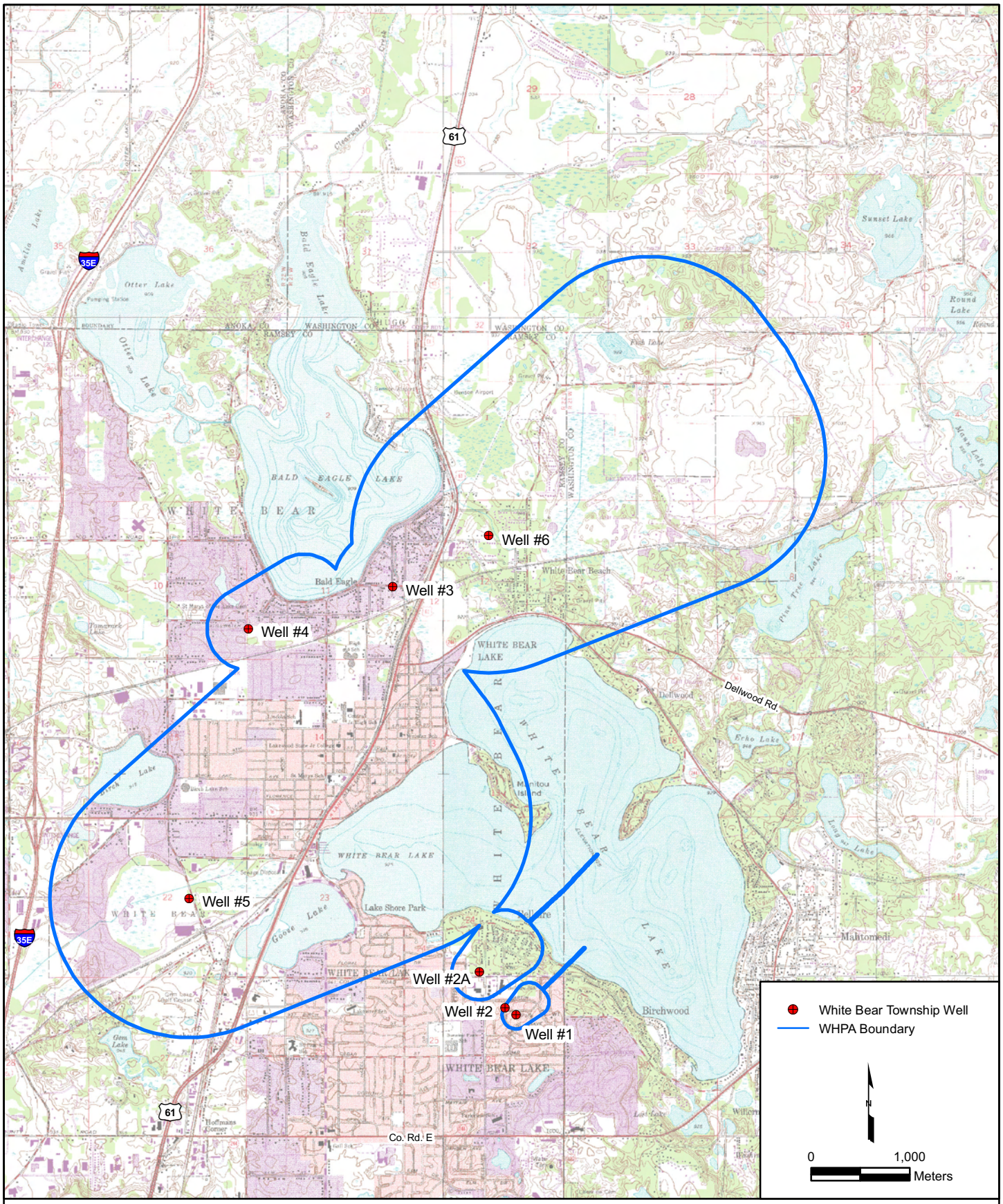
FRACTURE FLOW DELINEATION BOUNDARIES

FILE: G3WBT01A.MXD	DATE: 12/21/2006	FIGURE: 11



Source: Centerville, Hugo, White Bear Lake East and White Bear Lake West 7.5-Minute USGS Quadrangles.

Prepared By:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and
Environmental Engineering Services
8 Pine Tree Drive, Suite 250
St. Paul, MN 55112
651-490-1405

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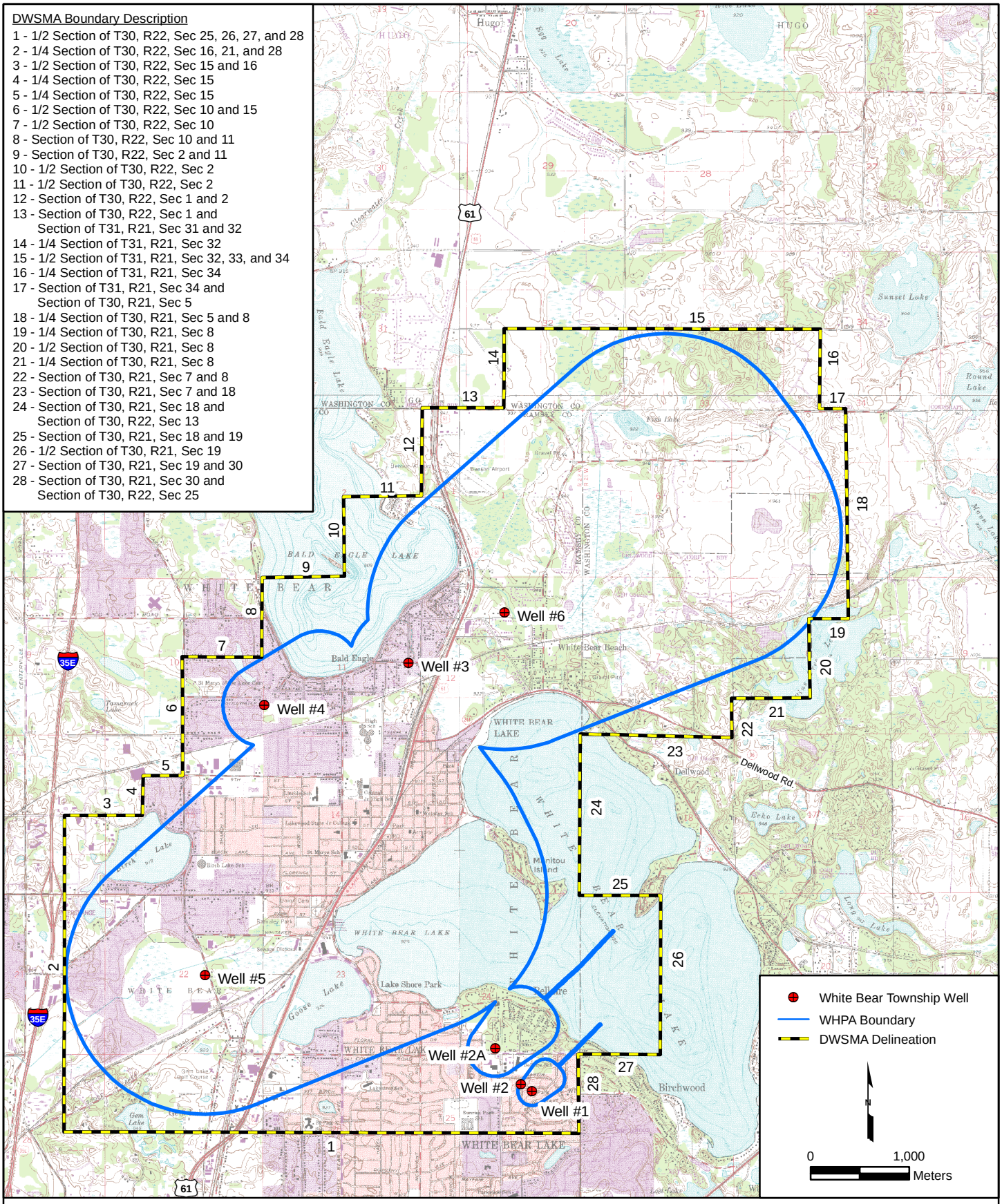
PART I WELLHEAD PROTECTION PLAN
WHITE BEAR TOWNSHIP, MINNESOTA

WELLHEAD PROTECTION AREA BOUNDARY

FILE: G3WBT01E.MXD	DATE: 12/21/2006	FIGURE: 12

DWSMA Boundary Description

1 - 1/2 Section of T30, R22, Sec 25, 26, 27, and 28
2 - 1/4 Section of T30, R22, Sec 16, 21, and 28
3 - 1/2 Section of T30, R22, Sec 15 and 16
4 - 1/4 Section of T30, R22, Sec 15
5 - 1/4 Section of T30, R22, Sec 15
6 - 1/2 Section of T30, R22, Sec 10 and 15
7 - 1/2 Section of T30, R22, Sec 10
8 - Section of T30, R22, Sec 10 and 11
9 - Section of T30, R22, Sec 2 and 11
10 - 1/2 Section of T30, R22, Sec 2
11 - 1/2 Section of T30, R22, Sec 2
12 - Section of T30, R22, Sec 1 and 2
13 - Section of T30, R22, Sec 1 and Section of T31, R21, Sec 31 and 32
14 - 1/4 Section of T31, R21, Sec 32
15 - 1/2 Section of T31, R21, Sec 32, 33, and 34
16 - 1/4 Section of T31, R21, Sec 34
17 - Section of T31, R21, Sec 34 and Section of T30, R21, Sec 5
18 - 1/4 Section of T30, R21, Sec 5 and 8
19 - 1/4 Section of T30, R21, Sec 8
20 - 1/2 Section of T30, R21, Sec 8
21 - 1/4 Section of T30, R21, Sec 8
22 - Section of T30, R21, Sec 7 and 8
23 - Section of T30, R21, Sec 7 and 18
24 - Section of T30, R21, Sec 18 and Section of T30, R22, Sec 13
25 - Section of T30, R21, Sec 18 and 19
26 - 1/2 Section of T30, R21, Sec 19
27 - Section of T30, R21, Sec 19 and 30
28 - Section of T30, R21, Sec 30 and Section of T30, R22, Sec 25



Source: Centerville, Hugo, White Bear Lake East and White Bear Lake West 7.5-Minute USGS Quadrangles.

Prepared By:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and Environmental Engineering Services
8 Pine Tree Drive, Suite 250
St. Paul, MN 55112
651-490-1405

TKDA / WHITE BEAR TOWNSHIP

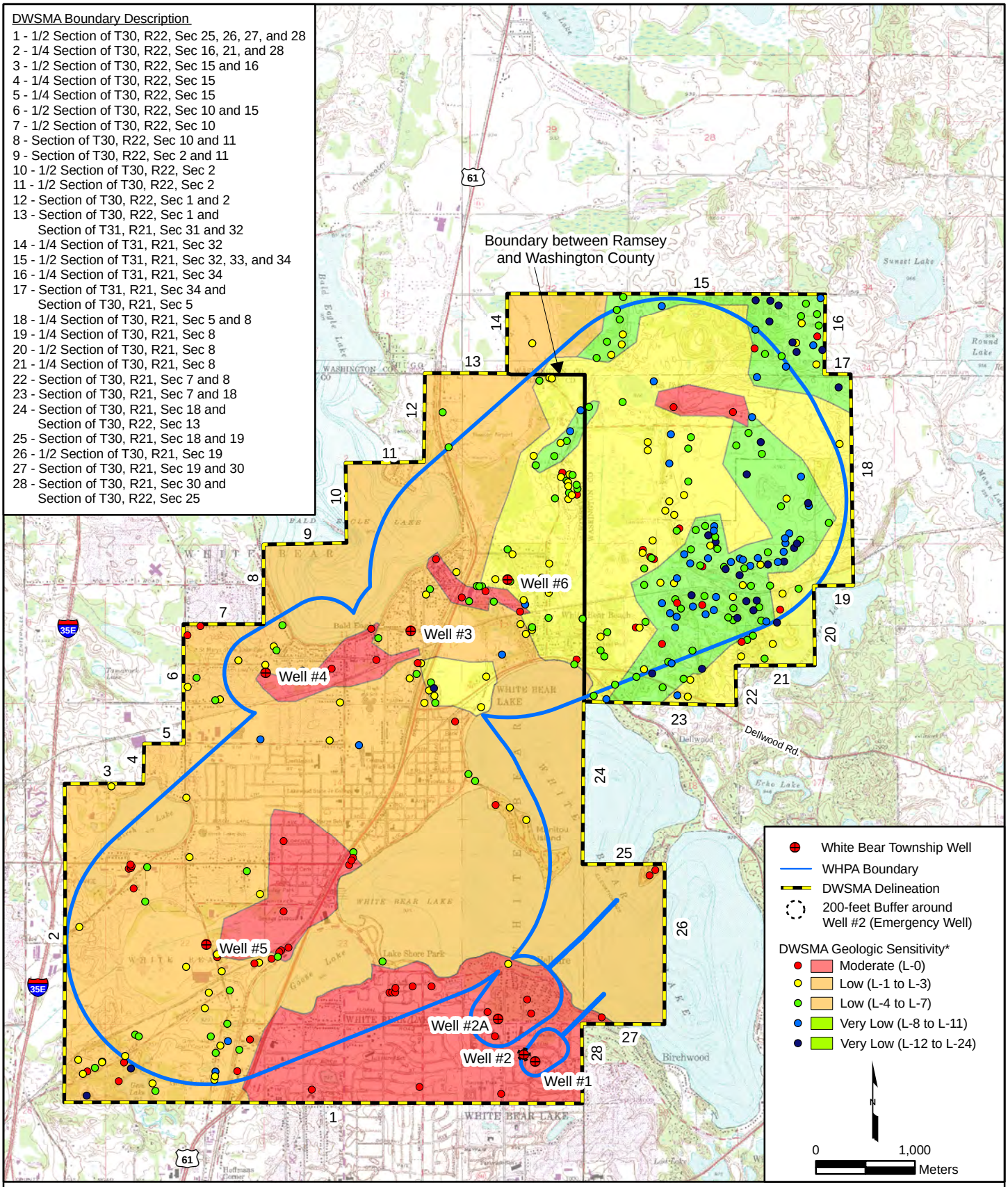
PART I WELLHEAD PROTECTION PLAN
WHITE BEAR TOWNSHIP, MINNESOTA

DWSMA DELINEATION

FILE: G3WBT01D.MXD	DATE: 01/04/2007	FIGURE: 13

DWSMA Boundary Description

1 - 1/2 Section of T30, R22, Sec 25, 26, 27, and 28
2 - 1/4 Section of T30, R22, Sec 16, 21, and 28
3 - 1/2 Section of T30, R22, Sec 15 and 16
4 - 1/4 Section of T30, R22, Sec 15
5 - 1/4 Section of T30, R22, Sec 15
6 - 1/2 Section of T30, R22, Sec 10 and 15
7 - 1/2 Section of T30, R22, Sec 10
8 - Section of T30, R22, Sec 10 and 11
9 - Section of T30, R22, Sec 2 and 11
10 - 1/2 Section of T30, R22, Sec 2
11 - 1/2 Section of T30, R22, Sec 2
12 - Section of T30, R22, Sec 1 and 2
13 - Section of T30, R22, Sec 1 and Section of T31, R21, Sec 31 and 32
14 - 1/4 Section of T31, R21, Sec 32
15 - 1/2 Section of T31, R21, Sec 32, 33, and 34
16 - 1/4 Section of T31, R21, Sec 34
17 - Section of T31, R21, Sec 34 and Section of T30, R21, Sec 5
18 - 1/4 Section of T30, R21, Sec 5 and 8
19 - 1/4 Section of T30, R21, Sec 8
20 - 1/2 Section of T30, R21, Sec 8
21 - 1/4 Section of T30, R21, Sec 8
22 - Section of T30, R21, Sec 7 and 8
23 - Section of T30, R21, Sec 7 and 18
24 - Section of T30, R21, Sec 18 and Section of T30, R22, Sec 13
25 - Section of T30, R21, Sec 18 and 19
26 - 1/2 Section of T30, R21, Sec 19
27 - Section of T30, R21, Sec 19 and 30
28 - Section of T30, R21, Sec 30 and Section of T30, R22, Sec 25



Source: Centerville, Hugo, White Bear Lake East and White Bear Lake West 7.5-Minute USGS Quadrangles, and Ramsey and Washington County Pollution Sensitivity maps (County Atlas Series).
*: DWSMA geologic sensitivity (L-scores) as determined by MDH using MN CWI data.

Prepared By:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and Environmental Engineering Services
8 Pine Tree Drive, Suite 250
St. Paul, MN 55112
651-490-1405

TKDA / WHITE BEAR TOWNSHIP

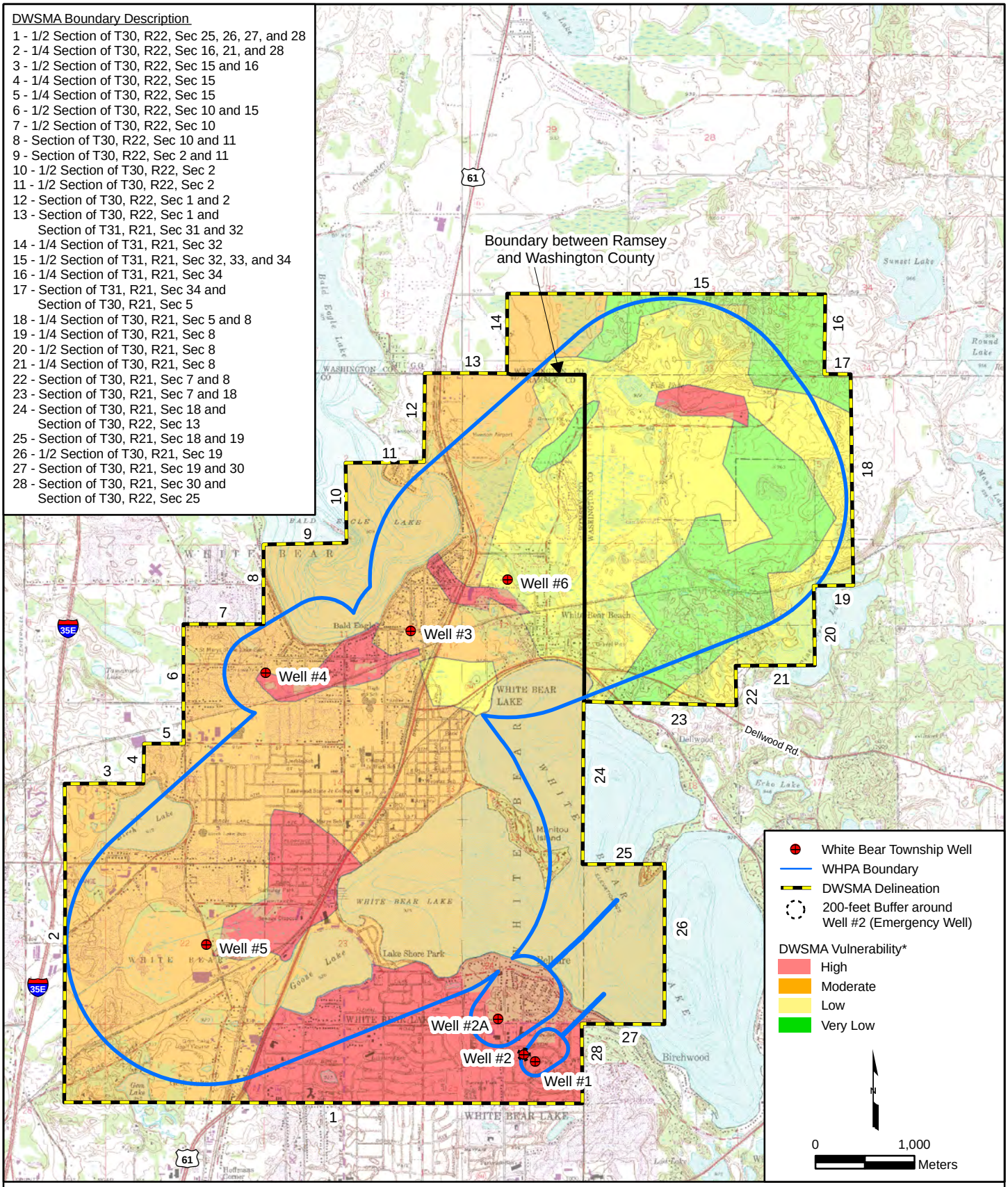
PART I WELLHEAD PROTECTION PLAN
WHITE BEAR TOWNSHIP, MINNESOTA

DWSMA GEOLOGIC SENSITIVITY ASSESSMENT

FILE: G3WBT01Y.MXD	DATE: 03/10/2009	FIGURE: 14

DWSMA Boundary Description

1 - 1/2 Section of T30, R22, Sec 25, 26, 27, and 28
2 - 1/4 Section of T30, R22, Sec 16, 21, and 28
3 - 1/2 Section of T30, R22, Sec 15 and 16
4 - 1/4 Section of T30, R22, Sec 15
5 - 1/4 Section of T30, R22, Sec 15
6 - 1/2 Section of T30, R22, Sec 10 and 15
7 - 1/2 Section of T30, R22, Sec 10
8 - Section of T30, R22, Sec 10 and 11
9 - Section of T30, R22, Sec 2 and 11
10 - 1/2 Section of T30, R22, Sec 2
11 - 1/2 Section of T30, R22, Sec 2
12 - Section of T30, R22, Sec 1 and 2
13 - Section of T30, R22, Sec 1 and Section of T31, R21, Sec 31 and 32
14 - 1/4 Section of T31, R21, Sec 32
15 - 1/2 Section of T31, R21, Sec 32, 33, and 34
16 - 1/4 Section of T31, R21, Sec 34
17 - Section of T31, R21, Sec 34 and Section of T30, R21, Sec 5
18 - 1/4 Section of T30, R21, Sec 5 and 8
19 - 1/4 Section of T30, R21, Sec 8
20 - 1/2 Section of T30, R21, Sec 8
21 - 1/4 Section of T30, R21, Sec 8
22 - Section of T30, R21, Sec 7 and 8
23 - Section of T30, R21, Sec 7 and 18
24 - Section of T30, R21, Sec 18 and Section of T30, R22, Sec 13
25 - Section of T30, R21, Sec 18 and 19
26 - 1/2 Section of T30, R21, Sec 19
27 - Section of T30, R21, Sec 19 and 30
28 - Section of T30, R21, Sec 30 and Section of T30, R22, Sec 25



Source: Centerville, Hugo, White Bear Lake East and White Bear Lake West 7.5-Minute USGS Quadrangles, and Ramsey and Washington County Pollution Sensitivity maps (County Atlas Series).
*: DWSMA vulnerability as delineated by MDH.

Prepared By:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Ground-Water and Environmental Engineering Services
8 Pine Tree Drive, Suite 250
St. Paul, MN 55112
651-490-1405

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PART I WELLHEAD PROTECTION PLAN
WHITE BEAR TOWNSHIP, MINNESOTA

DWSMA VULNERABILITY ASSESSMENT

FILE: G3WBT01X.MXD	DATE: 03/10/2009	FIGURE: 15

APPENDIX I

RSWCD Draft Report

WELLHEAD PROTECTION PLAN SUBMITTAL, WHITE BEAR TOWNSHIP, MINNESOTA:

Part I:

Wellhead Protection Areas, Drinking Water Supply Management Areas, and Vulnerability Assessment

July 2003

Prepared for
White Bear Township
1281 Hammond Road
White Bear Township, MN 55110

Prepared by
Ramsey Soil and Water Conservation District
2015 Rice Street
Roseville, MN 55113

JUL 1 4 2003
Source Water Protection Unit

I hereby certify that this plan, document, or 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.

Signature: _____ Typed or Printed Name: Matthew A. Swanson

Date: 10 JUL 03 Reg. No.: 40030

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MODFLOW Model Input Files
TCAAP Draft Fiscal Year 2002 Annual Performance Report

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SECTION 1

INTRODUCTION AND BACKGROUND

This Wellhead Protection (WHP) submittal was prepared by the Ramsey Soil and Water Conservation District (RSWCD) on behalf of White Bear Township (hereafter referred to as "WBT" or "the township").

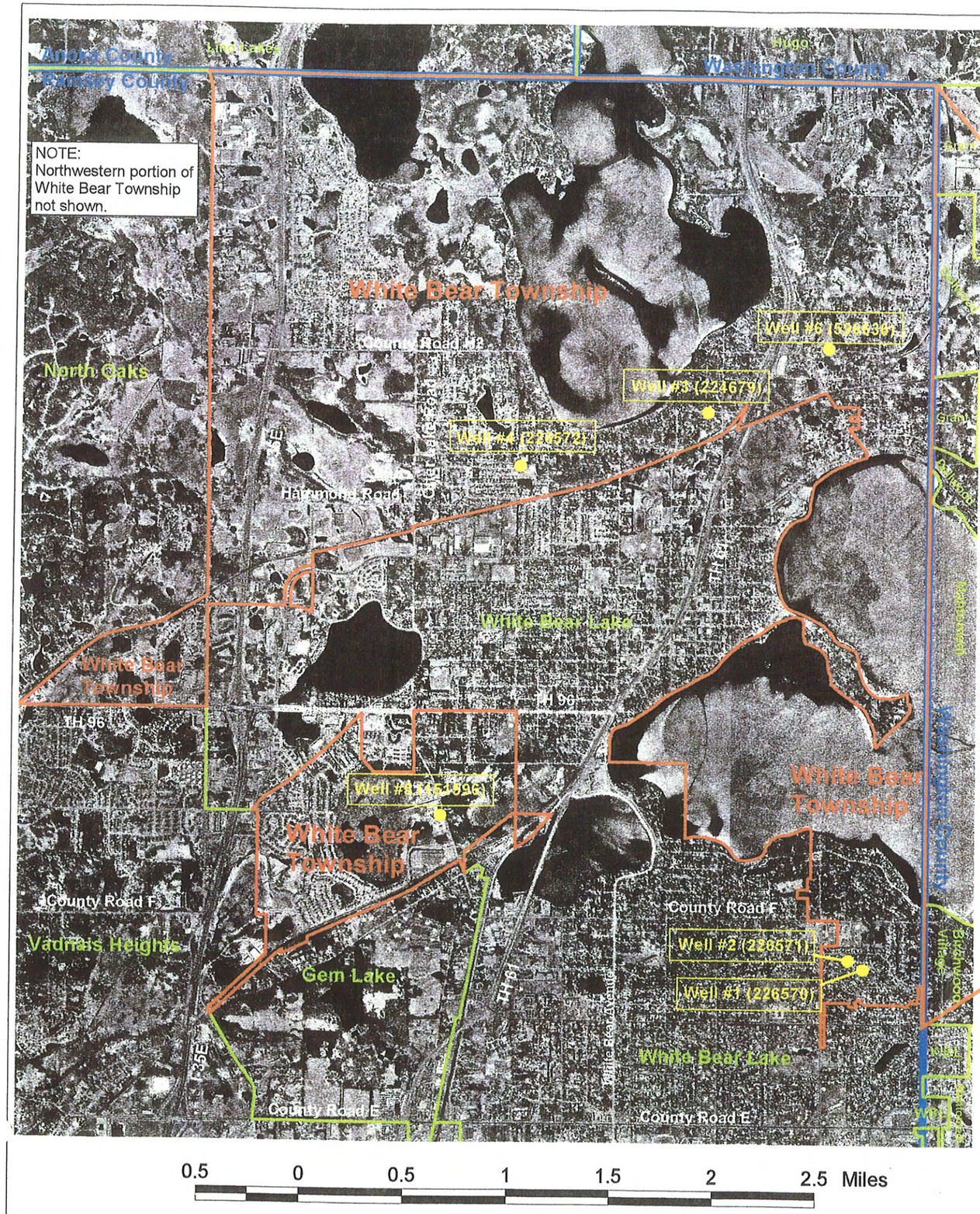
This plan applies to the following City water supply wells:

City Well No. 1 – Unique No. 226570
City Well No. 2 – Unique No. 226571
City Well No. 3 – Unique No. 224679
City Well No. 4 – Unique No. 226572
City Well No. 5 – Unique No. 151596
City Well No. 6 – Unique No. 596636

Locations of the township and the wells are shown on Figure 1.1.

1.1 Scope and Purpose

WHP is a pollution prevention and management strategy for protecting underground drinking water supplies. The 1986 amendments to the Federal Safe Drinking Water Act require states to implement WHP for public water supply wells. The 1989 Minnesota Groundwater Protection Act delegated the Minnesota Department of Health (MDH) the responsibility for developing WHP rules and a statewide WHP program mandating public water suppliers (PWS) who supply their constituents with water obtained from wells to develop and implement WHP programs. The United States Environmental Protection Agency (EPA) approved the MDH's WHP program in March 1996, and the final WHP rules were implemented on November 3, 1997. WHP requirements are found in Minnesota Rules, parts 4720.5100 to 4720.5590.



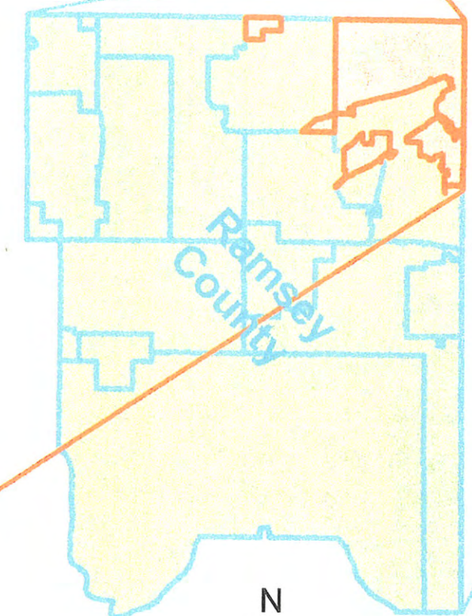


FIGURE 1.1
Location Map
White Bear Township
Wellhead Protection Plan

Ramsey Soil & Water Conservation District
Groundwater Program

The goal of a WHP program is to prevent contaminants that may have acute or chronic adverse impacts on human health from entering public water supply wells. WHP Plans also include an emergency planning component that outlines remedial action measures to be taken in the event a well cannot be used due to contamination or other circumstances. As part of the WHP process, wellhead protection areas (WHPAs) must be delineated. The EPA defines a WHPA as "the surface and subsurface area surrounding a water well or well field, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or well field". The purpose of a WHPA is to define the area of an aquifer(s) that provides water to a public well and to assist identifying and managing potential contamination sources within this limited geographic area.

White Bear Township uses six wells to supply its residents with potable water. Four of the wells (#3, #4, #5, and #6) are open to the Prairie du Chien-Jordan (Opcj) aquifer, and the other two (#1 and #2) are open only to the Jordan Formation (Cj). The Opcj aquifer is the most heavily used aquifer for public water supply in the Twin Cities metropolitan area.

The Opcj aquifer is semi-confined to confined within White Bear Township and throughout much of Twin Cities area, being covered by other bedrock units or significant thicknesses of glacial deposits. As a result, much of the recharge to the Opcj aquifer occurs outside of the most developed portions of the Twin Cities Metropolitan area. However, some recharge does reach the Opcj aquifer from the land surface within the central portions of the metro area, and there are always potential conduits for contaminants to move vertically into the Opcj aquifer, such as unused or abandoned wells. As a result, WHP planning is a means by which the Township can:

- delineate zones of contribution to the Township's wells by computing WHPAs and delineating drinking water supply management areas (DWSMAs);
- evaluate the vulnerability of the DWSMAs to contaminants released at the ground surface;
- inventory the current and historical sources of potential contamination within the DWSMAs; and

- outline how the City will use planning tools to address any concerns regarding management of potential contaminant sources in the DWSMAs.

This document will address the fist two items in the list above. Following public presentation and MDH approval of this document, a second document (a management plan) will be prepared to address the remaining items.

White Bear Township was formally notified by the MDH of the need to begin WHP planning in April 2001. The initial scoping meeting for this effort was on September 18, 2001, and was attended by representatives from the Township, MDH, and the Ramsey SWCD. A letter from MDH dated October 1, 2001 describing the results of that meeting is included in Appendix A.

1.2 Organization of this Document

Section 2 will briefly present basic data elements that will be used for various parts of the WHP planning process. Section 3 will briefly summarize the development of the groundwater flow model used to compute the WHPAs. Section 4 will present results of the WHPA and DWSMA delineations, while section 5 will present the vulnerability assessments. Section 6 lists the references used in preparing this document. Appendices A, B, and C contain specific information used to support the elements presented in Sections 2 through 5 of this report.

SECTION 2

REVIEW OF RELEVANT DATA

The WHP rules require that the MDH select data elements to be used in a WHP plan on the basis of the hydrogeologic setting and vulnerability of the wells and the DWSMAs, as known at the time of the scoping meeting. Appendix A contains the October 1, 2001 letter that outlines the data elements selected for White Bear Township. Certain of these elements are not needed for the activities documented in this report. Elements that are required for this Part I report include:

- geologic and hydrogeologic data needed to describe aquifers, confining layers, recharge areas, and groundwater flow characteristics;
- maps of parcel boundaries, political boundaries, and public land survey (PLS) data;
- records of construction, maintenance, and use of the public supply wells and other wells within the DWSMA;
- streamflow data, if needed;
- data on any known water-use conflicts and/or well interference issues;
- pumping data for wells in the vicinity of the WBT wells; and
- any relevant water quality data.

While the amount of data needed to meet these requirements could be quite large, the Scoping Decision Notice notes that only data not otherwise available to MDH (e.g., not available in the public domain) must be submitted. Nearly all of these data elements are already available to the MDH, but those elements most relevant to the discussion in this report will still be presented along with those data not readily available to the MDH.

2.1 Geologic and Hydrogeologic Setting

2.1.1 Regional Geology and Hydrogeology

Because the Twin Cities area is a major population center and because many of its communities rely on groundwater for potable water supply, the geology and hydrogeology of the Twin Cities area has been described in many documents. Some of the sources reviewed for this report include: Guswa, *et al.*, 1982; Delin and Woodward, 1984; Schoenberg, 1990; RSWCD, 1996; Meyer and Swanson, 1992; Meyer and Patterson, 1999; Meyer and Lusardi, 2000; and Mossler and Tipping, 2000. A brief summary is provided for the context of this report.

In the Twin Cities area, there are three general types of geologic units: Precambrian volcanic and crystalline rocks, late Precambrian and Paleozoic sedimentary rocks, and Quaternary unconsolidated deposits. Much of the Twin Cities metropolitan area lies in structural depression (the Twin Cities Basin), which lies in a larger-scale geologic structure known as the Hollandale embayment, which is another form of depression. These depressions are developed on Precambrian volcanic and crystalline rocks that are deep below the ground surface in the central metro area.

During the late Precambrian and early Paleozoic Eras, the Twin Cities Basin was covered with sediments deposited by a series of shallow seas. The sedimentary rocks remaining in the basin are up to 1,000 feet thick in some places, although the thickness generally decreases away from the center of the Twin Cities Basin, which is beneath Minneapolis. While deposition in the region may have continued beyond the Devonian Period, an extended time of non-deposition and/or erosion prior to the Quaternary Era has left only the Devonian and older rock behind. During the time of nondeposition/erosion, an extensive and well-developed drainage system developed. As a result, the upper surface of the Paleozoic sequence was further affected by erosion of ancient river valleys, which in several locations removed one or

more bedrock units. Due to the shape of the Twin Cities basin, the bedrock units are not horizontal, but dip very gently towards the center of the basin, creating what could be described as a broad "bowl" with very gently sloped sides.

During the Quaternary, a series of continental glaciers advanced and retreated across the metropolitan area. Glacial activity both eroded existing materials and deposited new sequences of sediments. Glacial till, which is an unsorted mix of silt, clay, sand, and larger material, was deposited beneath and immediately adjacent to the ice. Rivers of meltwater deposited sand and gravel, known as outwash. Multiple periods of glacial activity resulted in a complex distribution of glacial deposits, both vertically and horizontally. Many of the ancient valleys were filled with glacial deposits and thus are not apparent at the surface. During the glacial events, the ancestral Mississippi and Minnesota Rivers cut through glacial deposits (and bedrock), leaving wide river valleys with associated fluvial deposits.

Within this geologic framework are five regional aquifers. Four of the five regional aquifers are found within the Paleozoic sequence of rocks, with the fifth including all water-bearing units in the glacial drift (Table 2.1). The four bedrock units are the Mount Simon-Hinckley, the Ironton-Galesville, the Prairie du Chien-Jordan, and the St. Peter aquifers. The Platteville formation is discontinuous and is only locally a productive water-bearing unit. The Mount Simon-Hinckley and the Ironton-Galesville aquifers are beneath a major confining unit (the St. Lawrence Formation) and in the central Twin Cities area are not commonly used for most applications. The Prairie du Chien-Jordan (Opcj) aquifer is the most heavily used regional aquifer in the central portion of the Twin Cities metropolis, and it is the aquifer to which the WBT wells are open. The St. Peter is also present as discontinuous erosional remnants, although it is somewhat more continuous than the Platteville Formation and is often a suitable source of water.

Table 2.1
Generalized Geologic and Hydrogeologic Units
Twin Cities Metropolitan Area, Minnesota

Geologic Formation	Hydrologic Units	Approximate Thickness (ft)	Description	Water Bearing Characteristics
Undifferentiated Glacial Drift and Alluvium	Drift or Alluvial Aquifer	0 to 600	Glacial drift and alluvial materials vary considerably in lateral extent, thickness and composition over the entire metropolitan area. Fluvioglacial outwash materials and river alluvium can be among the most coarse of the materials, commonly containing a large fraction of sand and gravel. Tills and lacustrine deposits make up the fine-grained end of the spectrum. All exhibit intergranular porosity, and some tills may contain fractures with the capacity to transmit fluid.	Variable depending on the materials. Hydrologic boundaries include infiltration at the ground surface, surface water bodies of all kinds, and boundaries imposed by heterogeneity of host materials.
Platteville/Glenwood	Variable	0 to 33	Fine-grained dolostone and limestone of Platteville Formation is underlain by thin, green sandy shale of Glenwood Formation. Where deeply buried by younger bedrock, the Platteville may serve as an effective confining unit, but in areas where it subcrops or is only shallowly buried, the development of substantial secondary porosity allows the unit to transmit water readily.	Platteville exhibits bedding plane fractures that are locally very productive. Glenwood is typically a thin but effective confining unit. Hydrologic boundaries are locally at the edge of the outcrop area, typically near pre-glacial bedrock valleys.
St. Peter Sandstone	St. Peter Aquifer	0 to 170	The St. Peter Sandstone is present mainly in the central part of the Twin Cities metropolitan area and, where its full thickness is present, is approximately 150 to 170 feet thick. The St. Peter consists of fine to medium grained quartz sandstone, except for the lower parts that contain interbeds of coarse sandstone and mudstone, siltstone and shale. Intergranular porosity usually dominates.	Transmits water as a porous medium, generally at yields less than 100 gpm, and so consequently is not typically used for large capacity industrial or municipal supply applications. Basal portion can be quite fine-grained and acts as a confining unit. Hydrologic boundaries are locally at the edge of the outcrop area, typically near pre-glacial bedrock valleys.
Prairie du Chien Group	Prairie du Chien–Jordan Aquifer System	0 to 300	The Prairie du Chien Group is as much as 300 feet thick in some parts of the Dakota County, but in most parts of the Twin Cities area is about 100 to 200 feet thick. The Prairie du Chien is absent in western Carver County, western and northern Hennepin County, most of Anoka County and extreme northwest Washington County. It is commonly subdivided into two formations in the Twin Cities area: the upper two thirds being the Shakopee Formation and the lower one-third being the Oneota Dolomite. The Shakopee consists of thin to medium beds of dolomudstone, oolitic dolostone, shale, sandy dolostone, and minor amounts of siliciclastic sandstone. The Oneota is primarily thick beds of very fine-grained dolostone (Runkel and others, 1999).	Secondary porosity features such as fractures and solution-enhanced cavities impart most of the Prairie du Chien's permeability. Most of these features are developed in the Shakopee in all but the most shallow bedrock environments. The Oneota is considered a likely confining unit in many local settings, except where shallow burial may have subjected it to stress-relief and weathering fractures. The Prairie du Chien can provide considerable amounts of flow (in excess of 1500 gpm) to wells. Most major rivers and some of the largest and deepest lakes serve as hydrologic boundaries.

Table 2 - Continued

Geologic Formation	Hydrologic Units	Approximate Thickness (ft)	Description	Water Bearing Characteristics
St. Lawrence Formation	St. Lawrence Confining Unit	0 to 59	This formation conformably overlies the Franconia. It is mainly composed of dolomitic siltstone and very fine sandstone of the Lodi Member of the St. Lawrence. It has a maximum thickness of 65 feet (Mossler, 1972).	The St. Lawrence is typically considered a confining unit that retards the vertical migration of groundwater, especially in deep bedrock conditions. In shallow bedrock conditions, however, the development of secondary porosity features can impart significant horizontal flow, but other sections with minimal development of secondary porosity features may serve locally as confining units.
Franconia Formation	Franconia–Ironton–Galesville Aquifer System	0 to 160	The Franconia Formation is generally composed of very fine to fine-grained, glauconitic sandstones and siltstones. The upper portion of this formation is comprised of coarser, non-glauconitic sandstones, collectively termed the Mazomanie Member, which is most common in the northern and northeastern parts of the Twin Cities area. The thickness of the Mazomanie varies from approximately 40 feet in the southern portion of Anoka County to approximately 125 feet at its northeastern corner; the Franconia as a whole correspondingly increases in thickness from approximately 140 feet to 180 feet (Runkel, 1995).	The hydraulic character of the Franconia varies considerable over the Twin Cities metropolitan area. This variability is due to 1) lithostratigraphic changes (i.e., preponderance of coarse-grained Mazomanie in some parts of area) and 2) propensity for development of hydraulically active fractures in shallow environments. Lower Franconia can be confining and may even effectively isolate upper Franconia and Ironton-Galesville in some areas. Hydraulic boundaries exist where incised by rivers (e.g., St. Croix, Mississippi in southwest Anoka County) and where it subcrops and is overlain by saturated unconsolidated materials.
Ironton and Galesville Sandstones		0 to 65	The Galesville Sandstone unconformably overlies the Eau Claire. Both the Galesville and Ironton Sandstones are medium-grained quartzose sandstones. Their aggregate thickness is 35 to 65 feet in the Twin Cities Basin. Because of their similar hydraulic properties and lack of separating layer, these sandstones are regarded as a single aquifer.	Considered a major aquifer in areas beyond the limits of the Prairie du Chien – Jordan. Flow is typically considered to be chiefly through intergranular pore spaces. Hydraulic boundaries are to the north and west, at the units erosional boundaries, in deep bedrock valleys where overlying bedrock has been eroded away, and to the east where it is cut by the St. Croix. Also likely discharges to Minnesota River in southwest Scott County and to Mississippi River in southwest Anoka County.

Table 2 - C nued

Geologic Formation	Hydrologic Units	Approximate Thickness (ft)	Description	Water Bearing Characteristics
Eau Claire Formation	Eau Claire Confining Unit	0 to 150	The Mt. Simon conformably grades upward into the Eau Claire Formation, which is composed of glauconitic siltstones, very fine-grained sandstones and a green shale. Where deeply buried by bedrock porosity is mostly intergranular, but in shallow environments stress-relief fractures may develop. The formation is approximately 100 to 125 feet thick and is mostly continuous laterally over all of the Twin Cities Basin.	The Eau Claire Formation is generally considered to act as an effective confining unit, especially in deep bedrock conditions, between the Mt. Simon and Ironton-Galesville. In shallow bedrock conditions, fracture networks can locally provide water for domestic wells.
Mt. Simon Sandstone	Mt. Simon–Hinckley Aquifer	0 - 280	The Mt. Simon Sandstone directly overlies the Hinckley with no intervening confining unit. The Mt. Simon is a mostly medium- to coarsely-grained, friable quartzose sandstone. It is generally about 250 feet thick along the western margin of the Twin Cities Basin and thins to the east. The upper portion of this unit contains interbeds of coarse and fine clastic strata that may be up to 30 feet thick.	Used as a major aquifer in the Twin Cities metropolitan area, especially where the Jordan is absent. In deep bedrock settings, primary intergranular porosity contributes chiefly to unit's hydraulic conductivity. Fine-grained interbeds in the upper part of section may be locally confining. Few hydrologic boundaries in the Twin Cities area include the St. Croix River and the Minnesota in southwestern Scott County.
Hinckley Sandstone			The Hinckley Sandstone is a quartzose sandstone that directly overlies the Keweenawan red beds. It is lithologically similar to the overlying Mt. Simon Sandstone and appears to be differentiated in this area primarily by being involved in late Keweenawan faulting.	Where present, the Hinckley can be difficult to distinguish from the Mt. Simon, and likely behaves as a hydrostratigraphically similar unit.

In the Twin Cities area, groundwater flow within the major regional aquifers (e.g., the Prairie du Chien-Jordan and deeper units) is generally from recharge areas near the limits of the Twin Cities basin (where these units are closest to the ground surface) towards the interior of the "bowl", where the bedrock units are found at the lowest elevations. In Ramsey County and adjacent portions of Hennepin County (east of the Mississippi River), this means that flow in the regional aquifers is typically to the south or southwest, except near the Mississippi River, especially for the Opcj aquifer. This is because the Mississippi River is a regional hydraulic boundary for the Opcj, so that near the river, flow in the Opcj is directed towards the river.

In the shallower aquifers (the St. Peter and the glacial drift), groundwater flow directions are more variable. This is because of the discontinuous nature of the St. Peter Formation, as well as the controls on flow exerted by surface water features.

2.1.2 Local Geology and Hydrogeology

In the vicinity of White Bear Township, the depth to bedrock varies between 30 to 200 feet, with the maximum depth to the west and south of well #5. The minimum depth is in the vicinity of wells #1 and #2, where the Platteville and Glenwood Formations are present (Meyer and Swanson, 1992). As listed in the County Well Index, the depths to bedrock at wells #1 and #2 is about 32 to 45 feet, while at well #5 the depth to bedrock is about 190 feet. At wells #3, #4, and #6, the depths to bedrock are about 150 feet, 165 feet, and 141 feet, respectively. Figure 2.1 shows a map of the surficial geology in the vicinity of White Bear Township, and Figure 2.2 shows the bedrock geology and topography. Figure 2.3 presents a cross-section through northeastern Ramsey County (including portions of White Bear Township), showing the general vertical distribution of glacial deposits.

Note: Northwestern portion of White Bear Township not shown.

Lino Lakes
Hugo
Grant
White Bear Township
Well #6 (596636)
Well #3 (224679)
Well #4 (226572)
North Oaks
Grant
Dellwood
White Bear Lake
Well #5 (151596)
Vadnais Heights
White Bear Township
White Bear Township
Mahtomedi
Well #2 (226571)
Well #1 (226570)
Gem Lake
White Bear Lake
Birchwood Village

- White Bear Township Wells
- White Bear Township Boundaries
- Municipal Boundaries
- County Boundaries
- Roads

Surficial Geology

- Lacustrine Deposits
- Richfield Terrace
- Organic sediment or peat
- Organic Deposits
- New Brighton Fm; sand facies
- New Brighton Fm; silt & clay facies
- New Ulm Fm; lake sand (Des Moines)
- New Ulm Fm; outwash (Des Moines)
- New Ulm Fm; Twin Cities Member
- New Ulm Fm; Loam Till (Des Moines)
- New Ulm Fm; sandy till (Des Moines)
- Till under sandy lake sediment
- Loamy till w/stream-mod. surface
- Loamy till under stream sediment
- Cromwell Fm; Lake sand & silt (Superior)
- Cromwell Fm; Outwash (Superior)
- Cromwell Fm; Till (Superior)
- Cromwell Fm; Ice-contact (Superior)
- Cromwell Fm; Till & sand complex (Superior)
- Lake or Stream

(Sources: Hobbs, 1999; Meyer, 1999.)

N

0.3 0 0.3 0.6 0.9 1.2 1.5 Miles

500 0 500 1000 1500 2000 Meters

FIGURE 2.1
Surficial Geology
White Bear Township
Wellhead Protection Plan

Ramsey Soil & Water Conservation District
Groundwater Program

Note: Northwestern portion of White Bear Township not shown.

Lino Lakes
Hugo
Grant
White Bear Township
North Oaks
Dellwood
White Bear Lake
Vadnais Heights
Mahtomedi
Gem Lake
Birchwood Village

Well #6 (596636)
Well #3 (224679)
Well #4 (226572)
Well #5 (151596)
Well #2 (226571)
Well #1 (226570)

- White Bear Township Wells
- White Bear Township Boundaries
- Municipal Boundaries
- County Boundaries
- Roads
- Bedrock Topography (contour interval = 50 feet)

Bedrock Geology

- Decorah Shale
- Platteville & Glenwood Fms.
- St. Peter Sandstone
- Prairie du Chien Group
- Jordan Sandstone

(Source: Mossler and Tipping, 2000.)

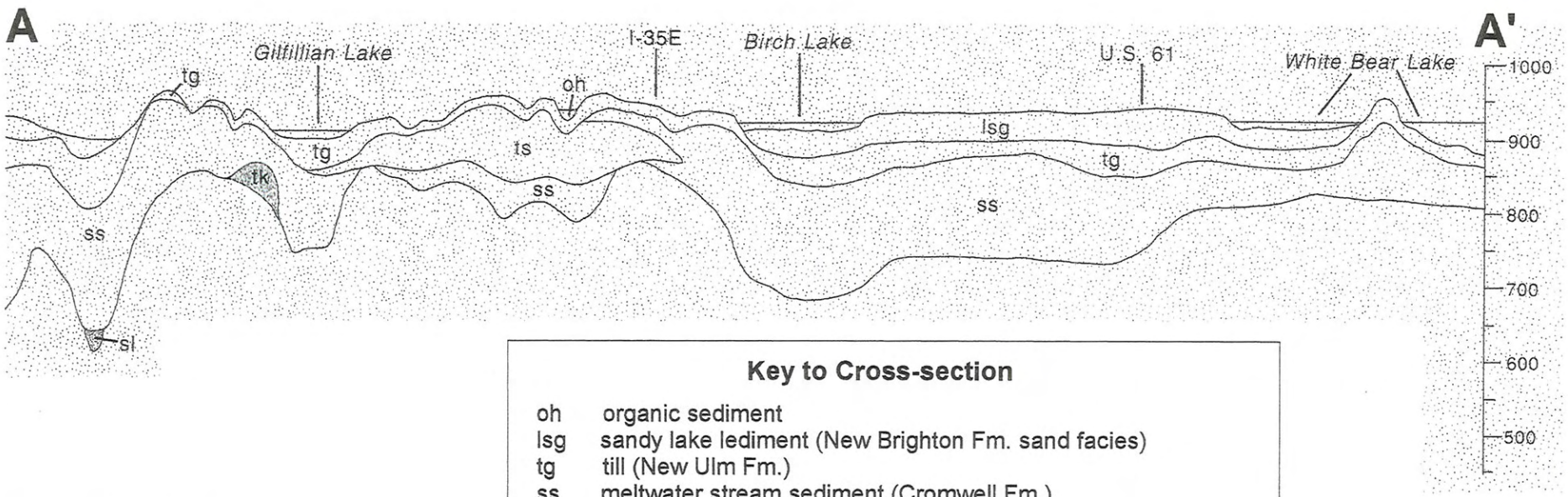
N

0.2 0 0.2 0.4 0.6 0.8 1 Miles

400 0 400 800 1200 1600 2000 Meters

FIGURE 2.2
Bedrock Geology and Topography
White Bear Township
Wellhead Protection Plan

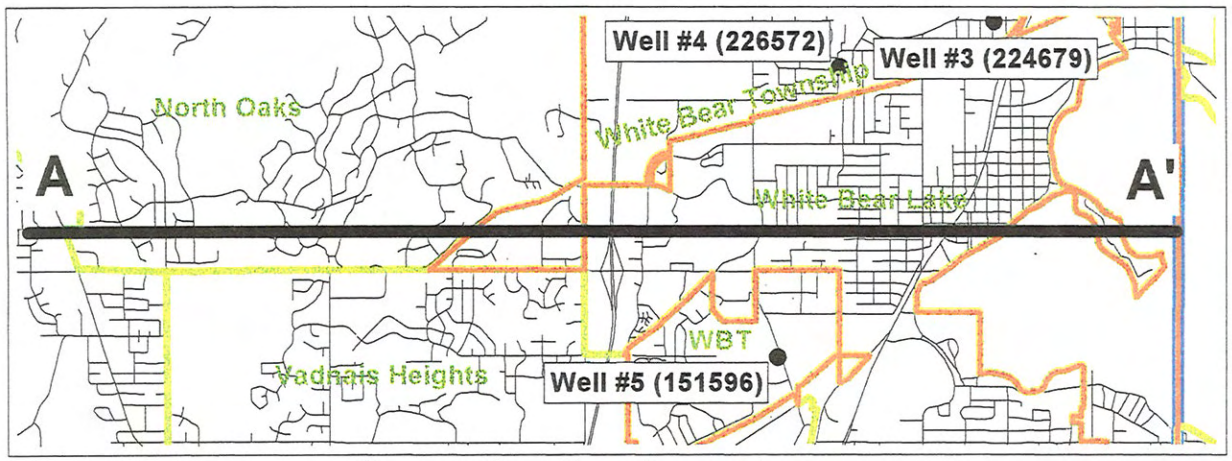
Ramsey Soil & Water Conservation District
Groundwater Program



Key to Cross-section

oh	organic sediment
lsg	sandy lake lediment (New Brighton Fm. sand facies)
tg	till (New Ulm Fm.)
ss	meltwater stream sediment (Cromwell Fm.)
tk, sl	older glacial deposits (before most recent glacial advances)

Cross-section source:
Meyer and Swanson, 1992



Cross-Section Location

FIGURE 2.3

Regional Cross-section of Glacial Deposits

White Bear Township
Wellhead Protection Plan

Ramsey Soil & Water Conservation District
Groundwater Program

Glacial deposits overlying the bedrock in the vicinity of White Bear Township include lake sediment (generally sandy), glacial till, and glacial outwash. Till refers to the materials deposited directly from the glacial ice. This material is not sorted and so it tends to contain particle sizes ranging from clay to boulders. In the WBT area, there are two main till units: the New Ulm Formation (younger till from the Des Moines ice lobe) and the Cromwell Formation (older till from the Superior ice lobe). Till from the Des Moines lobe generally is gray to brown, while the Superior till is reddish. These colors often are noted on drillers' logs. Glacial outwash is material that is sorted and deposited by running water, and is usually sandy.

As shown on the surficial geology map (Figure 2.1), the deposits at the ground surface in the vicinity of the Township wells are generally lake sediments, except in the vicinity of wells #1 and #2. In the vicinity of wells #1 and #2, till is present at the surface (listed as "hardpan" and "yellow gravel" in the County Well Indix [CWI] logs). In the vicinity of wells #3, #4, and #6, till lies beneath a thin mantle of lake sediments. As shown on Figure 2.3, a typical section might include older stream deposits overlain by glacial till, which is in turn overlain by younger sandy lake deposits. However, the upper sandy lake deposits are not present everywhere, and they may be thin where they are present. While this cross-section is somewhat generalized, the main point it illustrates is that there is till in the subsurface. This is important because the presence of fine material in the till helps limit vertical migration of groundwater (and, potentially, contaminants).

The Washington County Geologic Atlas (Swanson and Meyer, 1990) presents a cross-section that suggests older glacial till is present beneath the Superior till in the vicinity of Birchwood, which is near WBT wells #1 and #2. Another study of surficial geology (Meyer, 1985) presents a north-south cross –section along the Ramsey – Washington County line. This section suggests that there is a significant thickness of Superior till in the vicinity of WBT, similar to that indicated by the east – west cross-section in the Ramsey County Atlas.

In the vicinity of the WBT wells, the Prairie du Chien Group (Opdc) averages around 130 feet (40 m) thick, while the Jordan Formation is between 75 and 97 feet thick (although the bottom of the formation was not always logged). As shown on Figure 2.2, the St. Peter Sandstone is absent in a sinuous band that outlines the location of a bedrock valley. The location of this valley is roughly indicated by the configuration of the Opdc map unit. Wells #3, #4, and #5 are on the margins of this valley, while well #6 is in an area where the St. Peter is present in significant thickness. Only in the vicinity of wells #1 and #2 are the Platteville and Glenwood Formations present above these units.

The Platteville and Glenwood formations are present in the vicinity of wells #1 and #2, with the Glenwood being a regional confining unit. In addition, where the St. Peter Sandstone is present the basal portion of that unit, which contains siltstone and shale units, also acts as a confining unit. Where the St. Peter is absent, the Prairie du Chien has no overlying bedrock confining units (Figure 2.2). This is also where glacial deposits are thickest; however, the till in this area is not as clayey as tills in the northwestern portion of Ramsey County (Meyer and Swanson, 1992). As a result, the Opcj Aquifer in these areas may be semi-confined and more vulnerable to vertically migrating contaminants. Given these geologic conditions, the Opcj aquifer in the vicinity of White Bear Township is confined to semi-confined. These conditions mean that surface water and streamflow data are not needed for model calibration and WHPA calculation.

In general, groundwater flow in the Opcj aquifer in the vicinity of White Bear Township is towards the southwest. Data on flow directions in the St. Peter aquifer are not available. Regional gradients are generally around 0.001 (m/m), but may be locally affected by large-scale pumping. For the glacial aquifer(s), both the Ramsey County and Washington County Geologic Atlases (Swanson and Meyer, 1990 and Meyer and Swanson, 1992) indicate a regional flow

direction to the west and northwest. Locally, the flow directions are likely to be more variable due to the influence of surface water or local confining units.

2.2 Effects of Nearby Groundwater Pumping

Groundwater flow directions in the Opcj near the WBT wells might be affected by pumping from adjacent wells. Figure 2.4 shows locations of public water supply wells and wells listed in the DNR SWUDS database for the area around White Bear Township. Figure 2.4 also shows a 1-mile buffer zone around each well to show which other wells are near the WBT wells.

There is only 1 well within a mile of WBT wells #1 and #2 – the City of Mahtomedi's well 5, which is open to the Opcj. From 1997 to 2001, 31 to 56 million gallons per year (MGY) were withdrawn from this well (similar to the magnitude of withdrawal from WBT #1). This well is cross-gradient from the WBT wells, and given the amount pumped from all of the wells, is unlikely to produce any significant interference effects. There are no wells within 1 mile of WBT wells #3 and #4, while there are two wells within 1 mile of WBT well #6. These 2 wells are for the Dellwood Hills Golf Club, and both are open to the Opcj. These wells pumped from 1.8 to 10.7 MGY from 1997 through 2001.

Given the locations and pumping rates for wells within 1 mile of any of the WBT wells, it is unlikely that there will be any well interference problems. There is no other available evidence of such problems.

2.3 Aquifer Testing and Pumping Volumes

For the purposes of creating a groundwater flow model, the aquifer transmissivity and/or hydraulic conductivity must be identified. These hydraulic parameters (and others) may be determined via pumping tests or by examining test results from other wells in similar settings. Also important is a determination of pumping volumes that will be representative for the subject wells.

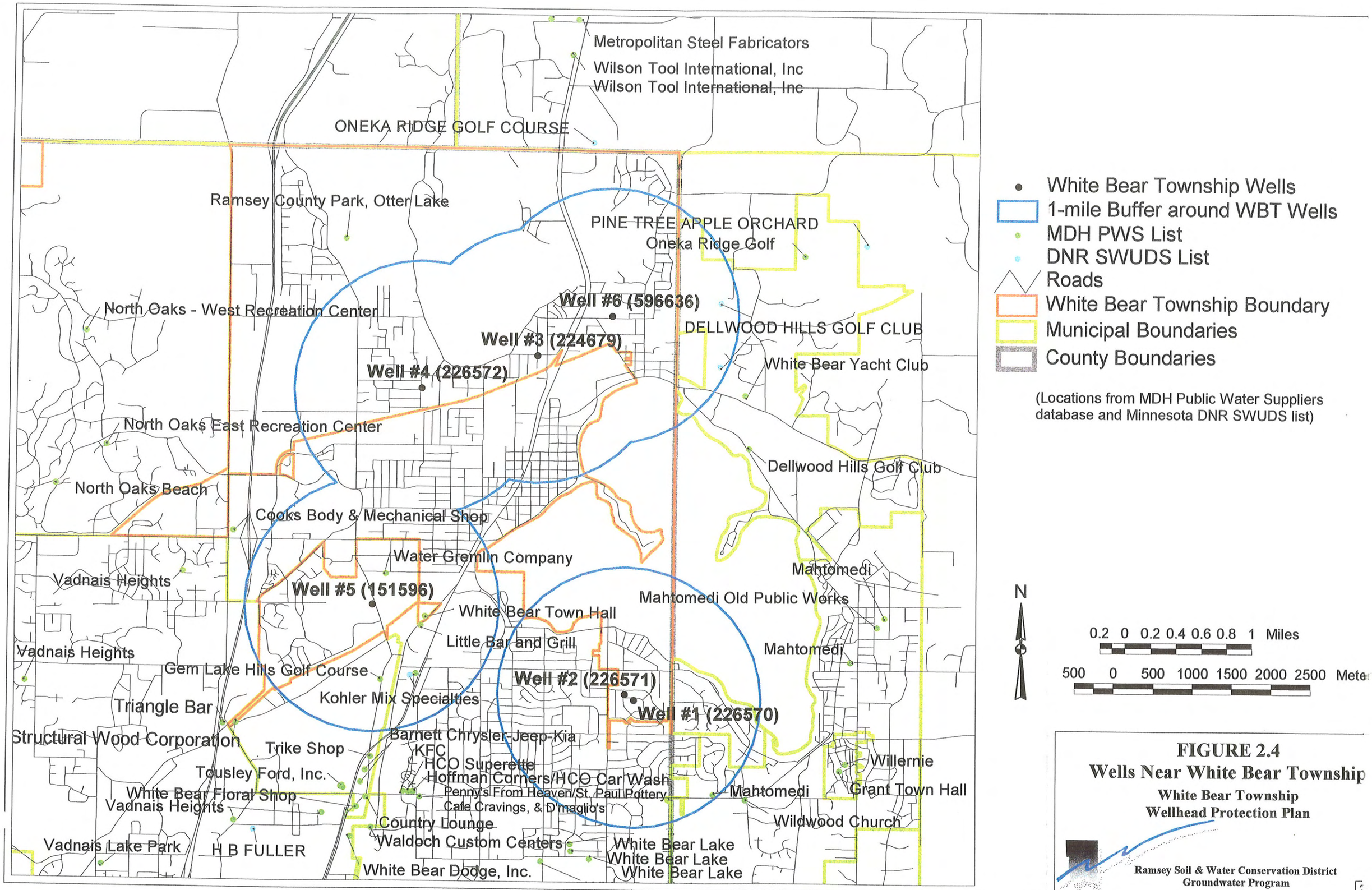


FIGURE 2.4
Wells Near White Bear Township
White Bear Township Wellhead Protection Plan

Ramsey Soil & Water Conservation District
Groundwater Program

2.3.1 Aquifer Testing

From December 4 – 6, 2001, the MDH conducted a pumping test using WBT well #3 as a pumping well and wells #4 and #6 as observation wells. The results of this test are summarized on Table 2.2. Transmissivities calculated from the results ranged from 1,346 feet squared per day (ft^2/day) to 53,580 ft^2/day based on drawdown and recovery observed in the pumping well. Transmissivities calculated from data collected at wells #4 and #6 ranged from 40,400 ft^2/day to 65,700 ft^2/day, along with a somewhat anomalous value of 202,000 ft^2/day for the early drawdown at well #6.

Hydraulic conductivity values derived from this data are also presented on Table 2.2. These values were calculated by dividing the transmissivity values by the aquifer thickness at the pumping well. Because all three wells are open to both the Prairie du Chien and the Jordan, the K values were calculated two ways: first using the thickness of the Prairie du Chien alone (172 feet); and then using the thickness of both units together (222 feet). For the pumping well, this gives a range of hydraulic conductivities from about 2 to 95 meters per day (m/day), and for the observation wells the values range from about 55 to 115 m/day.

2.3.2 Pumping Volumes and Rates

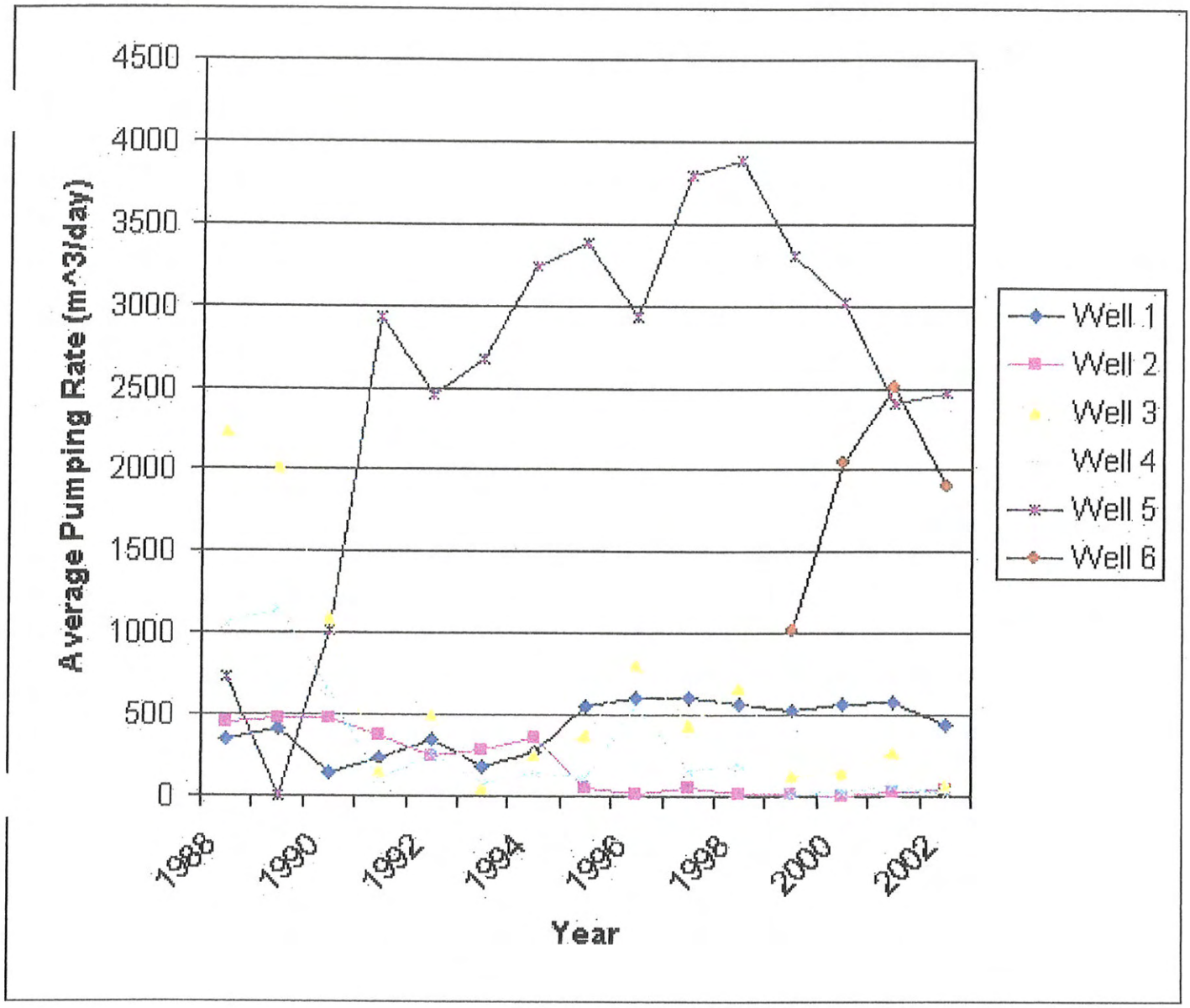
For the modeling effort, it is necessary to select pumping rates for the WBT wells. First, the historical pumping volume records from 1991 to 2001 were compiled from the Minnesota DNR's SWUDS database and from WBT records. Figure 2.5 graphically summarizes the historical pumping data. On the basis of these data, model rates were calculated using an average of the 1998 – 2002 rates. For wells #3, #4, #5, and #6, this average was then divided between the model layers representing the Prairie du Chien and the Jordan. This was done by estimating the contribution of each layer in the WBT wells in proportion to the product of the hydraulic conductivity of each layer and the thickness of the units in the wells. Then, these fractions were

TABLE 2.2

White Bear Township Well #3 (224679) Aquifer Test
December 4 - 6, 2001

(source: Minnesota Department of Health)

Well	Transmissivity T (ft^2/day)	Storage Coefficient S	Time Period Emphasized	Analysis Method	Hydraulic Conductivity (b = 172 feet) K (m/day)	Hydraulic Conductivity (b = 222 feet) K (m/day)
Pumping Well	1,346		Early Drawdown	Theis	2.39	1.85
WBT #3	2,998		Early Drawdown	Jacob	5.31	4.12
	24,250		Early Recovery	Theis	42.97	33.29
	53,580		Late Recovery	Theis	94.95	73.56
	1,560		All Drawdown	Hantush-Jacob	2.76	2.14
Observation Well 1	40,400	0.00063	Drawdown	Theis	71.59	55.47
WBT #4	51,700		Late Recovery	Theis	91.62	70.98
Observation Well 2	202,000		Early Drawdown	Theis	357.97	277.34
WBT #6	62,160	0.00021	Late Drawdown	Theis	110.15	85.35
	65,700		Drawdown	Jacob	116.43	90.21
	55,022		Late Recovery	Theis	97.51	75.54



WBT Well	15-yr. Average (MGY)	Average last 5 yrs. (MGY)	15-yr. Average (m^3/d)	Average last 5 yrs. (m^3/d)	Opc rate (last5 x 0.70)	CJ rate (last5 x 0.4)
1	40.96	51.65	424.72	535.56	N/A	N/A
2	18.45	1.78	191.32	18.42	N/A	N/A
3	58.99	24.52	611.78	254.27	177.99	101.71
4	29.29	5.84	303.74	60.59	42.41	24.23
5	245.90	290.84	2549.93	3016.01	2111.21	1206.40
6	179.90	179.90	1865.54	1865.54	1305.88	746.22

FIGURE 2.5
Pumping Rate Summary
White Bear Township
Wellhead Protection Plan

Ramsey Soil & Water Conservation District
Groundwater Program

rounded up to the nearest one-tenth to add an extra factor to avoid underestimating model layer contributions to the wells. This resulted in fractions of 0.7 for the Prairie du Chien and 0.4 for the Jordan. Because wells #1 and #2 are open only to the Jordan, no such calculation was necessary.

2.4 Water Quality and Related Issues

With respect to other water quality issues, the City performs required periodic testing for analytes such as coliform bacteria, arsenic, radon, and volatile organic compounds (VOCs). These results are reported to the MDH as needed and are not included in this document. There are no known water quality issues indicated by this sampling of the White Bear Township system.

SECTION 3

WHPA AND DWSMA DELINEATIONS

Minnesota Rules, Parts 4720.5100 to 4720.5590 (the Wellhead Protection Rule) include several criteria for delineating WHPAs. While computations for WHPA delineation may be done with other methods, using a numeric groundwater-flow model in order to calculate the specific zones of contribution to the City wells necessarily includes all the criteria listed in Part 4720.5510.

3.1 Groundwater Flow Model Overview

Because of previous efforts by the Minnesota Pollution Control Agency (MPCA), the MDH and the RSWCD, several regional-scale models covering the White Bear Township area were already available (Barr, 1999a; Barr, 1999b; Barr, 2001; Seaberg and Hansen, 2000; and KDB Consulting and EOR, 2000). From the content and/or electronic datasets of these regional models, along with added details on wells in the vicinity of WBT, a local model was developed specifically for computing zones of contribution to WBT wells. The basic model is a four-layer model, with the top layer representing glacial drift, the second layer representing the St. Peter Sandstone and the drift, the third layer for the Prairie du Chien Group (and valleys filled with drift), and the fourth layer for the Jordan Formation. The St. Lawrence Formation is assumed to provide a boundary that limits vertical migration such that the base of the Jordan can be represented as a no-flow boundary.

The RSWCD first obtained a regional model by contracting with Barr Engineering in 1998. This effort produced two models, one derived from the MPCA's metro model (Seaberg and

Hansen, 2000) using the analytic element method, and one derived from the MPCA model, but using the US Geological Survey's MODFLOW code (Barr, 1999a). From this model, Barr (1999b) developed a MODFLOW model for MDH that primarily covered Scott and Dakota Counties, but also included the same spatial data sets used for the RSWCD work. In 2000, KDB Consulting and EOR (2000) provided a model to MDH covering Ramsey, Washington, and Anoka Counties. This model was developed using analytic element methods. Parameters, boundaries, and layer geometries were very similar to the model Barr presented to the RSWCD in 1999.

In 2001, Barr updated the Scott/Dakota MODFLOW model and the spatial data sets to allow use of a feature in the Department of Defense Groundwater Modeling System (GMS) software used to create model input files and view model output. This feature is known as the "true layer" approach in which layer geometry, horizontal hydraulic conductivity, and vertical hydraulic conductivity are explicitly defined throughout the entire model domain. This allows flexibility in model application and calibration, and greatly simplifies the derivation of local models from regional models.

As these models were developed, RSWCD staff incorporated selected developments into a regional MODFLOW model. The model used as a starting point for the WBT work is derived largely from the three-dimensional/true-layer model developed by Barr (2001), which in turn was developed from the previous MODFLOW models covering the Ramsey County region.

3.1.1 Regional Model

The extents and grid spacing of the regional MODFLOW model used as a starting point for this effort are shown on Figure 3.1. The basic model layer geometry, hydraulic parameters, and flux data (except for wells) developed by Barr (1999a, 1999b, and 2001), provided the basic model setup. To minimize the computational burden, this model covers a smaller area than the

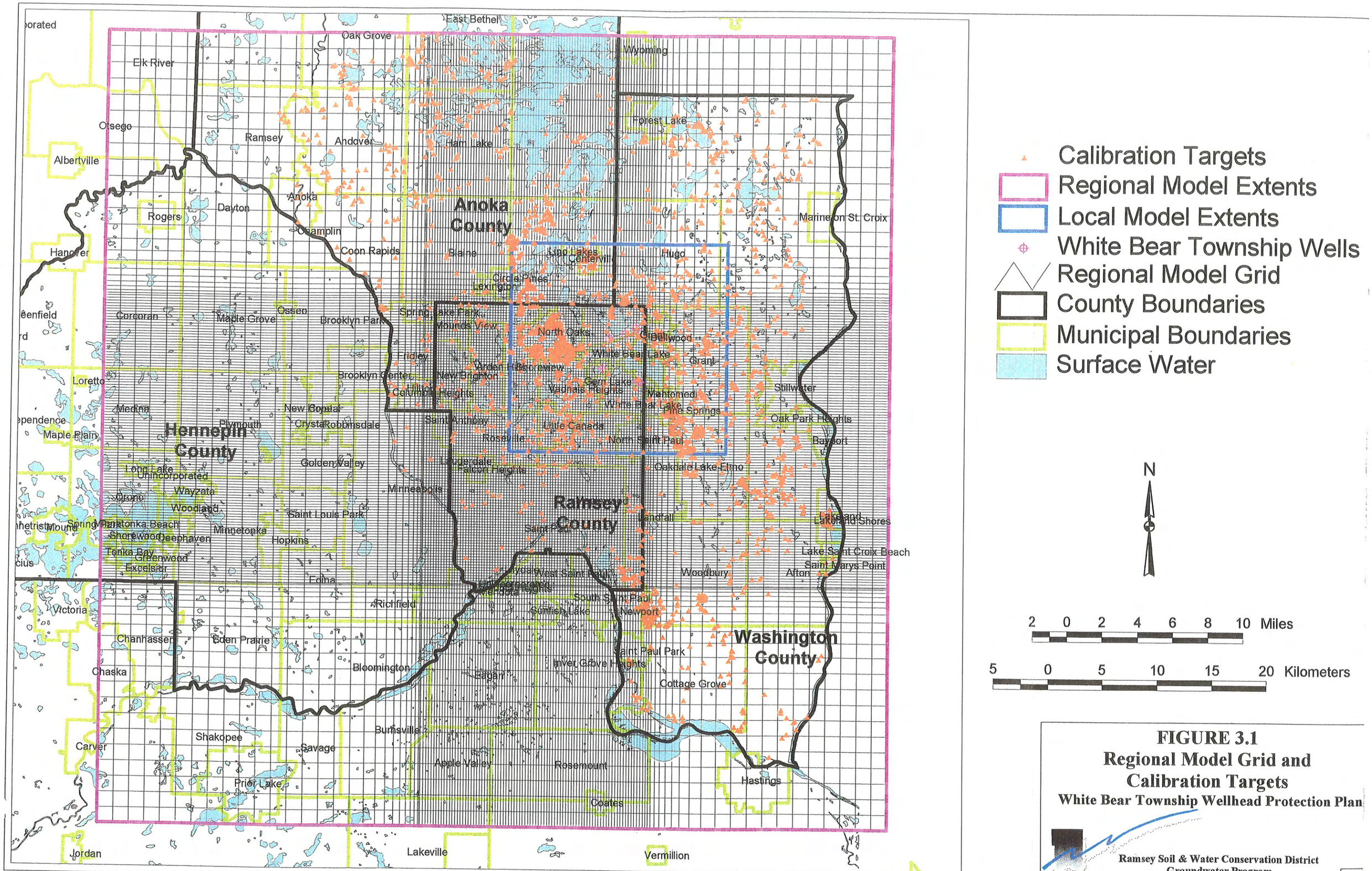


FIGURE 3.1
Regional Model Grid and Calibration Targets
White Bear Township Wellhead Protection Plan

Ramsey Soil & Water Conservation District
Groundwater Program

original Barr models, which cover all of Scott and Dakota Counties, as well as additional area to the west. Bringing the model boundaries in to those shown on Figure 3.1 did not affect the calibration statistics noticeably.

To this smaller regional model, RSWCD staff added well locations and pumping data derived from the DNR's SWUDS database and from the MDH's Public Water supply database. Some minor changes had to be made to layer geometry in a few small areas to make sure layer tops and bottoms were consistent (e.g., to ensure the top of a lower layer did not rise above the bottom of the layer above). In addition, the model was recalibrated to data from wells in Ramsey, Washington, and Anoka Counties (as well as from Hennepin County east of the Mississippi River), rather than data from Scott and Dakota Counties (see Figure 3.1 for calibration target locations). RSWCD staff evaluated the effects of changes to several model parameters on the calibration statistics. Parameters that were varied included horizontal hydraulic conductivity of the Prairie du Chien and Jordan layers, recharge rates, and vertical hydraulic conductivity. Ultimately, the only change made was to multiply the hydraulic conductivity of layer 3 (Prairie du Chien and some drift) by a factor of five (5). This results in the hydraulic conductivity of the Prairie du Chien increasing to 35 m/day, which is more consistent with pump test results obtained from WBT wells. Once this regional model was completed, it was used for the development of a smaller model covering the WBT area. Calibration statistics for this model are summarized in Appendix B.

3.1.2 Local Model

The extents and grid spacing of the local model created for the WBT WHPA delineations are shown on Figure 3.2. As before, the model area was decreased to minimize the computational burden while allowing the creation of a model grid with finer spacing in the vicinity of the WBT wells. Boundary conditions for this model were derived from the regional model described above. The entire perimeter of the local model is a constant-head boundary for all four layers,

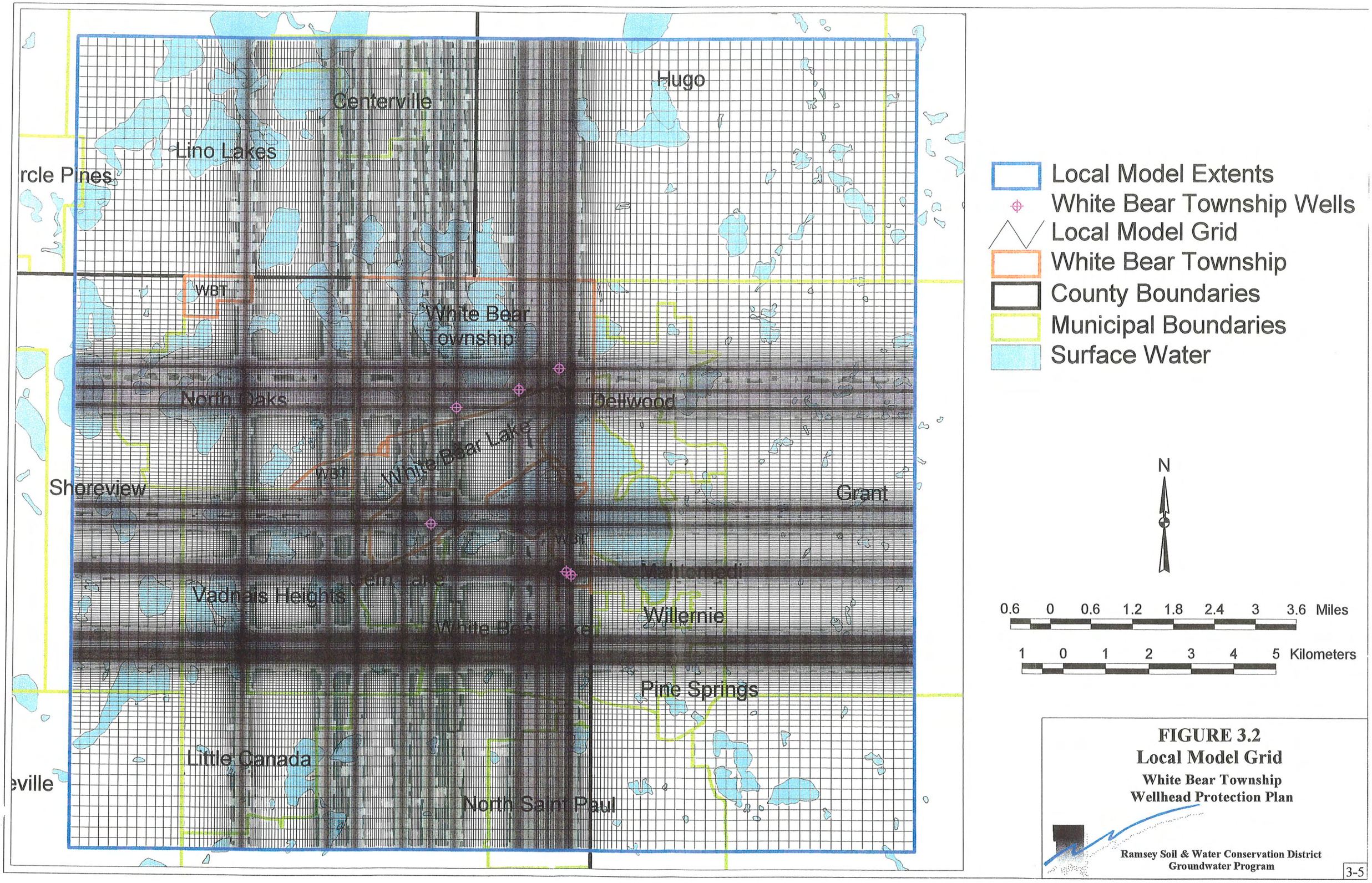


FIGURE 3.2
Local Model Grid
White Bear Township
Wellhead Protection Plan

Ramsey Soil & Water Conservation District
Groundwater Program

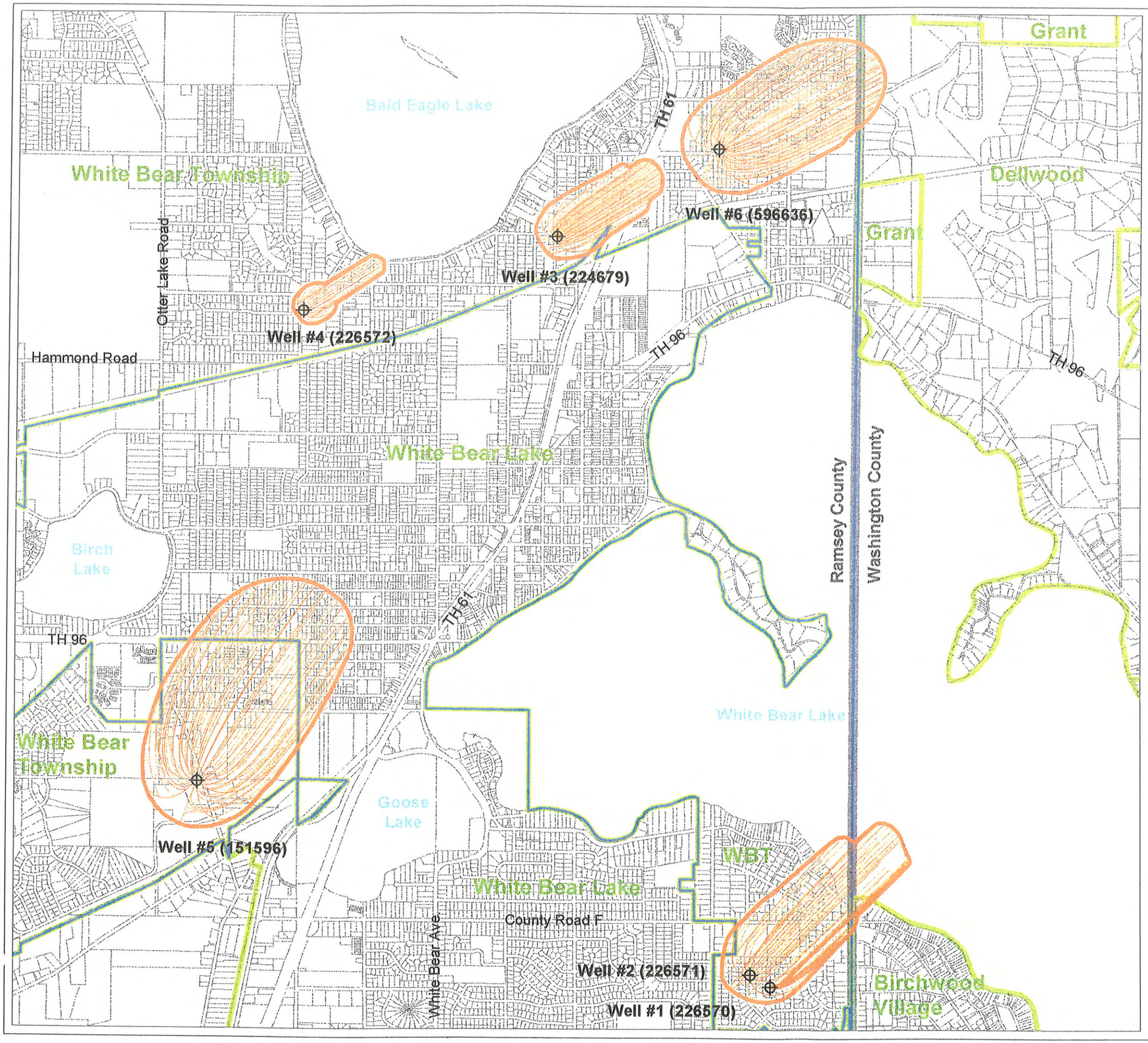
with the constant heads copied over from the computed heads in the regional model. This process is known as telescopic mesh refinement and is described by Ward *et. al* (1987) and by Anderson and Woessner (1992).

The local model was produced as described and run to check calibration. Obviously, calibration was checked using only the wells in the refined model domain. Some slight changes were made in the constant-head boundaries to improve calibration. Specifically, some of the constant heads in each layer decreased in the southeast corner of the model, which was needed to remove some large errors in that area. Calibration statistics for this model are summarized in Appendix B, along with maps of computed heads.

3.2 WHPA Delineation

The WHPA is intended to define the area of an aquifer (or aquifers) that provides water to a public well and is thus designated for management using the WHP Plan. A WHPA may be considered to be that area or volume of the aquifer(s) of concern defined by computational methods incorporating the data and criteria specified in part 4720.5510. WHPA delineations for all six White Bear Township wells were completed using the MODFLOW model previously discussed in this report.

Delineation was accomplished by coupling the MODFLOW model with the particle-tracking routine MODPATH. MODPATH was used to backtrack the positions of 75 particles placed throughout the extent of each model cell in which a WBT municipal well was located. Pumping rates used for the delineation were the same as described in Section 2.4.2, while a 10-year time of travel was used for the particle tracking calculations. Porosity was assumed to be 0.2 for all calculations. WHPAs are shown on Figure 3.3.



White Bear Township Wells
WHPA Boundary
Particle Tracks
Property Parcels
White Bear Township
Municipal Boundaries
County Boundaries

N

0.2 0 0.2 0.4 0.6 0.8 1 Miles

300 0 300 600 900 1200 1500 Meters

FIGURE 3.3
White Bear Township WHPAs
White Bear Township
Wellhead Protection Plan

Ramsey Soil & Water Conservation District
Groundwater Program

3.2.1 Uncertainty Analysis

Modeling groundwater flow and delineating WHPAs involves simplification of a natural system. This is done partly to make the modeling computationally feasible, and partly to account for the lack of detailed information everywhere in the model area. This introduces uncertainty into the delineation of the WHPAs.

During the formulation of the original models, Barr used an automated parameter estimation routine, with the results (model heads and flux to streams) compared against the calibration data. The process and the results are documented in Barr's reports (1999a, 1999b, 2001). The bedrock units of concern for WBT are fairly well characterized with respect to aquifer thickness, and the model represents the thickness for the Opdc to within a few meters within the vicinity of the wells; for the Jordan, the thickness in the model is slightly greater than (but within 5 meters of) observed values. Using automated parameter estimation, Barr calculated a horizontal hydraulic conductivity for both the Prairie du Chien Group and the Jordan Formation of about 7.2 m/day, but on the basis of pumping tests on WBT well #3 and other locations, K for the Opdc conductivity was increased to 35 m/day. The K for the Jordan Formation was left at 7.2 m/day.

While the groundwater flow field appears to have been fairly well approximated within the local model boundaries (on the basis of head data), uncertainty remains for many reasons (which are documented in standard modeling texts, but will not be discussed here). One issue worth discussing is the vertical hydraulic conductivity values used in the model. Barr derived these values as part of the conversion of the model from quasi-three-dimensional to a full three-dimensional representation. There is little data available on these values, and so they introduce an unknown element of uncertainty. On the other hand, these values become significant only where vertical movement of groundwater is pronounced. This is the case only in immediate proximity to the pumping wells, and so should not significantly affect the WHPA shape.

3.3 DWSMA Delineation

DWSMAs are derived from and inclusive of the WHPAs, but represent the administrative boundaries of the surface and subsurface area to be managed using the WHP plan. These DWSMAs are defined by commonly used boundaries such as property lines, streets or other rights-of-way, section lines, political boundaries, or other practical boundaries reflecting property or infrastructure boundaries. By superimposing the WHPAs on parcel and road data in a GIS coverage, RSWCD delineated the DWSMAs using the parcel boundaries. The DWSMAs are shown on Figures 3.4 and 3.5.

DWSMAs were drawn in an attempt to simplify the boundaries while still including all property parcels that the WHPAs intersected. Where feasible, streets were used as boundaries, but if this required adding too much area to the DWSMA, parcel lines were used to draw the bounding lines. Streets are labeled where they are used as part of the DWSMA boundaries on Figures 3.4 and 3.5. In two cases where the WHPAs extended into lakes (for wells #1 & #2 and well #4), the DWSMA boundaries were extended to the nearest quarter-section boundaries. This was done because including the entire lake was impractical in both cases. Finally, combined DWSMAs were drawn for two sets of two wells. Wells #1 and #2 had a single WHPA, so they in turn had a single DWSMA. In the case of wells #3 and #6, only a few extra parcels needed to be added to join the two DWSMAs.

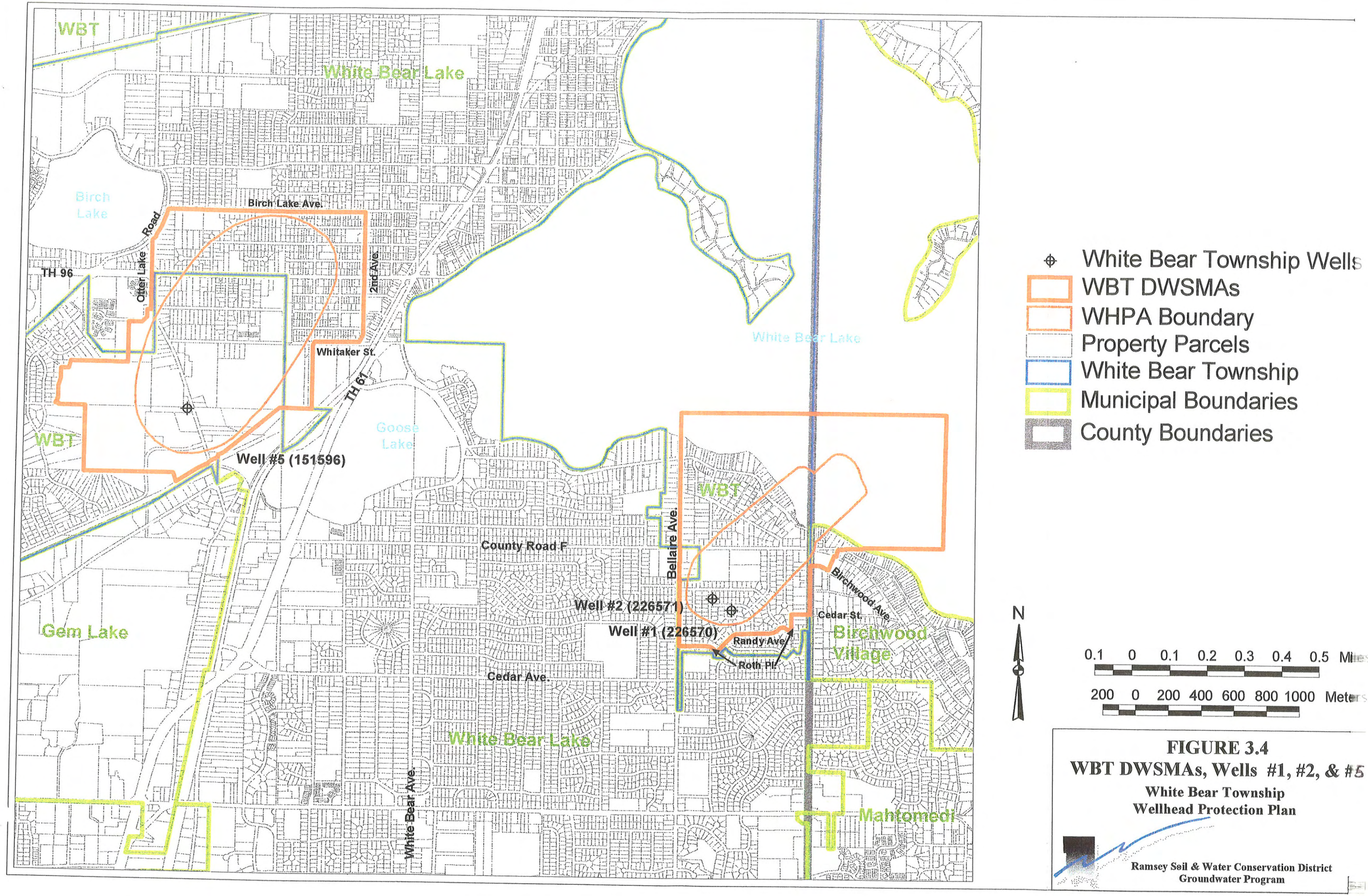
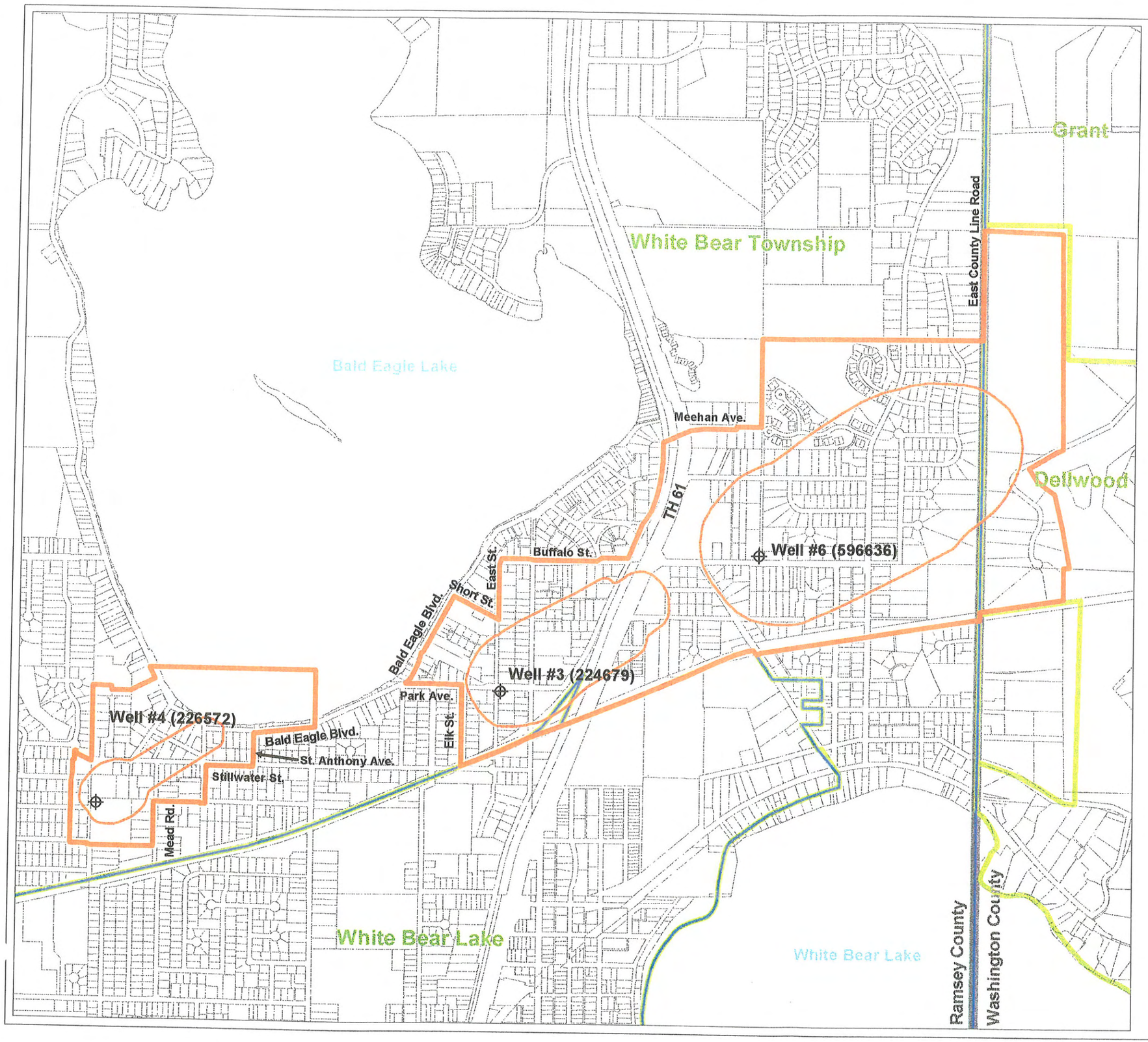


FIGURE 3.4
WBT DWSMAs, Wells #1, #2, & #5
White Bear Township
Wellhead Protection Plan

Ramsey Soil & Water Conservation District
Groundwater Program



- White Bear Township Wells
- WBT DWSMAs
- WHPA Boundary
- Property Parcels
- White Bear Township
- Municipal Boundaries
- County Boundaries

N

0.1 0 0.1 0.2 0.3 0.4 0.5 Miles

200 0 200 400 600 800 1000 M.

FIGURE 3.5
WBT DWSMAs, Wells #3, #4, & #6
White Bear Township
Wellhead Protection Plan

Ramsey Soil & Water Conservation District
Groundwater Program

SECTION 4

VULNERABILITY ASSESSMENT

Once the WHPAs and DWSMAs are delineated, the vulnerability of the DWSMAs to contamination can be assessed on the basis of the aquifer's inherent geologic sensitivity and on any relevant groundwater chemical data. The vulnerability of the wells also must be assessed. The criteria for a DWSMA vulnerability assessment are specified in part 4720.5510), and well vulnerability is assessed using the criteria in part 4720.5550. The MDH has already conducted well vulnerability assessments as part of their effort to phase in wells to the WHP program, and this assessment will be reviewed.

4.1 Well Vulnerability

Generally, assessing vulnerability of a well includes evaluating well construction, geologic vulnerability, pumping rate, water quality, and other factors. Vulnerability assessment for the White Bear Township wells is straightforward. The MDH has collected tritium samples from 2 of the 6 WBT wells at varying dates in the past. Tritium was detected in well #1 in 1991, and in well #6 in 2000, indicating that precipitation falling sometime after atmospheric nuclear testing was conducted in the 1950s has entered the Prairie du Chien – Jordan aquifer system and reached those wells. The presence of tritium provides a clear indication of the potential for contaminants to enter the subsurface and fairly rapidly (i.e., within tens of years) move to these municipal wells. These results were extended to declare all 6 WBT wells as vulnerable. The tritium data override other considerations such as geology, well construction, and pumping rates. This is reflected in the MDH Wellhead vulnerability ratings (see worksheets in Appendix A).

4.2 DWSMA Vulnerability

The vulnerability of the DWSMAs for the WBT wells was first evaluated using the geologic atlases for Ramsey and Washington Counties (Swanson and Meyer, 1990 and Meyer and Swanson, 1992). Figures 4.1 and 4.2 shows the WBT DWSMAs superimposed over maps showing the sensitivity of the Opcj to contamination. Note that boundaries for sensitivity data from Washington County are approximate; these maps are only available in paper form. A scanned copy of the paper map was used to digitize an approximation of the necessary areas.

For wells #1 and #2 (Figure 4.1), the southernmost part of the shared DWSMA is in an area designated as low sensitivity; this area includes the location of the wells. The low sensitivity is due to the presence of the Platteville and Glenwood Formations. The rest of this DWSMA extends over zones of moderate sensitivity or over White Bear Lake (which has no assigned sensitivity rating). For well #5 (Figure 4.1), the DWSMA includes areas rated as low, moderate, and high sensitivity. The well and most of the western portion of this DWSMA is in an area of moderate sensitivity, while the eastern one-third of the DWSMA and some small areas along the western edges of the DWSMA are in areas with high sensitivity. The high sensitivity is due to the presence of the bedrock valley, in which no other bedrock units are present over the Prairie du Chien Group. The moderate sensitivity areas in this DWSMA coincide with the presence of the St. Peter Sandstone in the subsurface.

For well #4 (Figure 4.2), most of the DWSMA is rated as moderate sensitivity. There is a small area of low sensitivity, and a few very small areas with high sensitivity in the northwestern corners. The remainder of the DWSMA includes a portion of Bald Eagle Lake. Again, the areas with high sensitivity are the areas beneath which the Prairie du Chien is exposed in the bedrock valley. Otherwise, the St. Peter Sandstone is present in the rest of the DWSMA (not including the lake). Well #3 lies in another area where the Prairie du Chien is the first bedrock unit. As a

result, a small area around well #3 is given a high sensitivity rating. All other areas of this DWSMA, including well #6, are ranked as low or moderate sensitivity.

As noted in the discussion of well vulnerability, elevated tritium concentrations have been detected in samples from two of the WBT wells. These samples were collected from wells #1 and #6, and for both of these wells the associated WHPAs are in areas with no greater than moderate geologic sensitivity. Regional geologic data (including WBT well logs) typically shows that there is clay till at the surface and in the subsurface in this area. The continuity of the till(s) in this specific area is not clear owing to the inconsistency of geologic descriptions in driller's logs contained in the CWI, and the termination of many of the logs before reaching suitable depths.

As found in the CWI, geologic logs in the vicinity of the DWSMA for wells #1 and #2 do not conclusively show the presence of till, owing to the lack of detail in the stratigraphic descriptions. Many clayey units are present, but thickness and depth(s) are variable. Figure 4.3 shows the thickness of clayey till units as interpreted from the CWI. However, the St. Peter Sandstone (with its basal confining bed) is present everywhere within this DWSMA, including beneath White Bear Lake. In addition, at the location of the WBT wells the Platteville Formation and Glenwood Shale are present.

Within the DWSMA for well #5 several shallow wells terminate in a clay layer (such as those marked "present" on Figure 4.3), and two deeper wells near the upgradient edges of the DWSMA show considerable thickness of "gray till" and "blue clay" (and/or "hardpan"), terms which often denote Des-Moines-age glacial till. At well #5, the log shows "blue clay" and "blue gravel + clay", also suggesting the till is present here. Unfortunately, in and near the northeast (upgradient) end of the DWSMA, the data are sparse, and some of the wells in the CWI are not deep enough to indicate the presence of till one way or another.

Within and adjacent to the DWSMA for well #4, shallow well logs show units of blue clay, gray clay, or clay with thicknesses of at least 17 feet up to at least 80 feet in the upper 80 feet of unconsolidated deposits (Figure 4.4). The log for well #4 is not sufficiently detailed with respect to the unconsolidated deposits, but it does indicate the presence of the St. Peter Sandstone. For wells #3 and #6, the till units appear to be present in most locations. The till does appear to thin to the northeast of well #6, but there are no data available for the upgradient portion of the DWSMA, so the continuity of the till unit is not verifiable here.

Note that while the maps from the Ramsey County Geologic Atlas (Meyer and Swanson, 1992) show areas of high sensitivity, these ratings do not fully agree with the data presented here. According to the sensitivity rating matrix on Plate 9 of that document, more than 10 feet and less than 50 feet of till (clayey or loamy) above the Opcj would yield a moderate sensitivity rating. Clearly, as shown in Figures 4.3 and 4.4, the sensitivity ratings are not entirely consistent with the current CWI data. The areas of the WBT DWSMAs with high sensitivity ratings should have moderate ratings. Most likely all of the CWI data currently available were not readily available when Plate 9 was prepared.

However, when the geologic sensitivity data are considered in conjunction with the tritium data, the assigned DWSMA vulnerability must be one level higher than the geologic sensitivity indicates. All WBT DWSMAs are dominated by areas of moderate sensitivity either as indicated by the maps or as re-interpreted from CWI data. As a result, the evidence of recent recharge (tritium) necessitates assigning a high vulnerability to all four WBT DWSMAs.

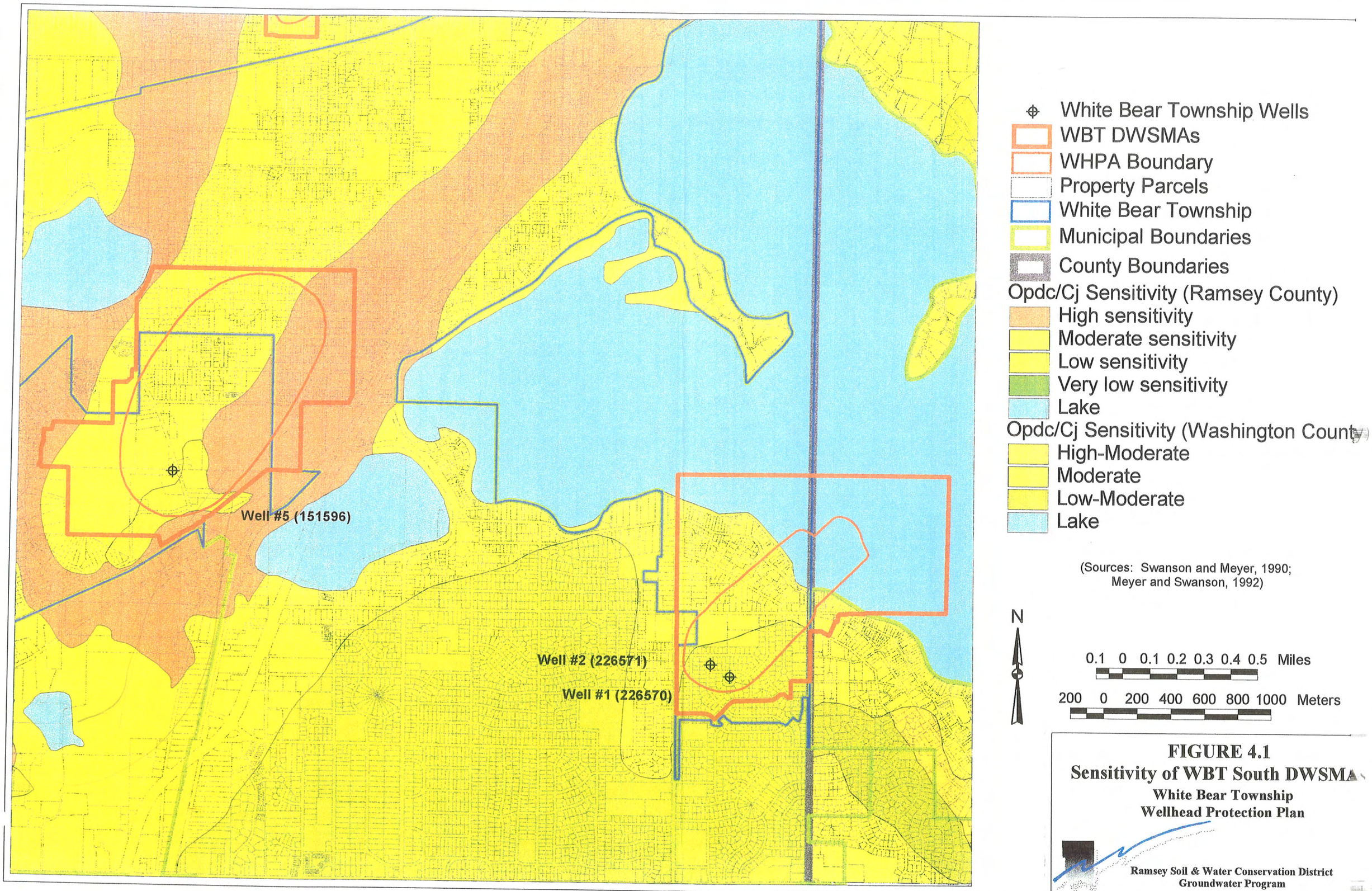
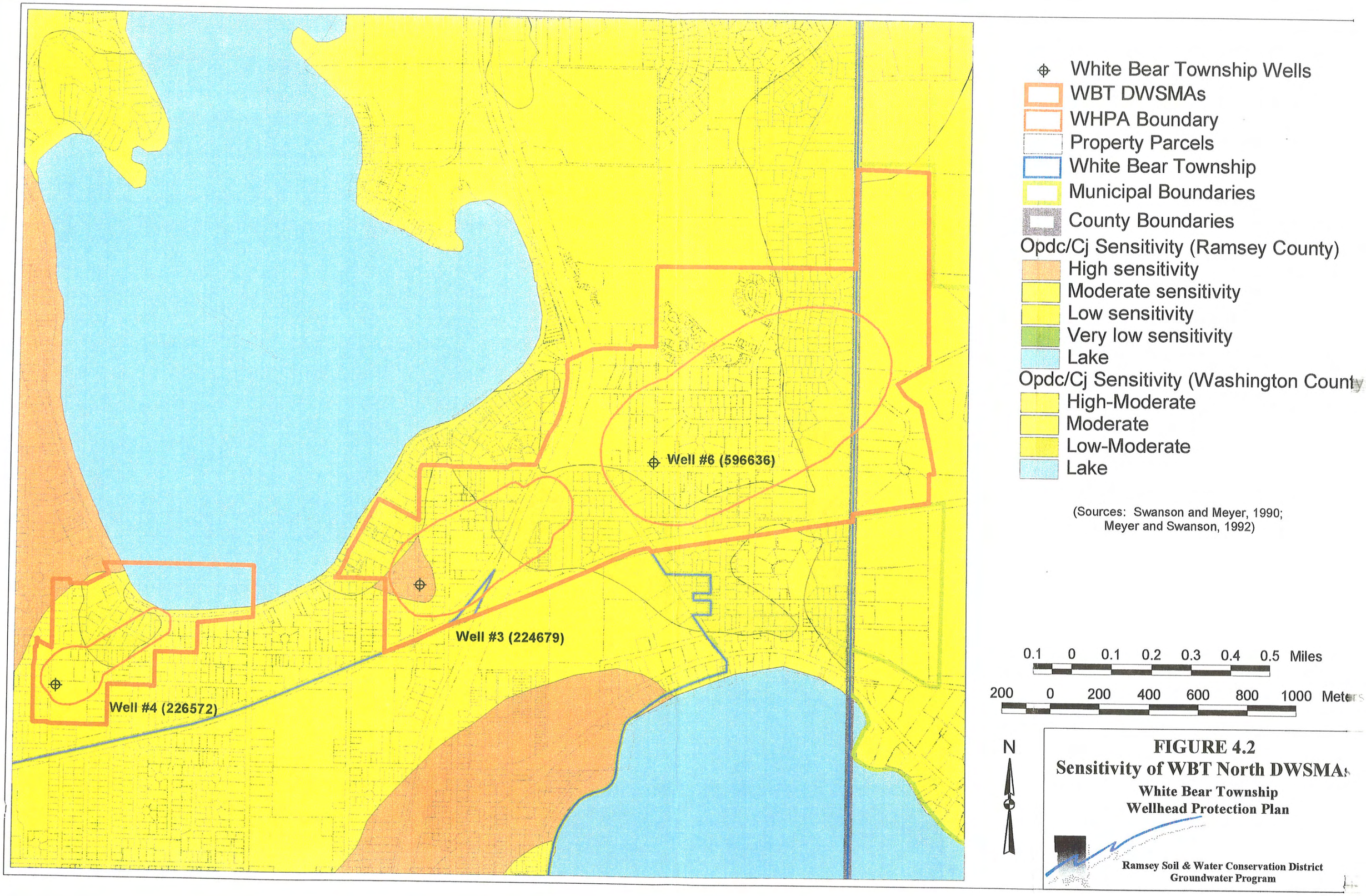


FIGURE 4.1
Sensitivity of WBT South DWSMAs
White Bear Township
Wellhead Protection Plan


Well #6 (596636)
Well #3 (224679)
Well #4 (226572)
White Bear Township Wells
WBT DWSMAs
WHPA Boundary
Property Parcels
White Bear Township
Municipal Boundaries
County Boundaries
Opdc/Cj Sensitivity (Ramsey County)
High sensitivity
Moderate sensitivity
Low sensitivity
Very low sensitivity
Lake
Opdc/Cj Sensitivity (Washington County)
High-Moderate
Moderate
Low-Moderate
Lake
(Sources: Swanson and Meyer, 1990; Meyer and Swanson, 1992)
0.1 0 0.1 0.2 0.3 0.4 0.5 Miles
200 0 200 400 600 800 1000 Meters
N
FIGURE 4.2
Sensitivity of WBT North DWSMAs
White Bear Township
Wellhead Protection Plan
Ramsey Soil & Water Conservation District
Groundwater Program

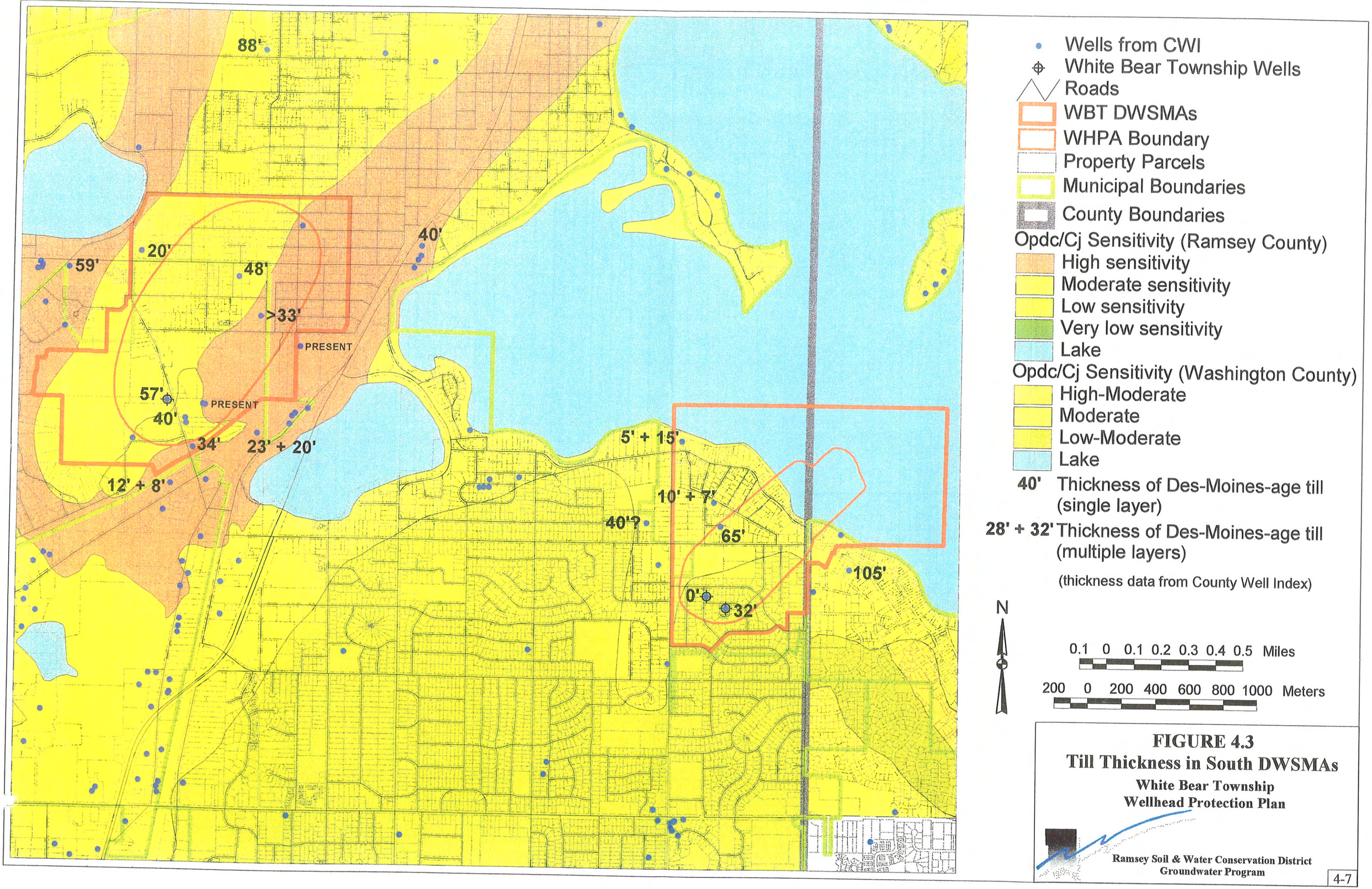


FIGURE 4.3
Till Thickness in South DWSMAs
White Bear Township
Wellhead Protection Plan

Ramsey Soil & Water Conservation District
Groundwater Program

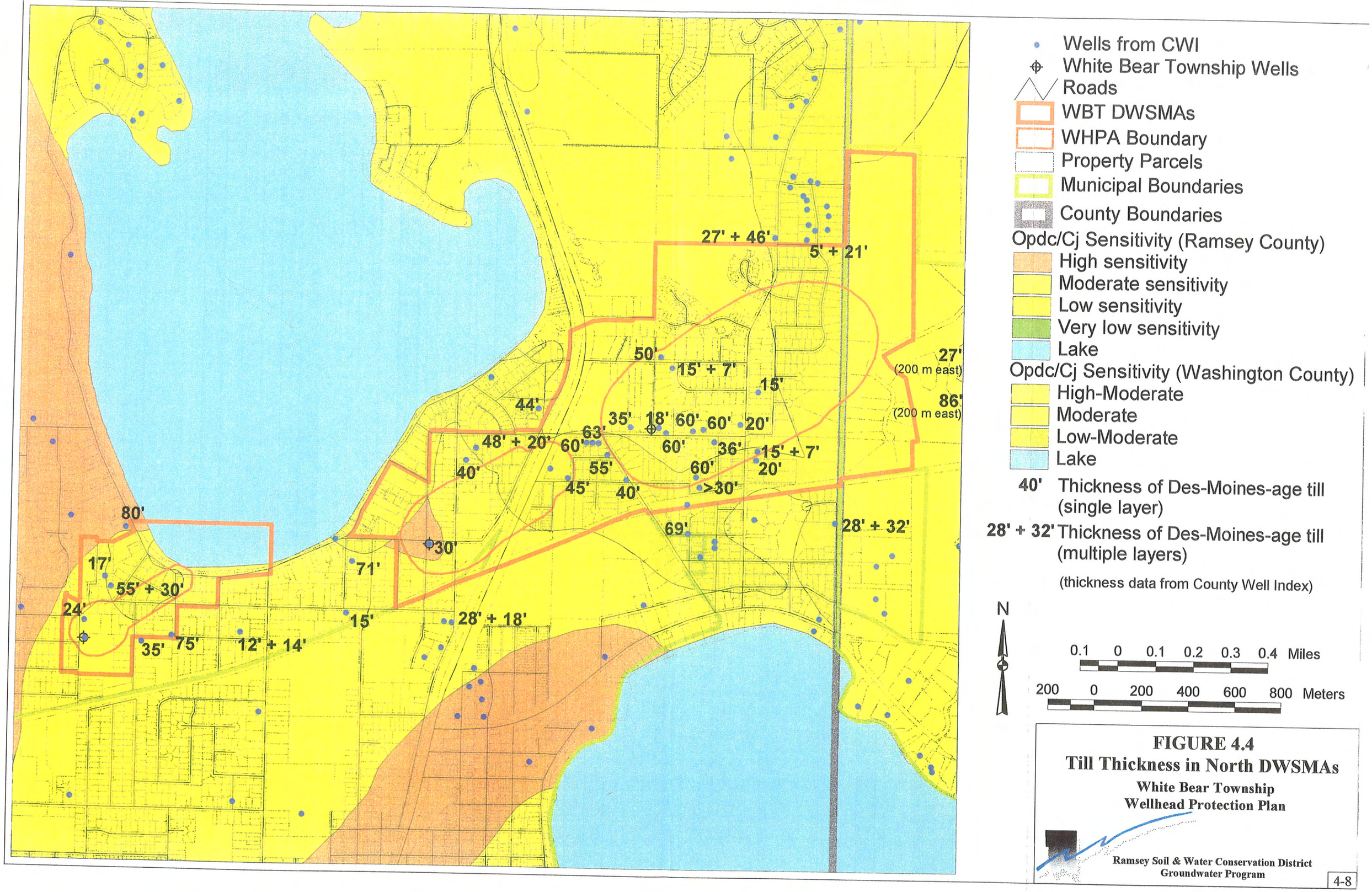


FIGURE 4.4
Till Thickness in North DWSMAs
White Bear Township
Wellhead Protection Plan

Ramsey Soil & Water Conservation District
Groundwater Program

SECTION 5

RECOMMENDATIONS

Owing to the vulnerability of the White Bear Township wells and some portions of the DWSMAs, Part II WHP work should focus on potential contaminant sources within the DWSMAs. In addition, Part II work may require some investigation and consideration of ongoing surface water quality activities affecting White Bear Lake and Bald Eagle Lake.

It may be worthwhile to collect concurrent water samples from White Bear Lake and Bald Eagle Lake and from the wells with DWSMAs intersecting those lakes for analysis of stable isotopes of oxygen. This information could give insight into whether or not there may be a connection between the surface water and the Prairie du Chien – Jordan Aquifer in those areas. The MDH may be able to help with this effort.

SECTION 6

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APPENDIX A

CORRESPONDENCE AND OTHER RELEVANT DOCUMENTS

MINNESOTA MDH DEPARTMENT OF HEALTH

Protecting, maintaining and improving the health of all Minnesotans

October 1, 2001

Mr. Bill LaBore, Public Works Coordinator
White Bear Township
1281 Hammond Road
White Bear Township, Minnesota 55110

Dear Mr. LaBore:

This letter provides notice of the results of a scoping meeting held with you, Matt Swanson (Ramsey SWCD), Art Persons (Department of Health), Robyn Hoerr (Minnesota Rural Water Association) and me on September 18, 2001, at your offices regarding wellhead protection planning. During our meeting, we discussed the 1) delineation of a wellhead protection area, 2) delineation of a drinking water supply management area, and 3) assessment of well and aquifer vulnerability related to these areas for the White Bear Township water supply wells (see enclosed tables). It is our understanding that you will serve officially as wellhead protection manager on behalf of the township. It is also our understanding that you will prepare and send a letter to local units of government notifying them of your intent to develop a wellhead protection plan, as required by the wellhead protection rule (part 4720.5300, subpart 3).

As you know, the time period for completion of the wellhead protection plan is determined by the rule as described at the meeting. During the meeting, we discussed the parameters that control the due date. We have determined, upon further review of your system, that Well No. 6 went on-line in July 1999, and so therefore White Bear Township will have until July 31, 2003, to complete its wellhead protection planning. Your board will be notified of this revision formally in a letter.

During our meeting, we discussed rule requirements and the types of information needed to delineate the wellhead protection area accurately and to conduct the vulnerability assessments. It is our understanding that the Ramsey SWCD will prepare the delineations and vulnerability assessments for the Township. Many of the data elements identified in the wellhead rule that may need to be considered in conducting Part I wellhead activities for White Bear Township are already available to the Minnesota Department of Health (MDH), and you need only provide documentation of information you use that is not otherwise available to us. Examples we discussed in the meeting are as follows:

- Annual pumping data for each of your wells (1996-2001).

Matt Swanson may be asking you for this information in the coming months as he works to prepare the first part of your plan.

The data elements identified in the scoping decision notice (enclosed) are those that will be needed to complete Part I of the wellhead rule requirements. The three components of Part I are the 1) wellhead protection area delineation, 2) drinking water supply management area delineation, and 3) vulnerability assessment. I have summarized some of the specific information requirements (with respect to rule requirements) in the following paragraphs.

Item 1 - Criteria for wellhead protection area delineation.

The following criteria specified in the rule language (part 4720.5510) must be used for wellhead protection area delineation:

Time of travel - A *minimum* ten-year time-of-travel must be used to determine the boundaries of the wellhead protection area. Ten years should provide a minimum-sized area in which to 1) detect possible aquifer contamination and 2) provide sufficient reaction time to remediate potential health impacts on the users of your public water supply. You have the option of selecting a time-of-travel longer than ten years. Ramsey SWCD can help you make this determination. Also, your submittals must show the one-year time-of-travel capture zone around each well.

Aquifer transmissivity - It is very important to have an accurate estimate of the aquifer transmissivity because it is a key factor affecting the size and shape of a wellhead protection area. The wellhead protection rule requires that public well owners estimate transmissivity from a pumping test, whenever possible.

As we discussed during the meeting, you will need to conduct an aquifer test to meet this provision of the rule. I am hoping that Ramsey SWCD, MDH and the Township can work cooperatively to get this test done.

Daily volume of water pumped - The daily volume of water pumped must be calculated for the public wells. According to the rule, this value should be determined from either 1) the previous five years pumping information for each well or 2) projected annual pumping over the next five years. The year having the greatest recorded or projected discharge for each well should be used to determine the maximum daily volume of water pumped. These data and the values used for the wellhead delineation analysis should be presented clearly in the report documenting the Part I activities.

Hydrologic boundaries - As we discussed at the meeting, the main hydrologic boundaries in the White Bear Township area that must be considered for the Prairie du Chien-Jordan Aquifer system are other high-capacity pumping wells in the vicinity of your wells. The Department of Natural Resources maintains a database of high-capacity pumping wells in the state. This database will likely be the best source of information regarding quantity of water pumped by other wells in the area. Locations of these wells should be confirmed.

Groundwater flow field - It will be necessary to determine the ambient direction of groundwater flow upgradient of your public wells. Information regarding the regional groundwater flow conditions in the Prairie du Chien-Jordan Aquifer system is available from a number of regional studies in Ramsey County.

Method used to delineate wellhead protection areas - The complexity of the groundwater flow field in the Prairie du Chien-Jordan Aquifer system and the nature of the hydrologic boundary conditions require that a computer code be used to make the wellhead protection area delineation. Several regional models are available that could be used for this analysis. Ramsey SWCD staff can recommend what will work best for your needs.

The locations of the your wells that I checked with you at the meeting are listed in the Table 2, which is presented at the end of this letter. These locations are presented in the form of coordinates using the UTM meters projection and a datum of NAD83, zone 15. Ramsey SWCD staff should use these locations for the delineation analysis or consult with MDH if modifications are required. All electronic submittals to MDH should use the UTM meters projection and the NAD83, zone 15 datum.

Delineation of drinking water supply management areas - Ramsey SWCD staff will work with you to identify the drinking water supply management area using streets, roads, section lines, parcel boundaries or other features that the public can easily understand for referencing the area that will be included in the city's wellhead protection plan.

Item 2 - Well and aquifer vulnerability assessments.

Along with the delineation of the wellhead protection areas, you must make an evaluation of the vulnerability of the wells and aquifers used by the township (part 4720.5210). This is needed to determine the scope of the inventory of potential contaminant sources and the resulting strategy for managing them in the future. Based on the information in our files, the department has determined that your wells are vulnerable to contamination. This designation is considered preliminary and could change if you have different or more current information about the wells than we had at the time the assessments were made. You will need to consider geologic conditions, well construction, and water chemistry to make the vulnerability assessment.

Item 3 - Information describing the physical environment and land use.

The wellhead protection plan should include a description of the geologic conditions throughout the drinking water supply management areas to support the delineation approach and the vulnerability assessment of the aquifers supplying your wells. Geologic maps, regional studies and information

available from local water well contractors will help fill in some of the gaps in our understanding of subsurface geological and groundwater conditions. This information should be presented in the report documenting the Part I activities.

We understand that you will be assisted in your wellhead protection efforts by staff from Ramsey SWCD. We talked of the importance of meeting partway through the project—a pre-delineation meeting—to make sure MDH, White Bear Township, and Ramsey SWCD staff are in agreement relative to the technical details. Should you desire additional information on the wellhead protection program and its technical requirements for either Part I or Part II activities, please contact MDH staff at the numbers listed below.

In closing, we look forward to working with you on completing your wellhead protection plan. I will be working on the wellhead protection area delineation and vulnerability assessment in conjunction with Robyn and Art. If you have any questions regarding this letter, please contact Robyn (218-821-5028), Art (507/292-5138), or me (651/215-1322).

Sincerely,

Stephen W. Robertson, Hydrogeologist
Environmental Health Division
P.O. Box 64975
St. Paul, Minnesota 55164-0975

SWR:kmc
Enclosure
cc: Art Persons, Planner, Source Water Protection Unit, Rochester District Office
Robyn Hoerr, Minnesota Rural Water Association
Matt Swanson, Ramsey SWCD

SCOPING DECISION NOTICE No. 1

- **Delineation of the Wellhead Protection Area**
- **Boundaries of the Drinking Water Supply Management Area**
- **Vulnerability Assessment of the Well**
- **Vulnerability Assessment of the Drinking Water Supply Management Area**

Name of Public Water Supply			Date
White Bear Township (PWSID =1620025)			September 18, 2001
Name of the Wellhead Protection Manager			
Mr. Bill LaBore			
Address	City		Zip
1281 Hammond Road	White Bear Township		55110
Unique Well Numbers			Phone
226570, 226571, 224679, 226572, 151596, 596636			651-429-5546

Instructions for Completing the Scoping No. 1 Form

N	D	V	S	
X				**N = Not required.** If this box is checked, this data element is **NOT** necessary for your wellhead protection plan. **Please go to the next data element.**

N	D	V	S	
	X			**D = Required for the DELINEATION.** If this box is checked, this data **MUST** be used for the **"delineation of the wellhead protection plan."**

N	D	V	S	
		X		**V = Required for the VULNERABILITY assessment.** If this box is checked, this data **MUST** be used for the **"vulnerability assessment of the drinking water supply management area."**

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

DATA ELEMENTS ABOUT THE PHYSICAL ENVIRONMENT

PRECIPITATION

N	D	V	S	
X				An existing map or list of local precipitation gauging stations.

Technical Assistance Comments:

N	D	V	S	
X				An existing table showing the average monthly and annual precipitation in inches for the preceding five years.

Technical Assistance Comments:

GEOLOGY

N	D	V	S	
	X	X	X	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.

Technical Assistance Comments:

Information of this type is required to characterize fully the geologic and hydrogeologic setting of the township's well fields. This information should be used to define aquifer geometry, location and magnitude of recharge and discharge areas, and groundwater flow information. Many regional-scale studies in the White Bear Township area are available to help in this characterization. Reference all information used to make the determination and submit to MDH only the information that is not available in the public domain.

N	D	V	S	
	X	X	X	Existing records of the geologic materials penetrated by wells, borings, exploration test holes, or excavations, including those submitted to the department.

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 information is not otherwise available to MDH.

N	D	V	S	
	X	X	X	Existing borehole geophysical records from wells, borings, and exploration test holes.

Technical Assistance Comments:

Submit only if information is not otherwise available to MDH.

N	D	V	S	
	X	X	X	Existing surface geophysical studies.

Technical Assistance Comments:

Submit only if information is not otherwise available to MDH.

SOILS

N	D	V	S	
X				Existing maps of the soils and a description of soil infiltration characteristics.

Technical Assistance Comments:

N	D	V	S	
X				A description or an existing map of known eroding lands that are causing sedimentation problems.

Technical Assistance Comments:

WATER RESOURCES

N	D	V	S	
	X			An existing map of the boundaries and flow directions of major watershed units and minor watershed units.

Technical Assistance Comments:

N	D	V	S	
	X			An existing map and a list of public waters as defined in Minnesota Statutes, section 103G.005, subdivision 15, and public drainage ditches.

Technical Assistance Comments:

N	D	V	S	
X				The shoreland classifications of the public waters listed under subitem (2), pursuant to part 6120.3000 and Minnesota Statutes, sections 103F.201 to 103F.221.

Technical Assistance Comments:

N	D	V	S	
X				An existing map of wetlands regulated under chapter 8420 and Minnesota Statutes, section 103G.221 to 103G.2373.

Technical Assistance Comments:

N	D	V	S	
X				An existing map showing those areas delineated as floodplain by existing local ordinances.

Technical Assistance Comments:

LAND USE

N	D	V	S	
	X		X	An existing map of parcel boundaries.

Technical Assistance Comments:
This information will be helpful in delineating the Drinking Water Supply Management Area.

N	D	V	S	
	X		X	An existing map of political boundaries.

Technical Assistance Comments:
This information will be helpful in delineating the Drinking Water Supply Management Area.

N	D	V	S	
	X		X	An existing map of public land surveys, including township, range, and section.

Technical Assistance Comments:
This information will be helpful in delineating the Drinking Water Supply Management Area.

N	D	V	S	
X				A map and an inventory of the current and historical agricultural, residential, commercial, industrial, recreational, and institutional land uses and potential contaminant sources.

Technical Assistance Comments:
While not needed for the Part I WHP planning activities, this information will likely be useful in conducting the Part II planning activities.

N	D	V	S	
X				An existing, comprehensive land-use map.

Technical Assistance Comments:
While not needed for the Part I WHP planning activities, this information will likely be useful in conducting the Part II planning activities.

N	D	V	S	Existing zoning map.
X				

Technical Assistance Comments:
While not needed for the Part I WHP planning activities, this information will likely be useful in conducting the Part II planning activities.

PUBLIC UTILITY SERVICES

N	D	V	S	An existing map of transportation routes or corridors.
	X			

Technical Assistance Comments:

N	D	V	S	An existing map of storm sewers, sanitary sewers, and public water supply systems.
	X			

Technical Assistance Comments:
While information regarding storm and sanitary sewers is not needed for the Part I WHP planning activities, this information will likely be useful in conducting the Part II planning activities. Other public water supply systems near the township's well field may represent a hydrologic boundary.

N	D	V	S	An existing map of the gas and oil pipelines used by gas and oil suppliers.
X				

Technical Assistance Comments:
While not needed for the Part I WHP planning activities, this information will likely be useful in conducting the Part II planning activities.

N	D	V	S	An existing map or list of public drainage systems.
X				

Technical Assistance Comments:

N	D	V	S	An existing record of construction, maintenance, and use of the public water supply well and other wells within the drinking water supply management area.
	X	X	X	

Technical Assistance Comments:
Data required to satisfy this element include information about the township's wells that may affect the vulnerability assessment (i.e., changes to the well construction recorded on the original well log due to rehabilitation or reconstruction, changes in pumping rate). Also required is information relative to past and projected use of the well that will be used for wellhead protection area delineation.

SURFACE WATER QUANTITY

N	D	V	S	An existing description of high, mean, and low flows on streams.
	X			

Technical Assistance Comments:
May be useful in helping to calibrate groundwater flow model.

N	D	V	S	An existing list of lakes where the state has established ordinary high water marks.
X				

Technical Assistance Comments:

N	D	V	S	
X				An existing list of permitted withdrawals from lakes and streams, including source, use, and amounts withdrawn.

Technical Assistance Comments:
Only required if affected surface water bodies are in direct hydraulic connection with the aquifer(s) of concern and withdrawals affect water levels in both the surface water and adjacent groundwater systems.

N	D	V	S	
X				An existing list of lakes and streams for which state protected levels or flows have been established.

Technical Assistance Comments:

N	D	V	S	
	X	X	X	An existing description of known water-use conflicts, including those caused by groundwater pumping.

Technical Assistance Comments:
Conflicts between use of groundwater resources and surface water bodies would be indicative of a hydrologic boundary that would need to be considered in delineating the wellhead protection area.

GROUNDWATER QUANTITY

N	D	V	S	
	X	X	X	An existing list of wells covered by state appropriation permits, including amounts of water appropriated, type of use, and aquifer source.

Technical Assistance Comments:
The intent of this data element is to collect information that may be useful in identifying hydrologic boundary conditions (i.e., pumping wells) that could affect the size and shape of wellhead protection area boundaries. The township must provide past and projected well use information in support of the wellhead protection area.

N	D	V	S	
	X		X	An existing description of known well interference problems and water-use conflicts.

Technical Assistance Comments:
Interference problems with other wells, if present, likely indicate a hydrologic boundary that would need to be considered in making the wellhead protection area delineation.

N	D	V	S	
	X	X	X	An existing list of state environmental boreholes, including unique well number, aquifer measured, years of record, and average monthly levels.

Technical Assistance Comments:
Only submit if not available to MDH.

DATA ELEMENTS ABOUT WATER QUALITY

SURFACE WATER QUALITY

N	D	V	S	
	X			An existing map or list of the state water quality management classification for each stream and lake.

Technical Assistance Comments:

N	D	V	S	
	X			An existing summary of lake and stream water quality monitoring data, including: 1. bacteriological contamination indicators; 2. inorganic chemicals; 3. organic chemicals; 4. sedimentation; 5. dissolved oxygen; and 6. excessive growth or deficiency of aquatic plants.

Technical Assistance Comments:

GROUNDWATER QUALITY

N	D	V	S	
	X	X	X	An existing summary of water quality data, including: 1) bacteriological contamination indicators; 2) inorganic chemicals; and 3) organic chemicals

Technical Assistance Comments:
Information of this type would be useful in completing the vulnerability assessment and in generally characterizing the hydrogeologic environment. Submit if information is not available to MDH.

N	D	V	S	
	X	X	X	An existing list of water chemistry and isotopic data from wells, springs, or other groundwater sampling points.

Technical Assistance Comments:
Information of this type would be useful in completing the vulnerability assessment and in generally characterizing the hydrogeologic environment. Submit if information is not available to MDH.

N	D	V	S	
	X	X	X	An existing report of groundwater tracer studies.

Technical Assistance Comments:

N	D	V	S	
	X	X	X	An existing site study and well water analysis of known areas of groundwater contamination.

Technical Assistance Comments:
Submit if information is not available to MDH.

N	D	V	S	
	X	X	X	An existing property audit identifying contamination.

Technical Assistance Comments:
Submit if information is not available to MDH.

N	D	V	S	
	X	X	X	An existing report to the Minnesota Department of Agriculture and the Minnesota Pollution Control Agency of contaminant spills and releases.

Technical Assistance Comments:
Submit if information is not available to MDH.

TABLE 1
Municipal Water Supply Information
White Bear Township, Minnesota

Local Well Name	Unique Well Number	Aquifer	Casing Depth (ft)	Well Depth (ft)	Date Constructed	Vulnerability Status [1]
1	226570	Jordan	365	445	1956	Vulnerable
2	226571	Jordan	375	435	1960	Vulnerable
3	224679	Prairie du Chien-Jordan	200	372	1975	Vulnerable
4	226572	Jordan	325	408	1976	Vulnerable
5	151596	Prairie du Chien-Jordan	230	412	1987	Vulnerable
6	596636	Prairie du Chien-Jordan	175	360	1998	Vulnerable

Note: 1. Vulnerability status based on MDH staff review of well construction, geologic materials encountered during drilling, well use and water quality.

TABLE 2
Municipal Water Supply Well Locations
White Bear Township, Minnesota

Local Well Name	Unique Number	UTM-Easting (meters)	UTM - Northing (meters)
1	226570	500,728	4,989,760
2	226571	500,614	4,989,830
3	224679	499,474	4,994,104
4	226572	498,010	4,993,677
5	151596	497,410	4,990,940
6	596636	500,447	4,994,617

Note: Datum is UTM - meters, NAD83 zone 15.

PW : 1620025
SYSTEM NAME: White Bear Township
WELL NAME : Well #1

TIER : 1
WHP RANK : 7
UNIQUE WELL #: 00226570

COUNTY: Ramsey TOWNSHIP NUMBER: 30 RANGE: 22 SECTION: 25 QUARTERS: ABDD

CRITERIA	DESCRIPTION	POINTS
Aquifer Name :	JORDAN	
DNR Geologic Sensitivity Rating: VL L	Score: 0	0
Geologic Data From :	Well Record	
Year Constructed :	1956	
Construction Method :	Cable Tool/Bored	0
Casing Depth :	365	5
Well Depth :	445	
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?	Unknown	0
Pumping Rate:	500	5
No. .HMS VOCs detected?	Methyl Isobutyl Ketone / /	vulnerable
	Ethylbenzene / /	
	M-Xylene / /	
	P-Xylene / /	
	O- Xylene / /	
Pesticides detected?	Unknown	0
Maximum nitrate detected :	<0.4	0
Maximum tritium detected :	3.6 07/13/1991	vulnerable
Carbon-14 age :	Unknown	0

Wellhead Protection Score : 10
Wellhead Protection Vulnerability Rating: VULNERABLE

COMMENTS
Very low vulnerability is based on the presence of the Glenwood shale and basal shale layers in the St. Peter Sandstone

PW : 1620025
SYSTEM NAME: White Bear Township
WELL NAME : Well #2

TIER : 1
WHP RANK : 7
UNIQUE WELL #: 00226571

COUNTY: Ramsey TOWNSHIP NUMBER: 30 RANGE: 22 SECTION: 25 QUARTERS: ABDC

CRITERIA	DESCRIPTION	POINTS
Aquifer Name :	JORDAN	
DNR Geologic Sensitivity Rating: VL L	Score: 0	0
Geologic Data From :	Public Water File	
Year Constructed :	1960	
Construction Method :	Cable Tool/Bored	0
Casing Depth :	375	5
Well Depth :	435	
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?	Unknown	0
Pumping Rate:	225	5
No. THMS VOCs detected?		vulnerable
Pesticides detected?	Unknown	0
Maximum nitrate detected :	<0.4	0
Maximum tritium detected :	Unknown	0
Carbon-14 age :	Unknown	0

Wellhead Protection Score : 10
Wellhead Protection Vulnerability Rating: VULNERABLE
Assessed By: WALSHJ

COMMENTS
VULNERABLE BASED ON TRITIUM DATA FROM OTHER WELLS IN SYSTEM.

PW : 1620025
SYSTEM NAME: White Bear Township
WELL NAME : Well #3

TIER : 1
WHP RANK : 7
UNIQUE WELL #: 00224679

COUNTY: Ramsey TOWNSHIP NUMBER: 30 RANGE: 22 SECTION: 11 QUARTERS: DAAA

CRITERIA	DESCRIPTION	POINTS
Aquifer Name :	PRAIRIE DU CHIEN-JORDAN	
DNR Geologic Sensitivity Rating: L L	Score: 3	20
Geologic Data From :	Well Record	
Year Constructed :	1975	
Construction Method :	Cable Tool/Bored	0
Casing Depth :	200	10
Well Depth :	372	
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?	Unknown	0
Pumping Rate:	1200	20
Non .HMS VOCs detected?	No	0
Pesticides detected?	Unknown	0
Maximum nitrate detected :	<0.1 09/28/1994	0
Maximum tritium detected :	Unknown	0
Carbon-14 age :	Unknown	0

Wellhead Protection Score : 55
Wellhead Protection Vulnerability Rating: VULNERABLE
Assessed By: WALSHJ

COMMENTS
Considered vulnerable because of tritium at well 1.

PWS : 1620025
SYSTEM NAME: White Bear Township
WELL NAME : Well #4

TIER : 1
WHP RANK : 7
UNIQUE WELL #: 00226572

COUNTY: Ramsey TOWNSHIP NUMBER: 30 RANGE: 22 SECTION: 11 QUARTERS: CBBB

CRITERIA	DESCRIPTION	POINTS
Aquifer Name :	JORDAN	
DNR Geologic Sensitivity Rating: L L	Score: 0	20
Geologic Data From :	Well Record	
Year Constructed :	1976	
Construction Method :	Cable Tool/Bored	0
Casing Depth :	325	5
Well Depth :	408	
Casing grouted into borehole?	Unknown	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?	Unknown	0
Pumping Rate:	650	10
Non-VHMS VOCs detected?	No	0
Pesticides detected?	Unknown	0
Maximum nitrate detected :	<0.1 09/28/1994	0
Maximum tritium detected :	Unknown	0
Carbon-14 age :	Unknown	0

Wellhead Protection Score : 45
Wellhead Protection Vulnerability Rating: VULNERABLE
Assessed By: WALSHJ

COMMENTS
Low vulnerability assessment based on geologic log for well 3. VULNERABLE RATING BASED ALSO ON TRIITUM DATA FOR OTHER WELLS IN SYSTEM.

PWS ID : 1620025
SYSTEM NAME: White Bear Township
WELL NAME : Well #5

TIER : 1
WHP RANK : 7
UNIQUE WELL #: 00151596

COUNTY: Ramsey TOWNSHIP NUMBER: 30 RANGE: 22 SECTION: 22 QUARTERS: DBAB

CRITERIA	DESCRIPTION	POINTS
Aquifer Name :	PRAIRIE DU CHIEN-JORDAN	
DNR Geologic Sensitivity Rating: VL L	Score: 6	15
Geologic Data From :	Well Record	
Year Constructed :	1987	
Construction Method :	Cable Tool/Bored	0
Casing Depth :	230	5
Well Depth :	412	
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?	Unknown	0
Pumping Rate:	1700	20
No. .HMS VOCs detected?	Bromochloromethane / /	vulnerable
	O- Xylene / /	
Pesticides detected?	Unknown	0
Maximum nitrate detected :	<0.4	0
Maximum tritium detected :	Unknown	0
Carbon-14 age :	Unknown	0

Wellhead Protection Score : 40
Wellhead Protection Vulnerability Rating: VULNERABLE

COMMENTS
VULNERABLE RATING ALSO BASED ON TRITIUM DATA FOR OTHER WELLS IN SYSTEM.

PWS : 1620025
SYSTEM NAME: White Bear Township
WELL NAME : Well #6

TIER : 1
WHP RANK : 7
UNIQUE WELL #: 00596636

COUNTY: Ramsey TOWNSHIP NUMBER: 30 RANGE: 22 SECTION: 12 QUARTERS: AAD

CRITERIA	DESCRIPTION	POINTS
Aquifer Name :	PRAIRIE DU CHIEN-JORDAN	
DNR Geologic Sensitivity Rating: L L	Score: 1	20
Geologic Data From :	Well Record	
Year Constructed :	1998	
Construction Method :	Cable Tool/Bored	0
Casing Depth :	175	10
Well Depth :	360	
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?	Unknown	0
Pumping Rate:	2000	20
No. HMS VOCs detected?	Unknown	0
Pesticides detected?	Unknown	0
Maximum nitrate detected :	<0.1 04/19/1999	0
Maximum tritium detected :	4.8 06/15/2000	vulnerable
Carbon-14 age :	Unknown	0

Wellhead Protection Score : 50
Wellhead Protection Vulnerability Rating: VULNERABLE
Assessed By: WALSHJ

COMMENTS
Well is considered vulnerable because of tritum detect at well 1.

APPENDIX B
MODEL CALIBRATION SUMMARY

A Brief Discussion of the Calibration Statistics

For the regional flow model, the root mean square (RMS) error was about 6.9 m (see Figure B.2). A common "rule-of-thumb" goal of flow model calibration is to reduce the RMS error to be less than 10 percent of the total head drop across the model domain. With a head drop across the regional model of about 105 meters, an RMS of 6.91 m easily reaches that goal.

It is worth considering that the calibration dataset from the MPCA includes data collected over several decades and that positional errors and elevation errors in the database make the inherent "accuracy" or "resolution" of the database such that any given calibration point could differ from actual conditions by several meters (personal communication with MPCA Metro Model Staff). Thus, the calibration of the regional model is likely to be approaching a point where the model error could be approaching measurement error.

For the local model, RMS error is about 4.8 m (see Figure B.3). The head drop across the full domain of this model was about 50 m, so this also meets the "rule of thumb" criterion. However, it is very near to the 10-percent criterion. So, although this calibration meets the criterion, it is unlikely that it could exceed the criterion like the regional model. It is possible that this model could be calibrated to a lower RMS error with to another data set; however, no such set is available. As it stands, these calibration statistics may be the about the best that can be determined using the given calibration data set and the errors inherent to that data set.

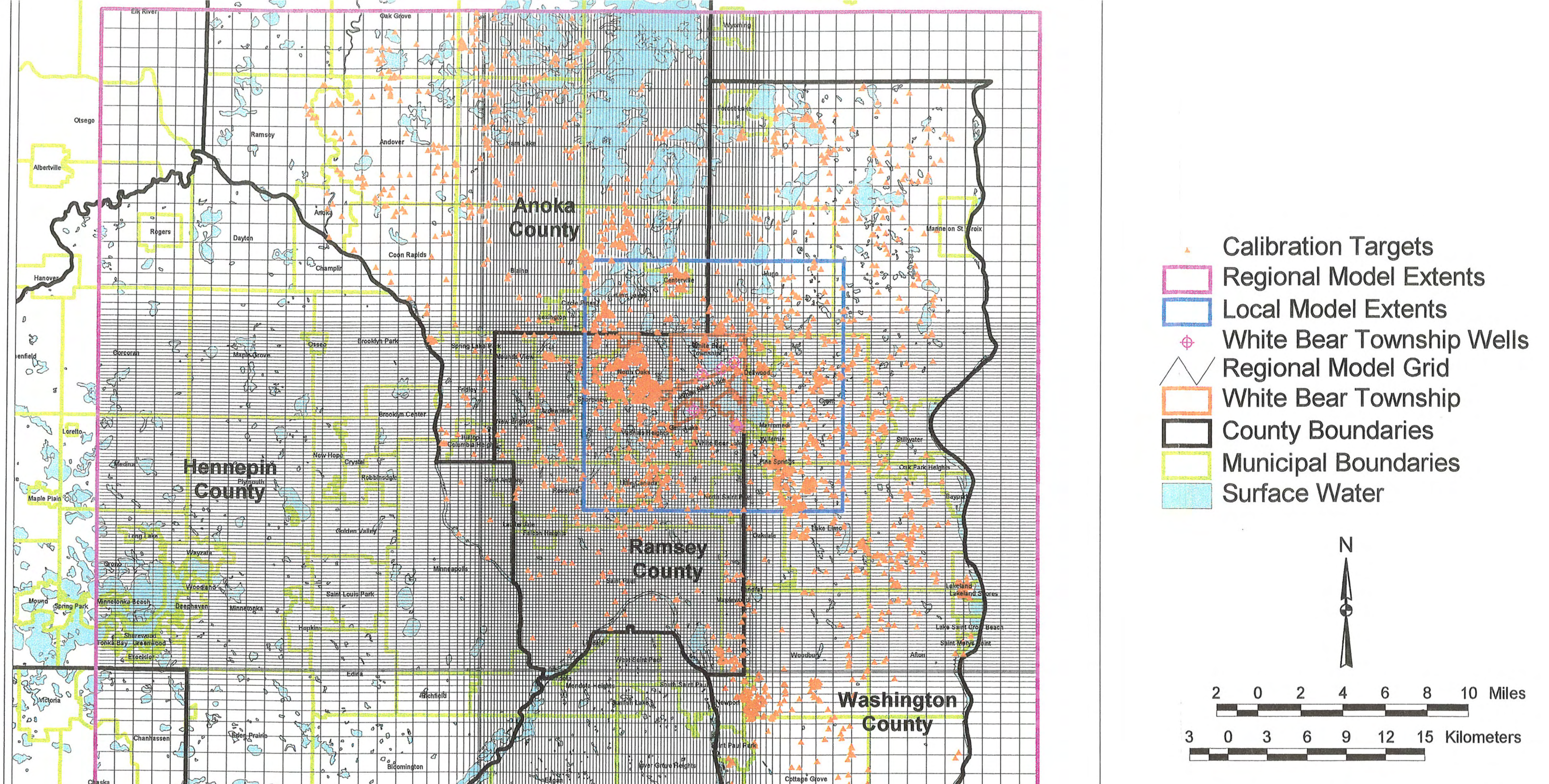
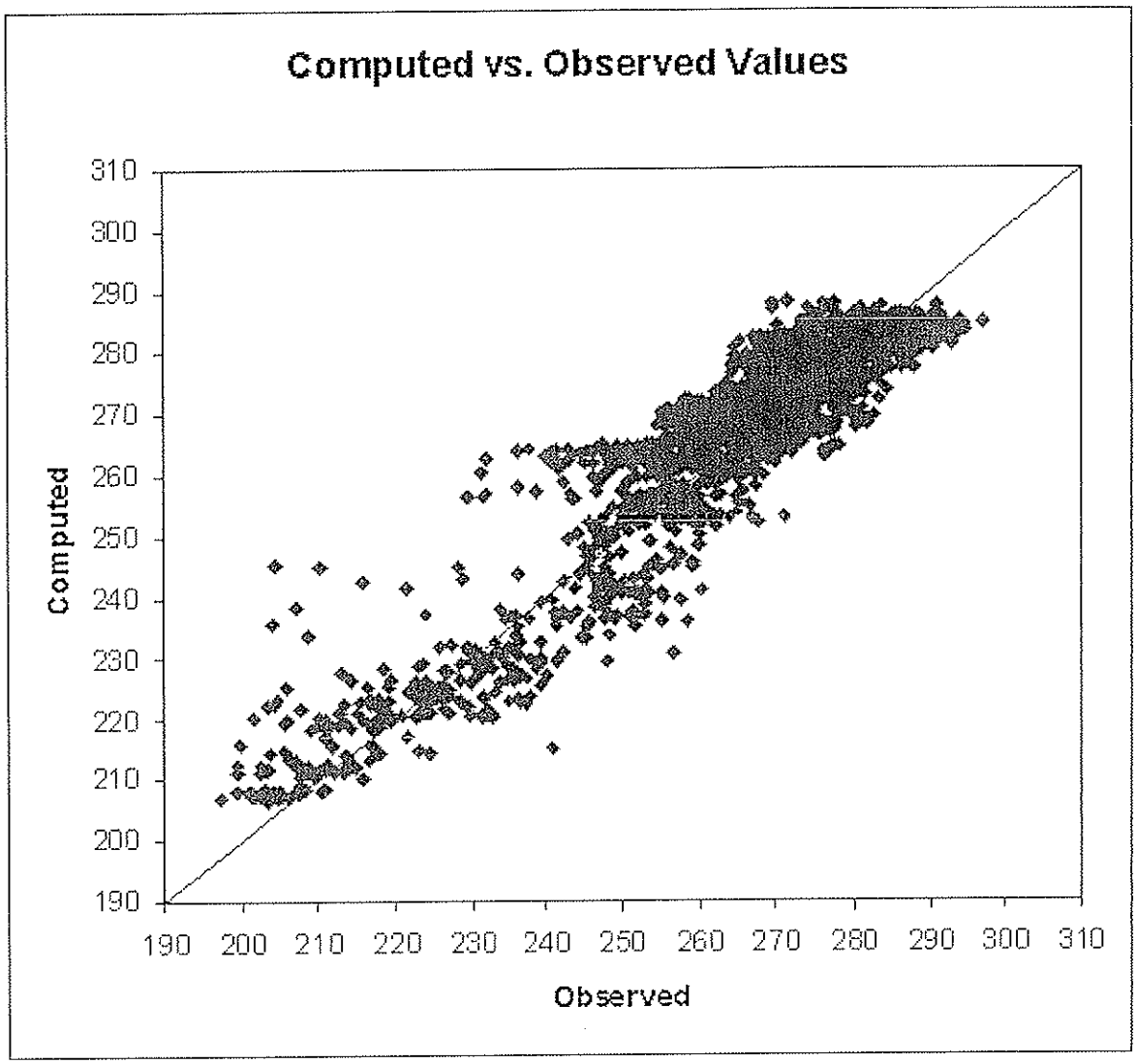


FIGURE B.1
Regional Model and Calibration Targets
White Bear Township
Wellhead Protection Plan

Ramsey Soil & Water Conservation District
Groundwater Program



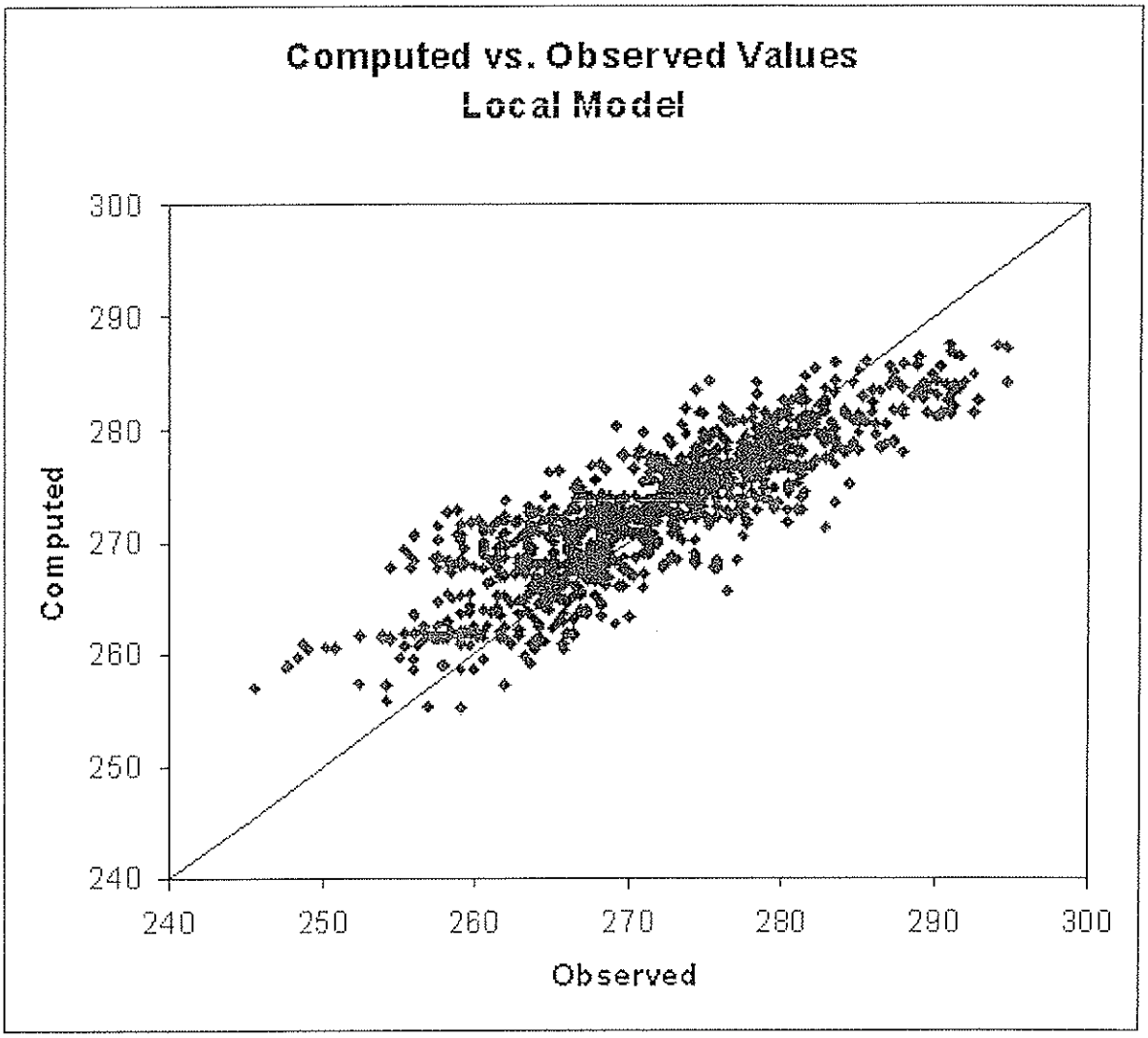
Note: Values are all in meters

Error Summary:

Mean error: 1.74 m
Mean absolute error: 5.24 m
Root mean square error: 6.91 m

FIGURE B.2
Regional MODFLOW Model Calibration Statistics
White Bear Township Wellhead Protection Plan

Ramsey Soil & Water Conservation District
Groundwater Program



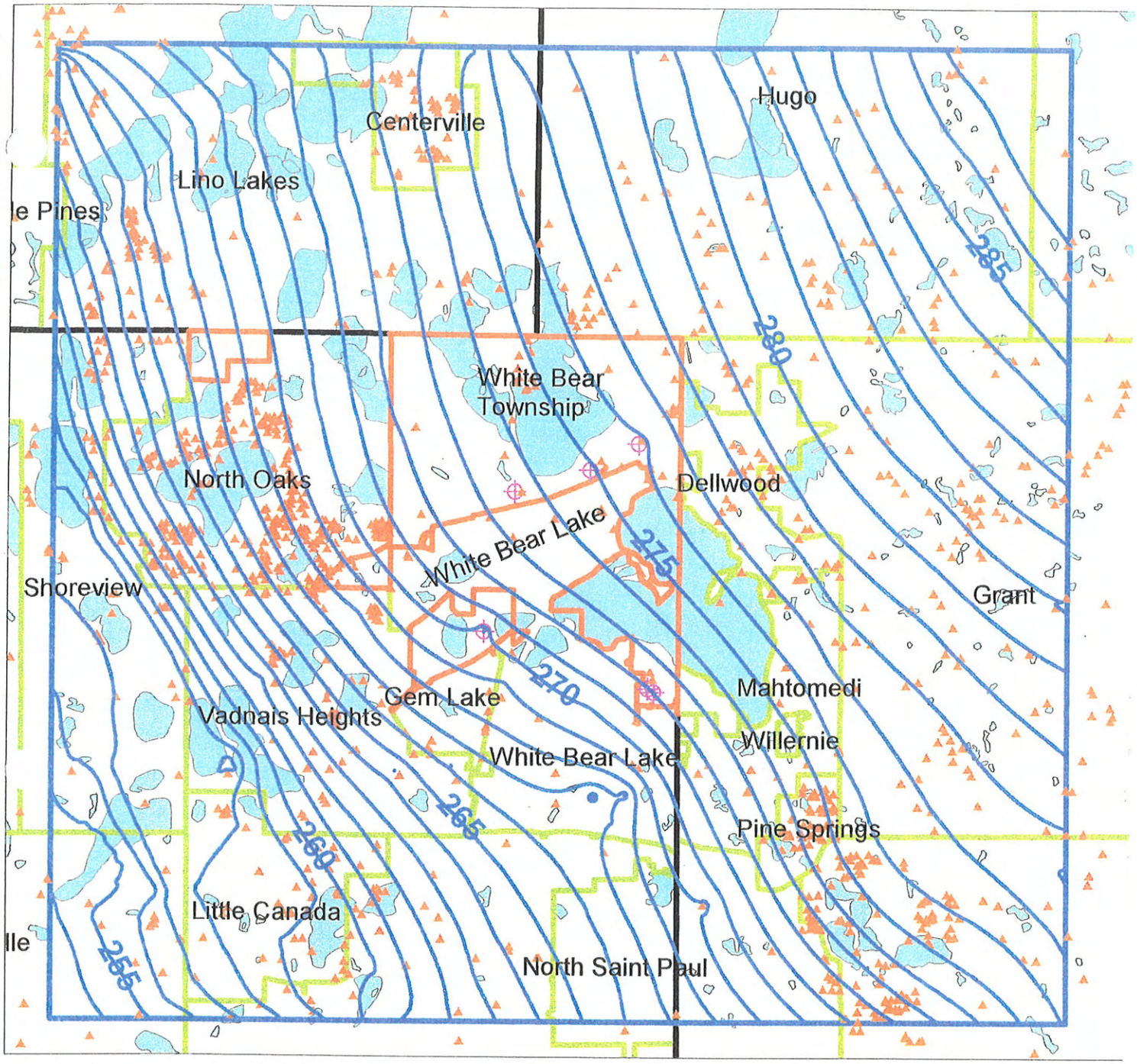
Note: Values are all in meters

Error Summary:

Mean error: 1.19 m
Mean absolute error: 3.72 m
Root mean square error: 4.76 m

FIGURE B.3
Local MODFLOW Model
Calibration Statistics
White Bear Township Wellhead Protection Plan

Ramsey Soil & Water Conservation District
Groundwater Program



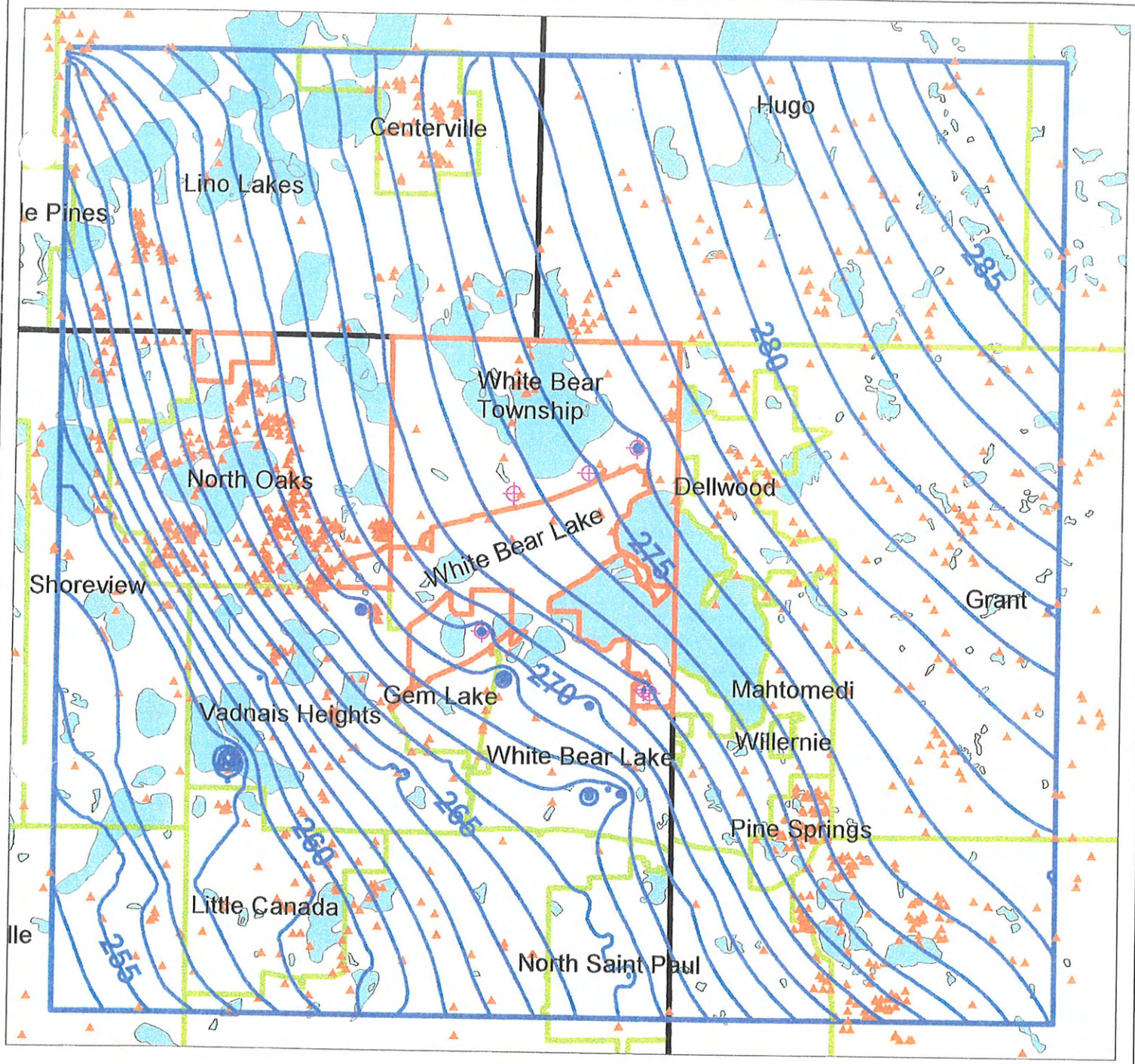
Modeled Heads, Layer 3
- Head Contours (m)
- Calibration Targets
- Local Model Extents
- White Bear Township Wells
- White Bear Township
- County Boundaries
- Municipal Boundaries
- Surface Water

N

0.5 0 0.5 1 1.5 2 2.5 Miles

FIGURE B.4
Layer 3 Heads, Local Model
White Bear Township
Wellhead Protection Plan

Ramsey Soil & Water Conservation District
Groundwater Program



Modeled Heads, Layer 4
- Head Contours (m)
- Calibration Targets
- Local Model Extents
- White Bear Township Wells
- White Bear Township
- County Boundaries
- Municipal Boundaries
- Surface Water

N

0.5 0 0.5 1 1.5 2 2.5 Miles

FIGURE B.5
Layer 4 Heads, Local Model

White Bear Township
Wellhead Protection Plan

Ramsey Soil & Water Conservation District
Groundwater Program

APPENDIX C

ELECTRONIC DATA:

WHPA AND DWSMA BOUNDARIES AND PARTICLE TRACKS (AS ARCVIEW® SHAPE FILES)

MODFLOW MODEL INPUT FILES

APPENDIX II

White Bear Township Municipal Well Logs

Unique No. 00226570	MINNESOTA DEPARTMENT OF HEALTH	Update Date 2003/03/11
County Name Ramsey	**WELL AND BORING RECORD**	Entry Date 1991/08/14
	Minnesota Statutes Chapter 1031	

Township Name	Township	Range	Dir	Section	Subsection	Well Depth	Depth Completed	Date Well Completed
	30	22	W	25	ABDDCA	445 ft.	445 ft.	1956/09/00

Well Name WHITE BEAR TOWNSHIP 1

EASTWOOD MANOR

WHITE BEAR LAKE MN

Drilling Method

Drilling Fluid

Well Hydrofractured? ☐ Yes ☐ No

From ft. to ft.

Use Community Supply (municipal)

Casing **Drive Shoe?** ☐ Yes ☐ N

Hole Diameter

Casing Diameter **Weight(lbs/ft)**

20 in. to 39 ft

12 in. to 365 ft

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
HARDPAN			0	32
PLATTEVILLE			32	52
SHALE			52	57
ST. PETER SANDROCK			57	172
SANDROCK & SHALE			172	212
SHAKOPEE			212	347
JORDAN			347	445
			445	

Screen N

Open Hole From 365 ft. to 442 ft.

Make Type

Static Water Level 72 ft. from Land surface Date 1956/09/00

PUMPING LEVEL (below land surface)

165 ft. after hrs. pumping 627 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

Material	From	To (ft.)	Amount(yds/bags)	
G	0	365	351	S

Nearest Known Source of Contamination

ft. direction type

Well disinfected upon completion? ☐ Yes ☐ No

Pump ☐ Not Installed Date Installed Y

Mfr name FAIRBANKS MORSE

Model AV 4763 HP 50 Volts 220

Drop Pipe Length 196 ft. Capacity 500 g.p.m

Type T

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: 020 TO 0039;012 TO 0365.

G.W.Q. NO. 0070

GAMMA LOGGED 1/11/85.

USGS Quad: White Bear Lake East Elevation 974

Aquifer: CJDN Alt Id: 84-6120

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 62012

License Business Name

Name of Driller KEMPER, H

Report Copy

Unique No. 00226571	MINNESOTA DEPARTMENT OF HEALTH	Update Date 2002/02/13
County Name Ramsey	**WELL AND BORING RECORD**	Entry Date 1991/08/14
	Minnesota Statutes Chapter 1031	

Township Name	Township	Range	Dir	Section	Subsection	Well Depth	Depth Completed	Date Well Completed
	30	22	W	25	ABDCBB	435 ft.	435 ft.	1961/00/00

Well Name WHITE BEAR TOWNSHIP 2

Drilling Method

Contact's Name WHITE BEAR #2
LAKEWOOD & STACKER AV
WHITE BEAR LAKE MN

Drilling Fluid

Well Hydrofractured? ☐ Yes ☐ No
From ft. to ft.

Use Community Supply (municipal)

Casing **Drive Shoe?** ☐ Yes ☐ N

Hole Diameter

Casing Diameter **Weight(lbs/ft)**
12 in. to 45 ft
8 in. to 375 ft

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
YELLOW GRAVEL			0	35
DRIFT & SHALE			35	45
LIMESTONE			45	52
SHALE			52	57
SANDSTONE			57	211
LIMESTONE			211	355
SANDSTONE			355	435

Screen N
Make Type

Open Hole From 375 ft. to 435 ft.

Static Water Level 65 ft. from Land surface Date 1961/00/00

PUMPING LEVEL (below land surface)
ft. after hrs. pumping 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: 012 TO 0045;008 TO 0375.

USGS Quad: White Bear Lake East Elevation 967
Aquifer: CJDN Alt Id: 84-6120

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No.
License Business Name
Name of Driller

Report Copy

Unique No. 676446

County Name Ramsey

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Update Date 2003/10/30

Entry Date

Township Name	Township	Range	Dir	Section	Subsection
	30	22	W	24	CDD

Well Depth	Depth Completed	Date Well Completed
420 ft.	420 ft.	2002/04/25

Well Name WHITE BEAR TOWNSHIP 2A

Drilling Method Cable Tool

Well Owner's Name WHITE BEAR TOWNSHIP
4099 BELLAIRE AV
WHITE BEAR TOWNSHIP MN 55110

Contact's Name WHITE BEAR TOWNSHIP
1281 HAMMOND RD
WHITE BEAR TOWNSHIP MN 55110

Drilling Fluid: Water

Well Hydrofractured? ☐ Yes ☐ No
From ft. to ft.

Use Community Supply (municipal)

Casing Drive Shoe? ☑ Yes ☐ N

Hole Diameter: in. to 420 ft

Casing Diameter				Weight(lbs/ft)
20	in. to	33	ft	78.6
14	in. to	299	ft	54.6

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
SAND/RUBBLE	BROW	HARD	0	25
PLATTEVILLE	GRAY	HARD	25	30
GLENWOOD	BLU/G	MEDIUM	30	35
ST. PETER	TAN/W	SOFT	35	143
ST. PETER	GRAY	HARD	143	197
SHAKOPEE/ONEOTA	PINK	HARD	197	330
JORDAN	TAN	MEDIUM	330	410
ST. LAWRENCE	BLUE	HARD	410	420

Screen N
Make Type

Open Hole From 299 ft. to 420 ft.

Static Water Level 55 ft. from Date 2003/04/21

PUMPING LEVEL (below land surface)
109.7 ft. after 4 hrs. pumping 1120 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

Material	From	To (ft.)	Amount(yds/bags)	
G	0	14	25	S
G	14	299	63	Y

Nearest Known Source of Contamination
140 ft. direction E type SDF
Well disinfected upon completion? ☐ Yes ☐ No

Pump ☑ Not Installed Date Installed N
Mfr name
Model HP 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.

ELEVATION: 949 FT, MSGS QUAD: C118

COMPLETED WITH TKDA & ASSOCIATES

USGS Quad: White Bear Lake East Elevation
Aquifer: Alt Id: 84-6120

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 71015
License Business Name
Name of Driller SIGAFOOS, R.

Report Copy

Unique No. 00224679	MINNESOTA DEPARTMENT OF HEALTH	Update Date 2004/01/06
County Name Ramsey	**WELL AND BORING RECORD**	Entry Date 1991/08/14
	Minnesota Statutes Chapter 1031	

Township Name	Township	Range	Dir	Section	Subsection	Well Depth	Depth Completed	Date Well Completed
	30	22	W	11	DAAABC	372 ft.	372 ft.	1975/00/00

Well Name WHITE BEAR TOWNSHIP 3

Drilling Method

Contact's Name TOWN OF WHITE BEAR
EAST ST. & PARK AVE
WHITE BEAR LAKE MN

Drilling Fluid

Well Hydrofractured? ☐ Yes ☐ No
From ft. to ft.

Use Community Supply (municipal)

Casing **Drive Shoe?** ☐ Yes ☐ N

Hole Diameter

Casing Diameter **Weight(lbs/ft)**
30 in. to 151 ft
24 in. to 200 ft

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
WET MUCK	LIGHT		0	10
CLAY & STONES	GRAY		10	40
GRAVEL & STONES	GRAY		40	70
GRAVEL	BROW		70	94
SAND	RED		94	95
SANDY	DK. BR		95	105
SAND	BROW		105	135
STONE			135	150
STONES & BROKEN SHAKO	LIGHT		150	151
SHAKOPEE	TAN		151	185
SHAKOPEE DIRTY	LT. TA		185	195
SHAKOPEE	LIGHT	V.HARD	195	225
SHAKOPEE	PINK	V.HARD	225	270
SHAKOPEE	TAN		270	275
SHAKOPEE	TAN		275	280
SHAKOPEE	PINK		280	282
JORDAN	WHITE	SOFT	282	305
JORDAN FINE	PINK		305	320
JORDAN COARSE	WHITE		320	325
ST. LAWRENCE SHALE	WHITE		325	340
SANDSTONE	PINK	HARD	340	350
SANDSTONE	PNK/G	HARD	350	372

Screen N
Make Type

Open Hole From 200 ft. to 372 ft.

Static Water Level 15 ft. from Land surface Date 1975/00/00

PUMPING LEVEL (below land surface)
64 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.

M.G.S. NO. 1143

USGS Quad: White Bear Lake West Elevation 923
Aquifer: OPCJ Alt Id: 84-6120

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 02015
License Business Name
Name of Driller SIGAFOOS, G

Report Copy

Unique No. 00226572	MINNESOTA DEPARTMENT OF HEALTH	Update Date 2002/02/13
County Name Ramsey	**WELL AND BORING RECORD**	Entry Date 1991/08/14
	Minnesota Statutes Chapter 1031	

Township Name	Township	Range	Dir	Section	Subsection	Well Depth	Depth Completed	Date Well Completed
	30	22	W	11	CBBBCC	408 ft.	408 ft.	1976/06/07

Well Name WHITE BEAR TOWNSHIP 4

Drilling Method

Contact's Name TOWN OF WHITE BEAR

WHITE BEAR LAKE MN

Drilling Fluid

Well Hydrofractured? ☐ Yes ☐ No

From ft. to ft.

Use Community Supply (municipal)

Casing **Drive Shoe?** ☐ Yes ☐ N

Hole Diameter

Casing Diameter **Weight(lbs/ft)**

30 in. to 166 ft

24 in. to 263 ft

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
DRIFT			0	149
SAND ROCK & GRAVEL			149	165
SANDROCK			165	186
SHAKOPEE			186	311
JORDAN			311	400
JORDAN & SHALE			400	408

Screen N

Open Hole From 263 ft. to 408 ft.

Make Type

Static Water Level 32 ft. from Land surface Date 1976/06/07

PUMPING LEVEL (below land surface)

86 ft. after hrs. pumping 700 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

Material	From	To (ft.)	Amount(yds/bags)	
G	0	325	250	S

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.

M.G.S. NO. 1101

MEAD PARK - STILLWATER AVENUE

USGS Quad: White Bear Lake West Elevation 940

Aquifer: MTPL Alt Id: 84-6120

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 62012

License Business Name

Name of Driller O'BRIEN, F

Report Copy

Unique No. 00151596	MINNESOTA DEPARTMENT OF HEALTH	Update Date 2002/02/13
County Name Ramsey	**WELL AND BORING RECORD**	Entry Date 1991/08/14
	Minnesota Statutes Chapter 1031	

Township Name	Township	Range	Dir	Section	Subsection	Well Depth	Depth Completed	Date Well Completed
	30	22	W	22	DBABBB	412 ft.	412 ft.	1987/03/25

Well Name WHITE BEAR TOWNSHIP 5

Drilling Method Cable Tool

Well Owner's Name WHITE BEAR TOWNSHIP 5

WHITE BEAR LAKE MN 55110

Contact's Name CITY OF WHITE BEAR TOWNSHIP
1281 HAMMOND RD
WHITE BEAR LAKE MN 55110-

Drilling Fluid

Well Hydrofractured? ☐ Yes ☐ No
From ft. to ft.

Use Community Supply (municipal)

Casing **Drive Shoe?** ☑ Yes ☐ N

Hole Diameter
in. to 154 ft
in. to 412 ft

Casing Diameter **Weight(lbs/ft)**
30 in. to 150 ft
24 in. to 199 ft
18 in. to 230 ft

Screen N

Open Hole From 230 ft. to 412 ft.

Make Type

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
DIRT			0	4
CLAY	BLUE		4	40
GRAVEL + CLAY	BLUE		40	61
SAND	GRAY		61	72
SAND + ROCKS	GRAY		72	104
SAND-FINE	BROW		104	142
SAND + CLAY	BROW		142	147
SAND	BROW		147	157
CLAY	GRAY		157	192
SANDSTONE	GREE		192	199
LIMESTONE	BROW		199	335
SANDSTONE	PINK		335	357
SANDSTONE	GRAY		357	411
SHALE	GREE		411	412

Static Water Level 17 ft. from Land surface Date 1987/03/16

PUMPING LEVEL (below land surface)
31 ft. after 4 hrs. pumping 2200 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

Material	From	To (ft.)	Amount(yds/bags)	
G	0	230	30	Y

Nearest Known Source of Contamination
100 ft. direction type BOW
Well disinfected upon completion? ☑ Yes ☐ No

Pump ☑ Not Installed Date Installed N
Mfr name
Model HP 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.

GAMMA LOGGED 3-23-87. 0-192 DRIFT 192-200 OSTP 200-320 OPDC 320-404

M.G.S. NO. 2772.

WELL LOCATED S. OF HWY 96 AND W. OF OTTER LAKE RD.

USGS Quad: White Bear Lake West Elevation 921
Aquifer: MTPL Alt Id: 84-612

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 62012
License Business Name
Name of Driller SITTIG, R

Report Copy

Unique No. 00596636

County Name Ramsey

MINNESOTA DEPARTMENT OF HEALTH

WELL AND BORING RECORD

Minnesota Statutes Chapter 1031

Update Date 2004/01/06

Entry Date 1998/06/25

Township Name	Township	Range	Dir	Section	Subsection
	30	22	W	12	

Well Depth	Depth Completed	Date Well Completed
360 ft.	360 ft.	1998/05/22

Well Name WHITE BEAR TOWNSHIP 6

Drilling Method Cable Tool

Contact's Name WHITE BEAR TOWNSHIP 6
2530 BUFFALO ST
MN

Drilling Fluid
Water

Well Hydrofractured? ☐ Yes ☐ No
From ft. to ft.

Use Community Supply (municipal)

Casing Drive Shoe? ☑ Yes ☐ N

Hole Diameter
0 in. to 360 ft

Casing Diameter Weight(lbs/ft)
30 in. to 145 ft
24 in. to 175 ft

GEOLOGICAL MATERIAL	COLOR	HARDNESS	FROM	TO
SAND & GRAVEL	BROW	SOFT	0	19
CLAY	GRAY	SOFT	19	37
GRAVEL & ROCKS	BROW	MEDIUM	37	60
SAND & GRAVEL	BROW	MEDIUM	60	141
LIMESTONE	TAN	HARD	141	272
SANDROCK	WHITE	MEDIUM	272	355
SHALE	GRY/B	MEDIUM	355	360

Screen N
Make Type

Open Hole From 175 ft. to 360 ft.

Static Water Level 21 ft. from Land surface Date 1998/04/27

PUMPING LEVEL (below land surface)
26 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

Material	From	To (ft.)	Amount(yds/bags)	
G	0	175	27	Y

Nearest Known Source of Contamination
150 ft. direction E type BOW
Well disinfected upon completion? ☐ Yes ☐ No

Pump ☑ Not Installed Date Installed N
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

USGS Quad: White Bear Lake East Elevation 928
Aquifer: OPCJ Alt Id: 1620025S06

Well CONTRACTOR CERTIFICATION Lic. Or Reg. No. 62012
License Business Name
Name of Driller SAMPSON, J.

Report Copy

APPENDIX III

Township Well Vulnerability Assessments

Vulnerability Assessment Worksheet

Well Name/No. White Bear Township Well #1

Public Water Supplier ID No. 1620025 Minnesota Unique Well No. 226570

1. DNR vulnerability rating - assign the following point values:		
Very High		Vulnerable
High		Vulnerable
Moderate		25 points
Low ("L" score of 1 to 3)		20 points
Low ("L" score of 4 to 7)		15 points
Very Low ("L" score of 8 to 11)		10 points
Very Low ("L" score of 12 or greater)	Glenwood and basal St. Peter shales present	0 points
TOTAL POINTS		**0**

2. Casing integrity - assign the following point values:	
Each breach of the casing.	20 points
Each casing string not grouted or extending to the land surface.	10 points
Each category for which information requested is unknown.	5 points
Each string of properly installed casing.	0 points
TOTAL POINTS	**0**

3. Casing depth - assign the following point values:		
<50 feet		20 points
50 to 200 feet		10 points
201 to 500 feet	365 feet	5 points
>500 feet		0 points
TOTAL POINTS		**5**

4. Pumping rate - assign the following point values:		
>1000 gallons/minute		20 points
501 to 1000 gallons/minute		10 points
50 to 500 gallons/minute	500 gpm	5 points
<50 gallons/minute		0 points
TOTAL POINTS		**5**

5. Isolation distance from contamination sources:	
For wells <50 feet deep, assign 10 points to each source located within 100 feet of the well.	
For wells >50 feet deep, assign 10 points to each source located within 50 feet of the well.	
TOTAL POINTS	**0**

6. Chemical and isotopic information:		
Volatile Organic Compounds Detection		Vulnerable
Synthetic Organic Compounds Detection		Vulnerable
Nitrate-Nitrogen Results		Vulnerable
>10 parts/million		Vulnerable
>3 but ≤10 parts/million		30 points
1 to 3 parts/million		10 points
<1 parts/million	<0.4	0 points
Tritium Results		
>1 TU	3.6 TU, 7/13/1991	Vulnerable
<1 TU		0 points
^{14}Carbon Results		
For wells in which the ^{14}carbon content of water indicates an age approximation of at least several centuries, subtract 20 points from the score.		
TOTAL POINTS		**Vulnerable**

7. Grand total score:		
1. DNR Vulnerability Rating		0
2. Casing Integrity		0
3. Casing Depth		5
4. Pumping Rate		5
5. Isolation Distance from Contaminant Sources		0
6. Chemical and Isotopic Information		0
GRAND TOTAL	**Vulnerable due to Tritium > 1 TU**	**10**

Note: See MDH SWP Vulnerability rating sheet and well log for source data.

► If the score is 45 or more, the well is considered vulnerable.

► If the score is between 5 and 40, priority for phasing into the state's WHP program is referenced to population served.

► If the score is 0 or less, the well is considered not vulnerable.

Vulnerability Assessment Worksheet

Well Name/No. White Bear Township Well #2A

Public Water Supplier ID No. 1620025 Minnesota Unique Well No. 676446

1. DNR vulnerability rating - assign the following point values:			
Very High			Vulnerable
High			Vulnerable
Moderate			25 points
Low ("L" score of 1 to 3)	L2	Glenwood and basal St. Peter shales present	20 points
Low ("L" score of 4 to 7)			15 points
Very Low ("L" score of 8 to 11)			10 points
Very Low ("L" score of 12 or greater)			0 points
TOTAL POINTS			**20**

2. Casing integrity - assign the following point values:	
Each breach of the casing.	20 points
Each casing string not grouted or extending to the land surface.	10 points
Each category for which information requested is unknown.	5 points
Each string of properly installed casing.	0 points
TOTAL POINTS	**0**

3. Casing depth - assign the following point values:		
<50 feet		20 points
50 to 200 feet		10 points
201 to 500 feet	299 feet	5 points
>500 feet		0 points
TOTAL POINTS		**5**

4. Pumping rate - assign the following point values:		
>1000 gallons/minute	1120 gpm	20 points
501 to 1000 gallons/minute		10 points
50 to 500 gallons/minute		5 points
<50 gallons/minute		0 points
TOTAL POINTS		**20**

5. Isolation distance from contamination sources:	
For wells <50 feet deep, assign 10 points to each source located within 100 feet of the well.	
For wells >50 feet deep, assign 10 points to each source located within 50 feet of the well.	
TOTAL POINTS	**0**

6. Chemical and isotopic information:		
Volatile Organic Compounds Detection		Vulnerable
Synthetic Organic Compounds Detection		Vulnerable
Nitrate-Nitrogen Results		Vulnerable
>10 parts/million		Vulnerable
>3 but ≤10 parts/million		30 points
1 to 3 parts/million		10 points
<1 parts/million	<0.05, 8/16/2004	0 points
Tritium Results		
>1 TU		Vulnerable
<1 TU	unknown	0 points
^{14}Carbon Results		
For wells in which the ^{14}carbon content of water indicates an age approximation of at least several centuries, subtract 20 points from the score.		
TOTAL POINTS		**0**

7. Grand total score:		
1. DNR Vulnerability Rating		20
2. Casing Integrity		0
3. Casing Depth		5
4. Pumping Rate		20
5. Isolation Distance from Contaminant Sources		0
6. Chemical and Isotopic Information		0
GRAND TOTAL	**Vulnerable**	**45**

Note: See MDH SWP Vulnerability rating sheet and well log for source data.

► If the score is 45 or more, the well is considered vulnerable.

► If the score is between 5 and 40, priority for phasing into the state's WHP program is referenced to population served.

► If the score is 0 or less, the well is considered not vulnerable.

Vulnerability Assessment Worksheet

Well Name/No. White Bear Township Well #3

Public Water Supplier ID No. 1620025 Minnesota Unique Well No. 224679

1. DNR vulnerability rating - assign the following point values:		
Very High		Vulnerable
High		Vulnerable
Moderate		25 points
Low ("L" score of 1 to 3)	L3	20 points
Low ("L" score of 4 to 7)		15 points
Very Low ("L" score of 8 to 11)		10 points
Very Low ("L" score of 12 or greater)		0 points
TOTAL POINTS		**20**

2. Casing integrity - assign the following point values:		
Each breach of the casing.		20 points
Each casing string not grouted or extending to the land surface.		10 points
Each category for which information requested is unknown.	Casing cement unknown	5 points
Each string of properly installed casing.		0 points
TOTAL POINTS		**5**

3. Casing depth - assign the following point values:		
<50 feet		20 points
50 to 200 feet	200 feet	10 points
201 to 500 feet		5 points
>500 feet		0 points
TOTAL POINTS		**10**

4. Pumping rate - assign the following point values:		
>1000 gallons/minute	1200 gpm	20 points
501 to 1000 gallons/minute		10 points
50 to 500 gallons/minute		5 points
<50 gallons/minute		0 points
TOTAL POINTS		**20**

5. Isolation distance from contamination sources:	
For wells <50 feet deep, assign 10 points to each source located within 100 feet of the well.	
For wells >50 feet deep, assign 10 points to each source located within 50 feet of the well.	
TOTAL POINTS	**0**

6. Chemical and isotopic information:		
Volatile Organic Compounds Detection		Vulnerable
Synthetic Organic Compounds Detection		Vulnerable
Nitrate-Nitrogen Results		Vulnerable
>10 parts/million		Vulnerable
>3 but ≤10 parts/million		30 points
1 to 3 parts/million		10 points
<1 parts/million	<0.05, 9/28/1994	0 points
Tritium Results		
>1 TU		Vulnerable
<1 TU	unknown	0 points
^{14}Carbon Results		
For wells in which the ^{14}carbon content of water indicates an age approximation of at least several centuries, subtract 20 points from the score.		
TOTAL POINTS		**0**

7. Grand total score:		
1. DNR Vulnerability Rating		20
2. Casing Integrity		5
3. Casing Depth		10
4. Pumping Rate		20
5. Isolation Distance from Contaminant Sources		0
6. Chemical and Isotopic Information		0
GRAND TOTAL	**Vulnerable**	**55**

Note: See MDH SWP Vulnerability rating sheet and well log for source data.

► If the score is 45 or more, the well is considered vulnerable.

► If the score is between 5 and 40, priority for phasing into the state's WHP program is referenced to population served.

► If the score is 0 or less, the well is considered not vulnerable.

Vulnerability Assessment Worksheet

Well Name/No. White Bear Township Well #4

Public Water Supplier ID No. 1620025 Minnesota Unique Well No. 226572

1. DNR vulnerability rating - assign the following point values:		
Very High		Vulnerable
High		Vulnerable
Moderate		25 points
Low ("L" score of 1 to 3)	L3, based on Well #3 log	20 points
Low ("L" score of 4 to 7)		15 points
Very Low ("L" score of 8 to 11)		10 points
Very Low ("L" score of 12 or greater)		0 points
TOTAL POINTS		**20**

2. Casing integrity - assign the following point values:		
Each breach of the casing.		20 points
Each casing string not grouted or extending to the land surface.	Not all casings extend to grade	10 points
Each category for which information requested is unknown.		5 points
Each string of properly installed casing.		0 points
TOTAL POINTS		**10**

3. Casing depth - assign the following point values:		
<50 feet		20 points
50 to 200 feet		10 points
201 to 500 feet	325 feet	5 points
>500 feet		0 points
TOTAL POINTS		**5**

4. Pumping rate - assign the following point values:		
>1000 gallons/minute		20 points
501 to 1000 gallons/minute	650 gpm	10 points
50 to 500 gallons/minute		5 points
<50 gallons/minute		0 points
TOTAL POINTS		**10**

5. Isolation distance from contamination sources:	
For wells <50 feet deep, assign 10 points to each source located within 100 feet of the well.	
For wells >50 feet deep, assign 10 points to each source located within 50 feet of the well.	
TOTAL POINTS	**0**

6. Chemical and isotopic information:		
Volatile Organic Compounds Detection		Vulnerable
Synthetic Organic Compounds Detection		Vulnerable
Nitrate-Nitrogen Results		Vulnerable
>10 parts/million		Vulnerable
>3 but ≤10 parts/million		30 points
1 to 3 parts/million		10 points
<1 parts/million	<0.05, 9/28/1994	0 points
Tritium Results		
>1 TU		Vulnerable
<1 TU	unknown	0 points
^{14}Carbon Results		
For wells in which the ^{14}carbon content of water indicates an age approximation of at least several centuries, subtract 20 points from the score.		
TOTAL POINTS		**0**

7. Grand total score:		
1. DNR Vulnerability Rating		20
2. Casing Integrity		10
3. Casing Depth		5
4. Pumping Rate		10
5. Isolation Distance from Contaminant Sources		0
6. Chemical and Isotopic Information		0
GRAND TOTAL	**Vulnerable**	**45**

Note: See MDH SWP Vulnerability rating sheet and well log for source data.

► If the score is 45 or more, the well is considered vulnerable.

► If the score is between 5 and 40, priority for phasing into the state's WHP program is referenced to population served.

► If the score is 0 or less, the well is considered not vulnerable.

Vulnerability Assessment Worksheet

Well Name/No. White Bear Township Well #5

Public Water Supplier ID No. 1620025 Minnesota Unique Well No. 151596

1. DNR vulnerability rating - assign the following point values:		
Very High		Vulnerable
High		Vulnerable
Moderate		25 points
Low ("L" score of 1 to 3)		20 points
Low ("L" score of 4 to 7)	L6	15 points
Very Low ("L" score of 8 to 11)		10 points
Very Low ("L" score of 12 or greater)		0 points
TOTAL POINTS		**15**

2. Casing integrity - assign the following point values:	
Each breach of the casing.	20 points
Each casing string not grouted or extending to the land surface.	10 points
Each category for which information requested is unknown.	5 points
Each string of properly installed casing.	0 points
TOTAL POINTS	**0**

3. Casing depth - assign the following point values:		
<50 feet		20 points
50 to 200 feet		10 points
201 to 500 feet	230 feet	5 points
>500 feet		0 points
TOTAL POINTS		**5**

4. Pumping rate - assign the following point values:		
>1000 gallons/minute	1700 gpm	20 points
501 to 1000 gallons/minute		10 points
50 to 500 gallons/minute		5 points
<50 gallons/minute		0 points
TOTAL POINTS		**20**

5. Isolation distance from contamination sources:	
For wells <50 feet deep, assign 10 points to each source located within 100 feet of the well.	
For wells >50 feet deep, assign 10 points to each source located within 50 feet of the well.	
TOTAL POINTS	**0**

6. Chemical and isotopic information:		
Volatile Organic Compounds Detection		Vulnerable
Synthetic Organic Compounds Detection		Vulnerable
Nitrate-Nitrogen Results		Vulnerable
>10 parts/million		Vulnerable
>3 but ≤10 parts/million		30 points
1 to 3 parts/million		10 points
<1 parts/million	0.69, 4/5/2005	0 points
Tritium Results		
>1 TU		Vulnerable
<1 TU	unknown	0 points
^{14}Carbon Results		
For wells in which the ^{14}carbon content of water indicates an age approximation of at least several centuries, subtract 20 points from the score.		
TOTAL POINTS		**0**

7. Grand total score:		
1. DNR Vulnerability Rating		15
2. Casing Integrity		0
3. Casing Depth		5
4. Pumping Rate		20
5. Isolation Distance from Contaminant Sources		0
6. Chemical and Isotopic Information		0
GRAND TOTAL	**Vulnerable, based on tritium results in nearby wells**	**40**

Note: See MDH SWP Vulnerability rating sheet and well log for source data.

► If the score is 45 or more, the well is considered vulnerable.

► If the score is between 5 and 40, priority for phasing into the state's WHP program is referenced to population served.

► If the score is 0 or less, the well is considered not vulnerable.

Vulnerability Assessment Worksheet

Well Name/No. White Bear Township Well #6

Public Water Supplier ID No. 1620025 Minnesota Unique Well No. 596636

1. DNR vulnerability rating - assign the following point values:		
Very High		Vulnerable
High		Vulnerable
Moderate		25 points
Low ("L" score of 1 to 3)	L1	20 points
Low ("L" score of 4 to 7)		15 points
Very Low ("L" score of 8 to 11)		10 points
Very Low ("L" score of 12 or greater)		0 points
TOTAL POINTS		**20**

2. Casing integrity - assign the following point values:	
Each breach of the casing.	20 points
Each casing string not grouted or extending to the land surface.	10 points
Each category for which information requested is unknown.	5 points
Each string of properly installed casing.	0 points
TOTAL POINTS	**0**

3. Casing depth - assign the following point values:		
<50 feet		20 points
50 to 200 feet	175 feet	10 points
201 to 500 feet		5 points
>500 feet		0 points
TOTAL POINTS		**10**

4. Pumping rate - assign the following point values:		
>1000 gallons/minute	2000 gpm	20 points
501 to 1000 gallons/minute		10 points
50 to 500 gallons/minute		5 points
<50 gallons/minute		0 points
TOTAL POINTS		**20**

5. Isolation distance from contamination sources:	
For wells <50 feet deep, assign 10 points to each source located within 100 feet of the well.	
For wells >50 feet deep, assign 10 points to each source located within 50 feet of the well.	
TOTAL POINTS	**0**

6. Chemical and isotopic information:		
Volatile Organic Compounds Detection		Vulnerable
Synthetic Organic Compounds Detection		Vulnerable
Nitrate-Nitrogen Results		Vulnerable
>10 parts/million		Vulnerable
>3 but ≤10 parts/million		30 points
1 to 3 parts/million		10 points
<1 parts/million	<0.05, 4/19/1999	0 points
Tritium Results		
>1 TU	4.8 TU, 6/15/2000	Vulnerable
<1 TU		0 points
^{14}Carbon Results		
For wells in which the ^{14}carbon content of water indicates an age approximation of at least several centuries, subtract 20 points from the score.		
TOTAL POINTS		**Vulnerable**

7. Grand total score:		
1. DNR Vulnerability Rating		20
2. Casing Integrity		0
3. Casing Depth		10
4. Pumping Rate		20
5. Isolation Distance from Contaminant Sources		0
6. Chemical and Isotopic Information		0
GRAND TOTAL	**Vulnerable**	**50**

Note: See MDH SWP Vulnerability rating sheet and well log for source data.

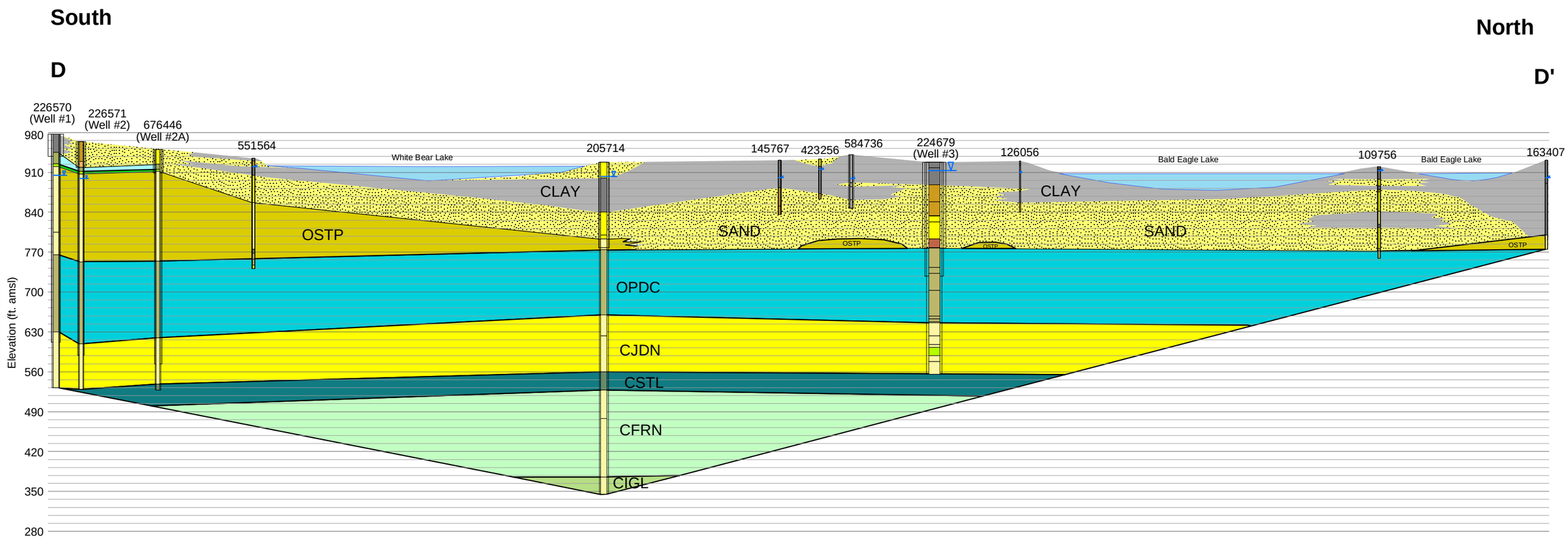
► If the score is 45 or more, the well is considered vulnerable.

► If the score is between 5 and 40, priority for phasing into the state's WHP program is referenced to population served.

► If the score is 0 or less, the well is considered not vulnerable.

APPENDIX IV

Geologic Cross-Section D-D’



Lithology

- CFRN (Franconia Formation)
- CIGL (Ironton - Galesville Sandstone)
- CJDN (Jordan Sandstone)
- CSTL (St. Lawrence Formation)
- OGWD (Glenwood Formation)
- OPDC (Prairie du Chien Group)
- OPGW (Platteville Formation)
- OSTP (St. Peter Sandstone)
- White Bear Lake and Bald Eagle Lake
- SAND
- CLAY

0 0.5 Miles

Source: MN CWI, Bedrock Geology of the Twin Cities Metro Area (Misc Map M-104), and lake bathymetry and elevations from White Bear Lake West and White Bear Lake East USGS 7.5-Minute Quadrangles.

Prepared By:
LEGGETTE, BRASHEARS & GRAHAM, INC.

Professional Ground-Water and
Environmental Engineering Services
8 Pine Tree Drive, Suite 250
St. Paul, Minnesota 55112
651-490-1405

TKDA/WHITE BEAR TOWNSHIP

PART 1 WELLHEAD PROTECTION PLAN
WHITE BEAR TOWNSHIP, MINNESOTA

GEOLOGIC CROSS-SECTION INCLUDING WHITE BEAR AND BALD EAGLE LAKE

FILE:	G3WBTO1S.MXD	DATE:	07/10/2007	FIGURE:	AV - 1

APPENDIX B

List of Completed Comprehensive Storm Drainage Plan Reports

A. "Proposed Drainage Facilities in the Vicinity of Bellaire Avenue and County Road F, Prepared for the Town of White Bear and The City of White Bear Lake" - February, 1979

B. "Comprehensive Storm Drainage Plan for the Southwest Area of the Town of White Bear, Minnesota" - April, 1979

   Information and modeling efforts presented in this report were updated as part of the "Storm Water Management Study for Ramsey County Ditch No. 14," prepared for the Ramsey Soil and Water Conservation District, in September, 1987, by TKDA.

C. "Comprehensive Storm Drainage Plan for the Centerville Road/Hammond Road Watershed of White Bear Township, Minnesota" - September, 1979

D. "Comprehensive Storm Drainage Plan for the Northwest Area of White Bear Township, Minnesota" - October, 1979

E. 'Comprehensive Storm Drainage Plan for the County Road H2 - Stillwater Street Area, Township of White Bear, Minnesota" - November, 1979

F. "Final Report Comprehensive Stormwater Management Plan, East Bald Eagle Lake Watersheds, Including Areas Within the Communities of Dellwood, Grant Township (Washington County), Hugo, White Bear Lake, White Bear Township (Ramsey County)" - December, 1980

G. "Stormwater Management Plan Highway 96 - Centerville Road Area, White Bear Township, Minnesota" - November, 1987

H. "Comprehensive Storm Drainage Plan for the Centerville Road Watershed North of Hammond Road in White Bear Township, Minnesota" - October 1989

APPENDIX C

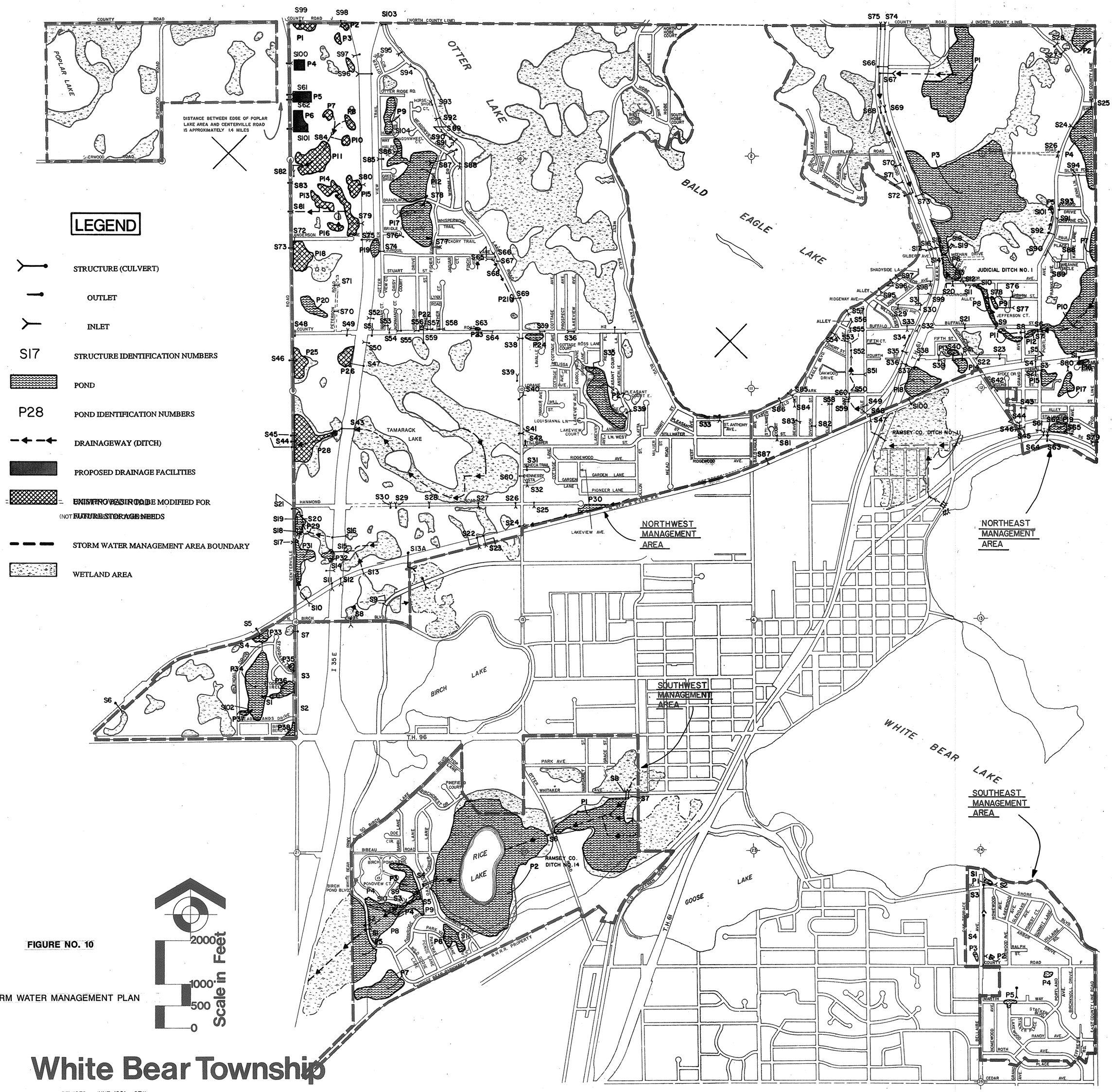


FIGURE NO. 10

STORM WATER MANAGEMENT PLAN

White Bear Township

REVISED	JUNE 1981	GEW
"	SEPT. 1984	CAM
"	MAR. 1988	RMO
"	MAR. 2000	MDM

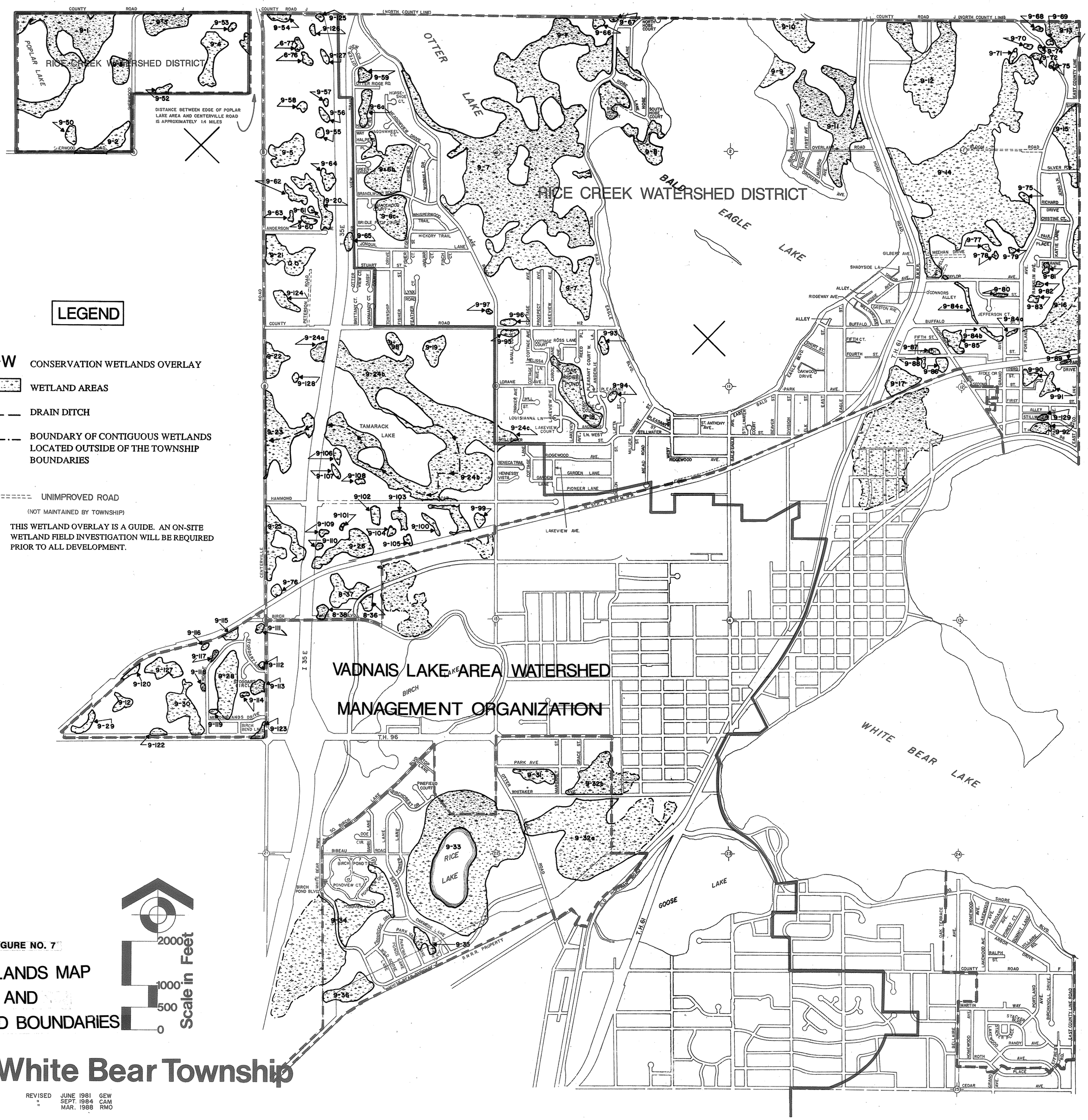


FIGURE NO. 7

WETLANDS MAP AND WATERSHED BOUNDARIES

White Bear Township

REVISED JUNE 1981 GEW
" SEPT. 1984 CAM
" MAR. 1988 RMO

STRUCTURE INVENTORY

STRUCTURE INVENTORY - NORTHEAST AREA

ID No.	Description	Upstream Invert Elevation	Downstream Invert Elevation	Comments
NE-S1	27" RCP			
NE-S2	12" CMP	929.82	929.66	
NE-S3	15" CMP	NA	NA	
NE-S4	24" RCP	NA	NA	
NE-S5	12" CMP	927.67	926.95	
NE-S6	38"X52" RCPA	912.25	911.73	From Construction Plans
NE-S8	48" CMP	911.10	911.35	
NE-S9	40"X65" CMPA	911.25	910.70	From Construction Plans
NE-S10	20' Span, 12' Wide, Timber Bridge	NA	NA	
NE-S11	66" CMP	NA	NA	
NE-S12	48"X72"CMPA	910.87	909.74	
NE-S13	48" CMP	909.70	909.37	
	48" CMP	910.57	909.17	
NE-S14	48" CMP	908.93	909.07	
NE-S15	4'X6' RC Box	907.97	908.35	40"x60" CMPA Ends
NE-S16	113"X96" ACP	910.19	909.43	
NE-S17	3'X8' RC Box	910.01	909.74	
NE-S18	18" CMP	912.07	911.65	
NE-S19	18" CMP	912.93	912.85	
NE-S20	18" RCP	911.86	911.61	
NE-S21	12" CMP	926.59	925.99	
NE-S22	12" CMP	927.15	927.00	
NE-S23	12" CMP	925.04	924.19	
NE-S24	15" CMP	NA	NA	
NE-S25	15" CMP	NA	NA	
NE-S26	15" CMP	NA	NA	
NE-S27	12" VCP	NA	NA	
NE-S28	12" CMP	NA	NA	
NE-S29	12" CMP	NA	NA	
NE-S30	18" CMP	NA	NA	
NE-S31	15" CMP	NA	NA	
NE-S32	18" CMP	NA	NA	
NE-S33	24" CMP	928.58	929.08	
NE-S34	15" CMP	928.15	925.53	
NE-S35	24" CMP	925.58	924.35	
NE-S36	36" CMP	922.52	922.02	
NE-S37	24" RCP	921.06	920.41	

NE-S38	18" CMP	NA	NA	
NE-S39	12" CMP	929.82	929.34	
NE-S48	48"X52" RC Oval	917.10	916.40	
NE-S49	18" CMP	922.08	920.62	
NE-S50	42" CMP	917.17	917.12	
NE-S51	24" CMP	918.00	NA	
NE-S52	30" RCP	915.85	916.05	
NE-S53	42" CMP	914.76	913.89	
NE-S54	72" RCP	909.72	NA	
NE-S55	18" CMP	917.10	916.40	
NE-S56	NA	NA	NA	
NE-S57	NA	NA	NA	
NE-S58	12" CMP	NA	NA	
NE-S59	12" CMP	NA	918.90	
NE-S60	12" CMP	NA	NA	
NE-S61	12"X18" CMPA	NA	NA	
NE-S62	24" RCP	924.05	923.86	
NE-S63	24" RCP	924.56	923.85	
NE-S64	18" CMP	NA	NA	
NE-S65	15" CMP	NA	NA	
NE-S66	12" CMP	NA	NA	
NE-S67	12" CMP	928.87	928.00	
NE-S68	24" CMP	NA	NA	
NE-S69	24" CMP	NA	NA	
NE-S70	18" CMP	NA	NA	
NE-S71	18" CMP	NA	NA	
NE-S72	12" CMP	912.00	910.71	
NE-S73	36" CMP	911.71	911.71	
NE-S74	24" RCP	NA	NA	
NE-S75	24" RCP	NA	NA	
NE-S76	12" RCP	923.50	NA	Connects to NW-S77
NE-S77	30" RCP	920.80	919.00	
NE-S78	15" RCP	916.50	916.30	
NE-S79	15" CMPA	NA	NA	
NE-S80	24" CMP	NA	NA	
NE-S85	24"	NA	NA	
NE-S86	24" RCP	912.71	NA	
NE-S87	36" Iron Culv.	NA	NA	
NE-S88	12" RCP	939.00	NA	See S92
NE-S89	12" RCP	938.09	NA	See S92
NE-S90	12" RCP	934.00	NA	See S92
NE-S91	15" RCP	937.95	NA	See S92
NE-S92	36" RCP	NA	928.54	Provides outlet for S88, S89, S90, S91
NE-S93	15" RCP	NA	NA	
NE-S94	NA	NA	NA	

NE-S95	NA	NA	NA
NE-S96	NA	NA	NA
NE-S97	NA	NA	NA
NE-S98	NA	NA	NA
NE-S99	NA	NA	NA
NE-S100	36" RCP	919.13	919.78
NE-S101	21" RCP	916.40	916.00

NA = Information not available.

STRUCTURE INVENTORY - NORTHWEST AREA

ID No.	Description	Upstream Invert Elevation	Downstream Invert Elevation	Comments
NW-S1	15" RCP	945.00	941.00	
NW-S2	15" into a 21" RCP	956.00	947.50	
NW-S3	15" into an 18" RCP	949.00	948.00	
NW-S4	15" into a 30" RCP	934.00	930.00	
NW-S5	24" CMP	NA	NA	
NW-S6	24" CIP	911.10	NA	8" Valve Outlet (Normally Closed)
NW-S7	24" RCP	NA	NA	
NW-S8	24" RCP	938.20	NA	
NW-S9	18" RCP	922.74(W)	922.5(E)	
NW-S10	24" RCP	938.20	NA	
NW-S11	24" RCP	NA	NA	
NW-S12	24" RCP	NA	NA	
NW-S13	24" RCP	929.90	NA	
NW-S13A	30" RCP	915.79	914.85	
NW-S14	18" RCP	NA	NA	
NW-S15	36" RCP	911.60	NA	
NW-S16	30" RCP	914.70	NA	
NW-S17	12" VCP & CMP	905.70	906.20	
NW-S18	14"CMP	NA	NA	
NW-S19	18" CMP	NA	NA	
NW-S20	12" RCP	NA		
NW-S21	22"X36" CMPA	902.90	NA	
NW-S22	24" RCP	NA	NA	
NW-S23	24" RCP	NA	NA	
NW-S24	18" ACP	NA	NA	
NW-S25	15" CMP	NA	NA	
NW-S26	12" CMP	NA	NA	
NW-S27	15" CMP	NA	NA	
NW-S28	12" CMP	NA	NA	

NW-S29	18" CMP	NA	NA	
NW-S30	18" CMP	NA	NA	
NW-S31	15" CMP	NA	NA	
NW-S32	15" CMP	NA	NA	
NW-S33	24" CMP	NA	NA	
NW-S34	36" RCP	NA	NA	
NW-S35	18" into a 21" RCP	NA	NA	
NW-S36	15" RCP	NA	NA	
NW-S37	15" RCP	NA	NA	
NW-S38	18" RCP	NA	NA	
NW-S39	15" CMP	NA	NA	
NW-S40	15" CMP	NA	NA	
NW-S41	18" CMP	NA	NA	
NW-S42	15" CMP	NA	NA	
NW-S43	48" RCP	904.50	904.30	
NW-S44	44"X27" ACP	901.50	900.60	Proposed for Centerville Road Upgrade
NW-S45	44"X27" ACP	902.00	900.60	Proposed for Centerville Road Upgrade
	44"X27" ACP	902.00	900.60	Proposed for Centerville Road Upgrade
NW-S46	24" RCP	NA	NA	Proposed for Centerville Road Upgrade
NW-S47	30" RCP	918.00	917.80	
NW-S48	15" CMP	927.40	927.20	
NW-S49	24" RCP	NA	NA	
NW-S50	18" RCP	NA	NA	
NW-S51	24" RCP	NA	NA	
NW-S52	18" RCP	NA	NA	
NW-S53	15" CMP	NA	NA	
NW-S54	15" CMP	NA	NA	
NW-S55	15" CMP	NA	NA	
NW-S56	22"X13.5" ACP	NA	NA	
NW-S57	22"X13.5" ACP	NA	NA	
NW-S58	22"X13.5" ACP	NA	NA	
NW-S59	24" CMP	NA	NA	
NW-S60	15" CMP	NA	NA	
NW-S61	36"X22" ACP	925.50	924.90	Proposed for Centerville Road Upgrade
NW-S62	36"X22" ACP	925.50	924.90	Proposed for Centerville Road Upgrade
NW-S63	15" CMP	935.70	933.63	
NW-S64	15" RCP	933.20	932.50	
NW-S65	24" CMP	929.01	928.59	
NW-S66	15" RCP	NA	NA	
NW-S67	24" CMP	928.53	928.45	

NW-S68	24" CMP	928.20	928.12	
NW-S69	24" CMP	920.40	NA	
NW-S70	10" CMP	NA	NA	
NW-S71	10" CMP	NA	NA	
NW-S72	15" RCP	906.00	905.00	
NW-S73	24" RCP	905.40	904.60	Proposed for Centerville Road Upgrade
NW-S74	24" CMP	NA	NA	
NW-S75	24" RCP	923.00	923.00	
NW-S76	18" RCP	NA	NA	
NW-S77	NA	NA	NA	
NW-S78	24" RCP	925.00	924.50	
NW-S79	18" RCP	NA	NA	
NW-S80	24" RCP	926.90	922.30	
NW-S81	36"X22" ACP	910.80	909.80	Proposed for Centerville Road Upgrade
NW-S82	18" CMP	907.10	906.60	
NW-S83	24" RCP	905.40	904.60	Proposed for Centerville Road Upgrade
NW-S84	15" CMP	926.70	926.50	
NW-S85	22"X13.5" ACP	NA	NA	
NW-S86	15" RCP	NA	NA	
NW-S87	18" RCP	425.70	918.66	
NW-S88	15" RCP	930.00	929.20	
NW-S89	NA	NA	NA	
NW-S90	NA	NA	NA	
NW-S91	12" CMP	NA	NA	
NW-S92	18" CMP	NA	NA	
NW-S93	12" CMP	NA	NA	
NW-S94	NA	NA	NA	
NW-S95	18" CMP	NA	NA	
NW-S96	30" RCP	925.30	924.90	
NW-S97	24" RCP	NA	NA	
NW-S98	18" RCP	NA	NA	
NW-S99	24" CMP	NA	NA	
NW-S100	24" RCP	928.10	927.40	Proposed for Centerville Road Upgrade
NW-S101	24" RCP	923.80	922.90	Proposed for Centerville Road Upgrade
NW-S102	24" RCP	942.00	941.00	
NW-S103	18" RCP	NA		NA
NW-S104	18" RCP	NA		NA

NA = Information not available.

STRUCTURE INVENTORY - SOUTHEAST AREA

ID No.	Description	Upstream Invert Elevation	Downstream Invert Elevation	Comments
SE-S1	15" RCP	926.25	924.47	Connects to existing storm sewer pipe outlet
SE-S2	18" CMP	927.72	927.53	
SE-S3	24" RCP	943.99	927.39	
SE-S4	30" ACP	949.60	944.63	

NA = Information not available.

STRUCTURE INVENTORY - SOUTHWEST AREA

ID No.	Description	Upstream Invert Elevation	Downstream Invert Elevation	Comments
SW-S1	40"X65" ACP	904.00	903.90	
SW-S2	40"X65" ACP	904.00	903.90	
SW-S3	48"X72" ACP	908.36	908.21	
SW-S4	36" RCP	909.17	908.54	Weir regulated by VLAWMO
SW-S5	36" RCP	909.18	908.50	Weir regulated by VLAWMO
SW-S6	48" RCP	908.68	908.83	
SW-S7	60"X84" CMPA	911.68	911.07	
SW-S8	60"X84" CMPA	911.33	911.07	
SW-S9	15" RCP	909.00	906.00	
SW-S10	15" RCP	907.60	906.20	
SW-S11	24" to 18" RCP	912.70	911.00	Pond runout elevation 912.7. Pond HWL elevation 915.2.

NOTE: Invert elevations have not been field checked.
NA = Information not available.

INVENTORY OF STORM WATER MANAGEMENT BASINS

INVENTORY OF STORM WATER MANAGEMENT BASINS
NORTHEAST MANAGEMENT AREA

Pond ID No.	Previous Study	Outlet Structure ID No.	100-Year Flood Elev. (Ft.)	100-Year Flood Discharge (CFS)	Comments
NE-P1	G	NE-S67	933.5	2.0	Development has significantly modified this basin, compared to its size and shape in the referenced study.
NE-P2	G	--	923.5	51.0	The majority of this basin is located outside of Township boundaries.
NE-P3	G	NE-S15	915.7	128.0	Discharge and elevation values are for existing conditions along Judicial Ditch No. 1.
NE-P4	G	--	920.8	--	Same basin as NE-P10.
NE-P5	None	NE-S101	912.5	NA	100-year elevation from developer's storm water management plan (White Bear Beach Estates).
NE-P6	G	NE-S14	918.2	127.0	Discharge and elevation values are for existing conditions long Judicial Ditch No. 1.
NE-P7	G	--	920.8	--	Same basin as NE-P10.
NE-P8	G	NE-S10	918.2	126.0	Discharge and elevation values are for existing conditions long Judicial Ditch No. 1.
NE-P9	None	NE-S78	916.3	NA	100-year elevation from developer's storm water management plan (Rice's Creek).
NE-P10	G	NE-S6	921.6	125.0	Discharge and elevation values are for existing conditions long Judicial Ditch No. 1.
NE-P11	G	NE-S9	919.2	126.0	Discharge and elevation values are for existing conditions long Judicial Ditch No. 1.
NE-P12	G	NE-S8	919.4	125.0	Discharge and elevation values are for existing conditions long Judicial Ditch No. 1.
NE-P13	G	NE-S40	928.9	22.0	
NE-P14	G	Landlocked	928.1	9.0	Basin overflows to basin NE-P18.
NE-P15	G	NE-S3	932.3	2.0	
NE-P16	G	NE-S1	921.5	10.0	
NE-P17	None	NE-S80	NA	NA	
NE-P18	G	NE-S100	922.5	31.0	
NE-P19	G	NE-S62	928.6	2.0	

NA = Information not available.
Previous Study: See Appendix D, Previous Study: Comprehensive Drainage Plan Reports, for report citation.

INVENTORY OF STORM WATER MANAGEMENT BASINS
NORTHWEST MANAGEMENT AREA

Pond ID No.	Previous Study	Outlet Structure ID No.	100-Year Flood Elev. (Ft.)	100-Year Flood Discharge (CFS)	Comments
NW-P1	I	S99	NA	7.2	Existing basin to be modified to provide future storage needs of 3.8 ac-ft.
NW-P2	I	S98	NA	3.0	Existing basin to be modified to provide future storage needs of 0.23 ac-ft.
NW-P3	I	S96	NA	4.8	Existing basin to be modified to provide future storage needs of 5.3 ac-ft.
NW-P4	I	S100	NA	83.	Proposed basin to provide future storage needs of 2.8 ac-ft.
NW-P5	I	S61 & S62	NA	78.0	Size of proposed basin not determined as subwatershed is fully developed.
NW-P6	I	S101	NA	10.0	Proposed basin to provide future storage needs of 2.3 ac-ft.
NW-P7	I	--	--	--	See NW-P10.
NW-P8	I	--	--	--	See NW-P10.
NW-P9	E	S104	927.3	8.0	
NW-P10	I	S84	NA	11.9	Existing basin to be modified to provide future storage needs of 8.0 ac-ft.
NW-P11	I	Not existing	NA	12.3	Existing basin to be modified to provide future storage needs of 3.1 ac-ft.
NW-P12	E	S87	927.2	10.7	
NW-P13	I	Not existing	NA	30.6	Existing basin to be modified to provide future storage needs of 8.6 ac-ft.
NW-P14	I	--	--	--	
NW-P15	I	--	--	--	
NW-P16	I	--	--	--	See NW-P13.
NW-P17	E	--	--	--	See NW-P12.
NW-P18	I	S78	NA	5.0	Existing basin to be modified to provide future storage needs of 11.5 ac-ft.
NW-P19	I	S75	NA	21.5	Existing basin to be modified to provide future storage needs of 3.2 ac-ft.

NW-P20	I	None	NA	Landlocked	Future storage needs are 3.0 ac-ft.
NW-P21	E	NW-S69	926.9	34.7	
NW-P22	I	NW-S59	--	--	Basin not included in referenced study.
NW-P23	E	NW-S64	954.3	11.0	
NW-P24	F	None	932.2	5.3	Basin presently landlocked, elevation and discharge information are for future conditions with project proposed in Previous Study F.
NW-P25	I	NW-S46	NA	4.5	Existing basin to be modified to provide future storage needs of 5.3 ac-ft.
NW-P26	I	NW-S47	NA	7.2	Existing basin to be modified to provide future storage needs of 1.7 ac-ft.
NW-P27	F	SW-S35	927.0	7.0	Basin was originally landlocked; NW-S35 was installed as an emergency overflow.
NW-P28	I	NW-S45 & -S44	904.1	85.3	Existing basin to be modified to provide future storage needs of 32.9 ac-ft.
NW-P29	D	NW-S21	906.1	19.5	Elevation and discharge information assume that the subwatershed develops as proposed in Previous Study D.
NW-P30	None	NW-S24	NA	NA	
NW-P31	D	NW-S18	908.2	23.5	Elevation and discharge information assume that the subwatershed develops as proposed in Previous Study D.
NW-P32	D	Not existing	912.7	37.5	Elevation and discharge information assume that the subwatershed develops as proposed in Previous Study D.
NW-P33	J	NW-S5	933.0	22.7	Elevation and discharge information from TR-20 model of The Meadowlands developed by TKDA.
NW-P34	J	NW-S4	940.7	17.9	Elevation and discharge information from TR-20 model of The Meadowlands developed by TKDA.
NW-P35	J	NW-S3	950.8	4.9	Elevation and discharge information from TR-20 model of The Meadowlands developed by TKDA.
NW-P36	J	NW-S1	948.2	9.3	Elevation and discharge information from TR-20 model of The Meadowlands developed by TKDA.
NW-P37	J	NW-S102	945.8	28.7	Elevation and discharge information from TR-20 model of The Meadowlands developed by TKDA.
NW-P38	J	NW-S2	957.6	4.1	Elevation and discharge information from TR-20 model of The Meadowlands developed by TKDA.

Previous Study: See Appendix D, Previous Study: Comprehensive Drainage Plan Reports, for report citation.
NA: Information not available.

INVENTORY OF STORM WATER MANAGEMENT BASINS
SOUTHEAST MANAGEMENT AREA

Pond ID No.	Previous Study	Outlet Structure ID No.	100-Year Flood Elev. (Ft.)	100-Year Flood Discharge (CFS)	Comments
SE-P1	None	SE-S1	929.2	26.7	Basin is a sedimentation basin sized to contain the 5-year runoff.
SE-P2	A	Landlocked	945.3	2.2	Basin is the Bellaire East Sump.
SE-P3	A	Landlocked	NA	NA	Basin is the Bellaire West Sump, which is landlocked. Overflow is west, out of Township.
SE-P4	A	Storm sewer	931.7	65.0	Basin is the Portland Sump. Proposed discharge and elevation values from Alternative 3 in Previous Study A.
SE-P5	A	Storm sewer	959.6	116.0	Basin is the Martin Way Sump. Proposed discharge and elevation values from Alternative 3 in Previous Study A.

Previous Study: See Appendix D, Previous Study: Comprehensive Drainage Plan Reports, for report citation.
NA: Information not available.

INVENTORY OF STORM WATER MANAGEMENT BASINS
SOUTHWEST MANAGEMENT AREA

Pond ID No.	Previous Study	Outlet Structure ID No.	100-Year Flood Elev. (Ft.)	100-Year Flood Discharge (CFS)	Comments
SW-P1	C	SW-S6	917.3	124.0	
SW-P2	C	SW-S4 & S5	913.0	85.0	Runout Elevation is 911.0.
SW-P3	None	SW-S9	NA	NA	Birch Lake Ponds.
SW-P4	None	SW-S10	NA	NA	Birch Lake Ponds.
SW-P5	C	--	908.0	78.0	Runout Elevation is 905.0.
SW-P6	None	SW-S11	915.2	NA	100-yera flood elevation from developer's drainage plan (Parkway Ponds).
SW-P7	None	None	NA	Landlocked	Basin is landlocked to elevation 915.0. Developer's drainage plan indicates 100-year elevation of 910.2 (Parkway Ponds).
SW-P8	C	SW-S1 & -S2	910.1	143.0	
SW-P9	C	SW-S3	910.2	143.0	Discharge and elevation information estimated based on Previous Study C.

Previous Study: See Appendix D, Previous Study: Comprehensive Drainage Plan Reports, for report citation.
NA: Information not available.

SUBWATERSHED INVENTORY
NORTHEAST MANAGEMENT AREA

Sub-watershed ID No.	Previous Study	Area (Ac)	Required Dead Storage Volume (Ac-Ft)	Peak Discharge 100-Year (CFS)	Live Storage Needs 100-Year (Ac-Ft)	Comments
NE1	G	709.6	--	--	--	Majority of subwatershed is outside Township boundaries.
NE2	G	160.8	9.9	*2.0	*67.7	
NE3	G	285.6	--	--	--	Majority of subwatershed is outside Township boundaries.
NE4	G	706.6	--	*116.0	*819.6	Majority of subwatershed is outside Township boundaries.
NE5	G	124.0	11.0	*117.0	*18.2	
NE6	G	304.3	16.2	*119.0	*63.2	
NE7	G	16.6	1.4	*2.0	*1.9	
NE8	G	361.8	31.0	NA	NA	
NE9	None	--	--	--		Subwatershed is not included in previous study.
NE10	None	--	--	--		Subwatershed is not included in previous study.
NE11	None	--	--	--		Subwatershed is not included in previous study.

*Discharge and storage values assume the drainage improvements recommended in referenced study are in place.
Previous Study: See Appendix D, Previous Study: Comprehensive Drainage Plan Reports, for report citation.
NA: Information not available.
Note: Dead storage volumes were determined assuming that wetland areas would remain and upland areas would develop as zoned.

SUBWATERSHED INVENTORY
NORTHWEST MANAGEMENT AREA

Sub-watershed	Previous Study	Area (Ac)	Required Dead Storage Volume	Peak Discharge 100-Year	Live Storage Needs 100-Year	Comments

ID No.			(Ac-Ft)	(CFS)	(Ac-Ft)	
NW1	I	2.4	0.4	3.0	0.23	
NW2	I	15.2	2.3	7.2	3.8	
NW3	I	21.2	3.4	4.8	5.3	
NW4	I	11.4	1.9	8.3	2.8	
NW5	I	21.6	3.7	78.0	--	Subwatershed is fully developed with no storage areas provided.
NW6	I	10.0	1.7	10.0	2.3	
NW7	I	32.8	5.1	11.9	8.0	
NW8	I	23.0	1.4	12.3	3.1	
NW9	I	9.2	0.8	15.2	--	No storage areas are provided for this subwatershed.
NW10	I	29.0	3.9	21.5	3.2	
NW11	I	55.8	4.4	30.6	8.6	
NW12	I	4.7	0.4	12.2	--	Storage assumed provided in NW14.
NW13	I	15.6	1.4	28.2	--	Storage assumed provided in NW14.
NW14	I	43.6	2.7	5.0	11.5	
NW15	I	12.3	1.1	--	--	Landlocked
NW16	I	13.1	1.2	29.4	--	Storage assumed provided in NW17.
NW17	I	22.7	1.3	4.5	5.3	
NW18	I	13.9	1.2	7.2	1.7	
NW19	I	53.5	4.8	111.3	--	Storage assumed provided in NW26.
NW20	E	10.6	0.8	11.0	0.3	
NW21	I	45.7	0.72	21.4	--	Storage assumed provided in NW26.
NW22	F	45.0	1.1	13.0	5.2	
NW23	None	38.0	--	--	--	
NW24	I	104.1	6.3	--	--	Majority of subwatershed is outside of Township boundaries.
NW25	I	200.6	Parkland	160.0	--	Storage assumed provided in NW26.
NW26	I	105.7	Parkland	92.9	59.0	
NW27	I	75.1	4.6	85.3	32.9	
NW28	E	25.4	2.1	12.1	0.6	
NW29	E	22.6	1.6	8.0	1.4	
NW30	E	9.6	0.9	--	1.2	Landlocked.
NW31	E	11.9	1.1	10.1	0.3	
NW32	E	9.2	0.8	8.6	0.13	
NW33	E	101.3	9.7	10.7	32.4	
NW34	E	8.7	0.8	11.3	--	No storage is provided in this subwatershed.
NW35	E	15.6	1.3	37.0	--	No storage is provided in this subwatershed.

NW37	E	6.2	0.6	32.5	--	No storage is provided in this subwatershed.
NW37	E	33.2	3.0	34.7	3.4	
NW38	F	2.9	0.3	3.6	--	Live storage assumed provided in NW39.
NW39	F	7.8	0.7	5.3	1.6	
NW40	F	17.7	1.4	19.	--	Storage assumed provided in NW44.
NW41	F	10.2	0.9	8.1	--	Storage assumed provided in NW44.
NW42	F	2.4	0.2	6.1	--	Storage assumed provided in NW44.
NW43	F	2.6	0.2	7.7	--	Storage assumed provided in NW44.
NW44	F	41.1	2.0	7.0	20.8	
NW45	F	12.1	1.0	6.5	--	
NW46	F	18.2	1.2	14.2	NA	
NW47	E	8.1	1.4	31.7	--	Storage assumed provided in NW50.
NW48	D	7.6	1.4	3.1	2.7	
NW49	D	23.0	3.3	NA	9.6	
NW50	D	50.2	8.9	25.0	15.6	
NW51	D	27.7	4.7	NA	NA	
NW52	D	12.2	1.9	16.1	4.2	
NW53	D	8.3	1.4	24.0	1.8	
NW54	D	41.1	5.2	19.5	21.0	
NW55	D	24.8	--	1.1	3.2	Subwatershed located outside of Township boundaries.
NW56	J	3.7	0.82	11.7	--	Storage is provided in NW57.
NW57	J	5.0	0.48	22.7	5.6	
NW58	J	2.8	0.22	9.0	0.2	
NW59	J	2.9	0.44	4.9	0.5	
NW60	J	5.1	0.79	20.0	--	Storage is provided in NW57.
NW61	J	23.6	Wetland 9-28	18.0	8.5	
NW62	H	39.6	4.0	Landlocked	7.8	
NW63	H	11.7	1.6	5.0	2.5	
NW64	H	23.2	2.4	7.0	2.5	
NW65	H	NA	NA	NA	NA	Subwatershed located outside of Township boundaries.
NW66	H	15.1	1.7	13.0	1.9	
NW67	H	24.7	3.3	17.0	3.3	
NW68	None	--	--	--	--	Subwatershed not included in previous studies.
NW69	None	--	--	--	--	Subwatershed not included in previous studies.
NW70	None	--	--	--	--	Subwatershed not included in previous studies.
NW71	None	--	--	--	--	Subwatershed not included in previous studies.
NW72	None	--	--	--	--	Subwatershed not included in previous studies.
NW73	None	--	--	--	--	Subwatershed not included in previous studies.

NW74	None	--	--	--	--	Subwatershed not included in previous studies.
NW75	None	--	--	--	--	Subwatershed not included in previous studies.
NW76	None	--	--	--	--	Subwatershed not included in previous studies.
NW77	J	4.0	0.44	11.0	--	Storage is provided in NW61.
NW78	J	2.6	0.42	8.7	--	Storage is provided in NW61.
NW79	J	5.4	0.55	28.7	1.1	
NW80	J	7.1	0.89	9.3	4.8	
NW81	J	5.5	1.0	9.6	0.8	
NW82	J	7.0	1.4	28.7	--	Live storage is provided in NW61 and NW79.
NW83	J	6.4	1.1	4.0	1.3	

Previous Study: See Appendix D, Previous Study: Comprehensive Drainage Plan Reports, for report citation.
NA: Information not available.
Note: Dead storage volumes were determined assuming that wetland areas would remain and upland areas would develop as zoned.

SUBWATERSHED INVENTORY
SOUTHEAST MANAGEMENT AREA

Sub-watershed ID No.	Previous Study	Area (Ac)	Required Dead Storage Volume (Ac-Ft)	Peak Discharge 100-Year (CFS)	Live Storage Needs 100-Year (Ac-Ft)	Comments
SE1	A	18.7	*	NA	NA	Majority of subwatershed is located outside of Township boundaries.
SE2	A	10.9	*	NA	NA	
SE3	A	5.1	*	NA	NA	Majority of subwatershed is located outside of Township boundaries.
SE4	A	3.1	*	NA	NA	
SE5	A	7.8	**	NA	NA	Subwatershed is located outside of Township boundaries.
SE6	A	6.4	**	NA	NA	Subwatershed is located outside of Township boundaries.
SE7	A	1.2	**	NA	NA	
SE8	A	3.3	**	NA	NA	
SE9	A	5.2	**	NA	NA	
SE10	A	18.6	**	NA	NA	Majority of subwatershed is located outside of Township boundaries.
SE11	A	30.0	*	NA	NA	A portion of this subwatershed is located outside of Township boundaries.

SE12	A	12.9	*	NA	NA	
SE13	A	8.0	*	NA	NA	
SE14	A	7.2	*	NA	NA	
SE15	A	11.3	*	NA	NA	
SE16	A	3.5	*	NA	NA	
SE17	A	4.1	*	NA	NA	
SE18	A	12.0	*	NA	NA	
SE19	A	11.7	*	NA	NA	
SE20	A	15.5	*	NA	NA	
SE21	None	7.3	**	29.0	--	Storage is provided in White Bear Lake.

*The total dead storage requirement for these subwatersheds is 13.9 ac-ft.
**The total dead storage requirement for these subwatersheds is 6.8 ac-ft.
Previous Study: See Appendix D, Previous Study: Comprehensive Drainage Plan Reports, for report citation.
NA: Information not available.
Note: Dead storage volumes were determined assuming that wetland areas would remain and upland areas would develop as zoned.

SUBWATERSHED INVENTORY
SOUTHWEST MANAGEMENT AREA

Sub-watershed ID No.	Previous Study	Area (Ac)	Required Dead Storage Volume (Ac-Ft)	Peak Discharge 100-Year (CFS)	Live Storage Needs 100-Year (Ac-Ft)	Comments
SW1	C	47.6	2.6	NA	NA	
SW2*	C	147.0	5.6	124.0	NA	
SW3	C	24.5	3.8	NA	NA	
SW4*	C	28.4	2.5	NA	NA	
SW5	C	17.2	1.3	NA	NA	
SW6	C	21.6	1.9	NA	NA	
SW7*	C	213.2	Rice Lake	85.0	200.5	
SW8*	C	23.3	NA	NA	NA	
SW9	C	84.7	3.5	100.0	NA	
SW10*	C	155.3	6.1	78.0	111.3	

*Portion of subwatershed is located outside Township boundaries.

Previous Study: See Appendix D, Previous Study: Comprehensive Drainage Plan Reports, for report citation.
NA: Information not available.
Note: Dead storage volumes were determined assuming that wetland areas would remain and upland areas would develop as zoned.

APPENDIX D

Minnesota Pollution Control Agency
520 Lafayette Road North | St. Paul, MN 55155-4194 | 651-296-6300 | 1-800-657-3864 | 651-282-5332 TTY | www.pca.state.mn.us

May 22, 2008

White Bear Township City MS4
Mr. William Short, Township Clerk
1281 Hammond Road
White Bear Township, MN 55110

RE: Issuance of Coverage under the National Pollutant Discharge Elimination System/State Disposal System (NPDES/SDS) Permit MNR040000 for Municipal Separate Storm Sewer Systems for White Bear Township MS4

Dear Mr. Short:

In accordance with Minn. R. 7001.0140, the Commissioner of the Minnesota Pollution Control Agency (MPCA) has made a final determination to issue coverage under the National Pollutant Discharge Elimination System/State Disposal System (NPDES/SDS) Permit MNR040000 for Municipal Separate Storm Sewer Systems (MS4 General Permit) to White Bear Township, effective May 22, 2008. Please find enclosed a copy of the above referenced MS4 General Permit.

The MPCA's final decision to issue permit coverage is based on the following:

- MPCA staff has reviewed your MS4 General Permit application and Stormwater Pollution Prevention Program (SWPPP);
- Public notice and opportunity for comment on your MS4 General Permit application and SWPPP has been provided and no comments that required a written response were received.
- MPCA staff has determined that your SWPPP is adequate.

As you know, it is the responsibility of the MS4 owner and/or operator to comply with the requirements of the MS4 General Permit and your SWPPP. This issuance of coverage does not preclude the MPCA from following up with an inspection or audit to verify compliance with the MS4 General Permit and SWPPP. Also, be aware that as a condition of recordkeeping, Part VI.B of the MS4 General Permit requires that the permittee retain their SWPPP and all records pertinent to it for at least three (3) years beyond the term of the MS4 General Permit.

In addition, for an MS4 that was covered under the previous MS4 General Permit (issuance date March 10, 2003), coverage under that permit is terminated on the effective date as specified above. An MS4 covered under the new MS4 General Permit is required to report on activities that were required or committed to under the previous permit. The MPCA expects that your MS4's annual report, due June 30, 2008, will cover all activities and permit requirements of the previous year regardless which permit those activities are conducted under.

RECEIVED
MAY 23 2008
TOWN OF WHITE BEAR

Finally, the MPCA thanks you for your cooperation in the permitting process. Please retain this letter as documentation of your MS4 General Permit coverage under the NPDES/SDS Permit MNR040000.

Please contact Don Kyser of our staff at 651-215-0191 if you have any questions.

Sincerely,

Dale B. Thompson

Dale Thompson, Supervisor
Municipal Stormwater Unit
Municipal Division

DT:wgp

Enclosure

Minnesota Pollution Control Agency

GENERAL PERMIT
AUTHORIZATION TO DISCHARGE STORM WATER
ASSOCIATED WITH MUNICIPAL SEPARATE STORM SEWER SYSTEMS
UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION
SYSTEM/STATE DISPOSAL SYSTEM PERMIT PROGRAM

EFFECTIVE DATE: June 1, 2006 **EXPIRATION DATE: May 31, 2011**

In compliance with the provisions of the Clean Water Act, as amended, (33 U.S.C. 1251 et seq.; hereinafter, the "**Act**"), 40 CFR 122, 123, and 124, as amended, et seq.; Minnesota Statutes Chapters 115 and 116, as amended, and Minnesota Rules Chapter 7001.

This permit establishes conditions for discharging **Storm Water** and specific other related discharges to **Waters of the State**. This permit is required for discharges that are from **Small Municipal Separate Storm Sewer Systems,** as defined in this permit.

Upon approval by the **Commissioner** applicants who submit a completed application in accordance with the requirements of this permit, are authorized to discharge **Storm Water** from **Small Municipal Separate Storm Sewer Systems,** under the terms and conditions of this permit.

Signature: Sheryl A. Corrigan

Sheryl A. Corrigan
Commissioner
Minnesota Pollution Control Agency

Issuance Date: 3/3/06

If **You** have questions on this permit, including the specific permit requirements, permit reporting or permit compliance status, please contact the appropriate Minnesota Pollution Control Agency offices.

Storm Water Management Unit
Storm Water Section
Municipal Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

Phone (651) 296-6300, or
Toll free in MN 800-657-3864
Fax (651) 297-2343

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PART I. PERMIT GOALS

The primary goal of this permit is to restore and maintain the chemical, physical, and biological integrity of **Waters of the State** through management and treatment of urban **Storm Water** runoff. This is accomplished by management of **Municipal Separate Storm Sewer Systems** through a **Storm Water Pollution Prevention Program.** The purpose is to maintain water quality standards where there is compliance, and help bring waters that do not meet water quality standards into compliance. It should be noted that when there is a discharge to waters where there are limitations on coverage (Part II.B), there may be more stringent requirements that must be addressed. **You** may also voluntarily adopt more stringent measures to meet local goals.

PART II. COVERAGE UNDER THIS PERMIT

A. Eligibility

This permit, including appendices, authorizes discharges of **Storm Water** from **Small Municipal Separate Storm Sewer Systems** as defined in 40 CFR § 122.26(b)(16).

B. Limitations on Coverage

1. This permit does not authorize discharges other than **Storm Water**. Non-**Storm Water** discharges may include: combined sewer overflow, noncontact cooling water, sewage, wash water, scrubber water, spills, oil, hazardous substances, fill, commercial equipment/vehicle cleaning and maintenance wastewaters. A separate National Pollutant Discharge Elimination System (NPDES) permit may be required for these discharges.

2. This permit does not authorize the discharge of **Storm Water** when a separate NPDES permit is required for these activities. For example, while **Storm Water** from industrial activity or construction activity may be discharged from a **MS4** with authorized **Storm Water** discharges, this permit does not replace or satisfy any other permits required for those discharges.

3. This permit does not authorize the discharge of **Storm Water** from any other entity located in the drainage area or outside the drainage area. Only your system and the portions of the storm sewer system that are under your operational control are authorized by your permit.

4. This permit does not authorize the following **discharges** as described in Appendix C unless the requirements of Part IX (Appendix C) are met:

    a. Discharges to waters with Prohibited Discharges as defined in Minn. R. 7050.0180, subp. 3, 4, and 5.

b. Discharges to waters with Restricted Discharge as defined in Minn. R. 7050.0180, subp. 6, 6a, and 6b.

c. Discharges to Trout Waters as defined in Minn. R. 6264.0050, subp. 2 and 4.

d. Discharges to **Wetlands** as defined in Minn. R. 7050.0130, subp. F (see also Minn. R. 7050.0186).

e. Discharges requiring Environmental Review required by Minn. Stat. ch. 116D and 42 U.S.C. §§ 4321 – 4370 f.

f. Discharges Affecting Threatened or Endangered Species or Their Habitat.

g. Discharges Affecting Historic or Archeological Sites.

h. Discharges Affecting Source Water Protection Areas.

5. This permit does not allow **discharges** if the requirements of Part X (Appendix D) and schedule of Part XI (Appendix E) are applicable, unless the **MS4** is in compliance with those appendices.

C. Obtaining Authorization

In order for **Storm Water** discharges from **Small Municipal Separate Storm Sewer Systems** to be authorized to discharge under this **General Permit**:

1. Submit an application with the **Storm Water Pollution Prevention Program You** intend to implement under this permit, in accordance with the requirements of Part III, using a form provided by the **Commissioner** (or a facsimile thereof).

2. Where the ownership or significant operational control of the **MS4** changes, after the submittal of an application under Part III, a new application must be submitted in accordance with Part III.

3. The **Commissioner** will review the application and **Storm Water Pollution Prevention Program** for completeness and compliance with this permit. The **Commissioner** shall determine whether to approve coverage or to deny coverage to dischargers who submit a complete application. In accordance with the procedures of this permit and requirements of Minn. R. ch. 7001, the **Commissioner** shall provide public notice with the opportunity for hearing on the determination. Upon approval by the **Commissioner**, dischargers are authorized to discharge **Storm Water** from **Small Municipal Separate Storm Sewer Systems** under the terms and conditions of this permit.

4. The **Commissioner** may deny coverage under this permit and require submittal of an application for an individual NPDES permit based on a review of the application or other information, in accordance with Minn. R. ch. 7000 and 7001.

PART III. APPLICATION REQUIREMENTS (Notice of Intent)

A. Deadlines for Application

If **You** are an **Owner** or **Operator** of a **Small Municipal Separate Storm Sewer System** regulated under 40 CFR § 122.32(a)(1), **You** must apply to obtain coverage under this permit within 90 days after the permit issuance date on page 1 of this permit. If **You** fail to make the application deadline, **You** are out of compliance and must submit an application. The **Owner** or **Operator** of an **MS4** that is not designated for coverage by federal rules, but has been designated under Minn. R. ch. 7090, must apply by the date specified in the **Commissioner's** designation documents.

B. Signature

The Application shall be signed in accordance with application forms provided by the **Commissioner** and shall include the following information:

1. The street address, county, and the **Owner** or **Person** with operational control of the **MS4** for which the notification is submitted; and

2. The name, address, and telephone number of the individual responsible for overall permit compliance.

C. Application Attachment: Storm Water Pollution Prevention Program

The proposed **Storm Water Pollution Prevention Program** for implementing the permit shall be attached to the application on forms provided by the **Commissioner** (or reasonable facsimiles), including:

1. The **Best Management Practices** or **BMPs** that **You** will implement for each of the **Storm Water** minimum control measures at Part V.G of this permit;

2. The measurable goals for each of the **BMPs**, including, as appropriate, the months and years in which **You** will undertake required actions, including interim milestones and the frequency of the action, in narrative or numeric form, as appropriate;

3. Estimated timeline(s) (months, years) in which **You** will implement each **BMP**; and

4. Individual(s) responsible for implementing and/or coordinating each component of the **Storm Water Pollution Prevention Program**. This should be the individual **You** want the **Agency** to contact for the particular component; it may be the overall coordinator or other individual.

D. Where to Submit

Applications signed in accordance with Part III.B of this permit, **Storm Water Pollution Prevention Programs** submitted under Part III.C, annual reports under Part VI.D, and submittals under Appendices C, D, and E, are to be submitted to the **Commissioner** at the following address:

Storm Water Management Unit
Storm Water Section
Municipal Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

Phone (651) 296-6300, or
Toll free in MN 800-657-3864
Fax (651) 297-2343

E. Record Retention

The applicant shall retain copies of the permit application, the **Storm Water Pollution Prevention Program,** all data and information used by the applicant to complete the application, and any information developed as a requirement of this permit or as requested by the **Commissioner**, for a period of at least three (3) years beyond the date of permit expiration. This period is automatically extended during the course of an unresolved enforcement action regarding the **MS4** or as requested by the **Commissioner**.

PART IV. RIGHTS AND RESPONSIBILITIES

A. The **Commissioner** may modify this permit or issue other permits, in accordance with Minn. R. ch. 7001, to include more stringent effluent limitations or permit requirements that modify or are in addition to the minimum control measures in Part V.G of this permit, or both. These modifications may be based on the **Commissioner**'s determination that such modifications are needed to protect water quality.

B. Additional **MS4s** may be designated for coverage under this permit in accordance with Minn. R. ch. 7090. The **Owner** or **Operator** of an **MS4** that is designated for coverage must comply with the permit requirements by the dates specified in the **Commissioner's** designation documents.

C. **You** may request individual permits based on Minn. R. ch. 7000, 7001, and other applicable rules.

D. Section 303(d) listings and **Total Maximum Daily Load (TMDL)**

If your **MS4** discharges to a **Water of the State** that appears on the current **USEPA** approved list of impaired waters under Section 303(d) of the Clean Water Act (33 U.S.C. § 303 (d)), **You** must review whether changes may be warranted in your **Storm Water Pollution Prevention Program** to **Reduce** the impact of your discharge. If a **USEPA**-approved **TMDL(s)** has been developed, **You** must review the adequacy of your **Storm Water Pollution Prevention Program** to meet the **TMDL's** Waste Load Allocation set for **Storm Water** sources. If the **Storm Water Pollution Prevention Program** is not meeting the applicable requirements, schedules and objectives of the **TMDL, You** must modify your **Storm Water Pollution Prevention Program**, as appropriate, within 18 months after the **TMDL** Waste Load Allocation is approved.

PART V. STORM WATER POLLUTION PREVENTION PROGRAM

A. **You** must develop, implement, and enforce a **Storm Water Pollution Prevention Program** designed to **Reduce** the discharge of pollutants from your **Small MS4**, to protect water quality, and to satisfy the appropriate water quality requirements of the Clean Water Act. Upon approval by the **Commissioner**, the **Storm Water Pollution Prevention Program** shall be implemented as specified in the permit or in the **Commissioner's** approval letter.

B. Your **Storm Water Pollution Prevention Program** must be designed and managed to **Reduce** the discharge of pollutants from your storm sewer system to the **Maximum Extent Practicable (MEP). You** must manage your municipal storm sewer system in compliance with the Clean Water Act and with the terms and conditions of this permit. **You** must manage, operate, and maintain the storm sewer system and areas **You** control that discharge to the storm sewer system in a manner to **Reduce** the discharge of pollutants to the **MEP**. The **Storm Water Pollution Prevention Program** will consist of a combination of **Best Management Practices**, including education, maintenance, control techniques, system design and engineering methods, and such other provisions as **You** determined to be appropriate, as long as the **BMPs** meet the requirements of this permit.

C. **You** shall submit an annual report on the implementation of the **Storm Water Pollution Prevention Program** by June 30 of each year, or on another later date if established for your **MS4** by the **Commissioner**. The report shall cover the entire previous calendar year, in accordance with the reporting requirements of Part VI.D.

D. Your **Storm Water Pollution Prevention Program** must include **BMPs** that control or **Reduce** pollutants, as appropriate for your community. In the development of **BMPs** for your **Storm Water Pollution Prevention Program,**

You must consider the sources of pollutants, the potentially polluting activities being conducted in the watershed, and the sensitivity of the receiving waters. For **MS4s** that have discharges to waters listed in Part II.B.4, see Part IX (Appendix C) for additional requirements. For **MS4s** listed in Part XI (Appendix E), see Part X (Appendix D) for additional requirements.

E. For each minimum control measure, there shall be a description of the **BMPs** for this measure, responsible department in charge, an implementation schedule, including any request by **You** for consideration by the Commissioner of an extension or exemption from any deadlines and timelines set forth in this permit, and measurable goals that will be used to determine the success or benefits of the **BMPs**.

F. The **Storm Water Pollution Prevention Program** shall become an enforceable part of this permit upon approval by the **Commissioner**. Modifications to the **Storm Water Pollution Prevention Program** that are required or allowed by this permit (see Part V.H) shall also become enforceable provisions.

G. The six minimum control measures to be included in your **Storm Water Pollution Prevention Program** are listed below. **You** must define appropriate **BMPs** for these minimum control measures and measurable goals for each **BMP**. The **Storm Water Pollution Prevention Program** must include all **BMPs** required below, must include annual schedules or procedures for implementation, and, where appropriate, must be implemented or established in ordinance, plan or policy by June 30, 2010, unless other timelines have been specifically established in this permit Part V.G.1-6, or by the **Commissioner** under Part IV.B, or under other rules and authorities.

1. Public education and outreach on **Storm Water** impacts. **You** must select and implement a program of appropriate **BMPs** and measurable goals for this minimum control measure consisting of, at minimum:

   a. **You** must implement a public education program to distribute educational materials to the community or conduct equivalent outreach activities about the impacts of **Storm Water** discharges on water bodies and the steps that the public can take to **Reduce** pollutants in **Storm Water** runoff.

   b. **You** must specifically implement an education program that individually addresses each minimum control measure (Part V.G.1-6):

      1) Public education and outreach;
      2) Public participation;
      3) Illicit discharge detection and elimination;
      4) Construction site **Storm Water** runoff control;

5) Post-construction **Storm Water** management in **New Development** and **Redevelopment**; and
6) Pollution prevention/good housekeeping for municipal operations.

c. For each control measure, your education program must identify:

1) The audience or audiences involved;
2) Educational goals for each audience in terms of increased awareness, increased understanding, acquired skills, and/or desired changes in behavior;
3) Activities used to reach educational goals for each audience;
4) Activity implementation plans, including responsible department in charge, entities responsible for given activities, and schedules; and
5) Available performance measures that can be used to determine success in reaching educational goals.

d. **You** must describe how your education program is coordinated with and makes effective use of other **Storm Water** education programs being conducted in your area by other entities as appropriate for your **MS4**, including, but not limited to: community groups, nonprofit organizations, lake conservation districts, soil and water conservation districts, watershed districts, watershed management organizations, school districts, University of Minnesota Extension, and county, regional, state, and federal government.

e. **You** must hold at least one public meeting per year addressing the **Storm Water Pollution Prevention Program**. **You** must hold the public meeting prior to submittal to the **Commissioner** of the annual report required in Part VI.D.

1) Location. The public informational meeting must be held in the general vicinity of the **MS4** that is the subject of the permit. Otherwise, the public informational meeting must be held in a place that is generally convenient to **Persons** expected to attend the meeting.
2) Notice. **You** must issue a notice of the public informational meeting at least 30 days prior to the meeting. The notice must contain a reference to the **Storm Water Pollution Prevention Program**, the date, time, and location of the public informational meeting; a concise description of the manner in which the public informational meeting will be conducted; and shall indicate the location where a copy of the **Storm Water Pollution Prevention Program** is available for public review.
3) Distribution of notice. **You** must publish the notice in a **Newspaper** of general circulation in the general vicinity of the

MS4, and shall make available a copy of the notice to the **Agency**, the appropriate city and county officials, and all other **Persons** who have requested that they be informed of public meetings for the **Storm Water Pollution Prevention Program**.

4) Joint meetings. **You** may consolidate two or more matters, issues, or related groups of issues, or hold joint **MS4** public meetings with other permittees to meet the requirements of this part. These public meetings may be part of a larger public meeting, such as a city council meeting, provided that adequate public notice and opportunity to participate is provided.

2. Public participation/involvement. **You** must select and implement a program of appropriate **BMPs** and measurable goals for this minimum control measure consisting of, at minimum:

   a. **You** must comply with applicable public notice requirements of Part V.G.1.e.2 when implementing the provisions of the **Storm Water Pollution Prevention Program**.

   b. **You** must solicit public input and opinion on the adequacy of the **Storm Water Pollution Prevention Program**, including input from the public meeting, described in Part V.G.1.e, each year prior to submittal of the annual report to the **Commissioner**, which is described in Part VI.D.

      1) **You** must afford interested **Persons** a reasonable opportunity to make oral statements concerning the **Storm Water Pollution Prevention Program**.
      2) **You** must consider timely, relevant written materials that interested **Persons** submit concerning the **Storm Water Pollution Prevention Program**.
      3) **You** may establish procedures and processes for each speaker's presentation, require speakers with similar views to select a spokesperson, specify the timing and format of written materials, or make similar rules to help ensure an opportunity for full and fair consideration of all views.

   c. **You** must consider the public input, oral and written, to the **Storm Water Pollution Prevention Program** and shall make adjustments **You** find appropriate.

3. Illicit discharge detection and elimination. **You** must develop, implement, and enforce a program to detect and eliminate illicit discharges as defined at 40 CFR § 122.26(b)(2) into your **Small MS4**. **You** must also select and implement a program of appropriate **BMPs** and measurable goals for this minimum control measure consisting of, at minimum:

a. **You** must develop, if not already completed, a storm sewer system map by June 30, 2008, or on another date established by the **Commissioner**, showing the location of:

1) Ponds, streams, lakes and **Wetlands** that are part of your system;
2) Structural pollution control devices (grit chambers, separators, etc.) that are part of your system;
3) All pipes and conveyances in your system as a goal, but at minimum, those pipes that are 24 inches in diameter and over; and
4) **Outfalls**, including discharges from your system to other **MS4s**, or waters and **Wetlands** that are not part of your system (where **You** do not have operational control); structures that discharge storm water directly into groundwater; overland discharge points and all other points of discharge from your system that are outlets, but not diffuse flow areas.

b. **You** must, to the extent allowable under law, effectively prohibit, through ordinance or **Other Regulatory Mechanism**, non-**Storm Water** discharges into your storm sewer system and implement appropriate enforcement procedures and actions.

c. **You** must develop and implement a program to detect and address non-**Storm Water** discharges, including illegal dumping, to your system.

d. **You** must inform employees, businesses, and the general public in your **MS4** area of hazards associated with illegal discharges and improper disposal of waste.

e. **You** must address the following categories of non-**Storm Water** discharges or flows (i.e., illicit discharges), <u>only</u> if **You** identify them as significant contributors of pollutants to your **Small MS4**:

water line flushing, landscape irrigation, diverted stream flows, rising ground waters, uncontaminated ground water infiltration (as defined at 40 CFR § 35.2005(b)(20)), uncontaminated pumped ground water, discharges from potable water sources, foundation drains, air conditioning condensation, irrigation water, springs, water from crawl space pumps, footing drains, lawn watering, individual residential car washing, flows from riparian habitats and **Wetlands**, dechlorinated swimming pool discharges, and street wash water, discharges or flows from fire fighting activities.

4. Construction site **Storm Water** runoff control. Within six months after extension of coverage under this permit, **You** must have developed and must have commenced to implement and enforce a program to **Reduce** pollutants in any **Storm Water** runoff to your **Small MS4** from construction activities

within your jurisdiction that result in a land disturbance of greater than or equal to one acre. Controls on **Storm Water** discharges from construction activity disturbing less than one acre must be included in your program, if that construction activity is part of a larger **Common Plan of Development or Sale** that would disturb one acre or more. **You** must also select and implement a program of appropriate **BMPs** and measurable goals for this minimum control measure consisting of, at minimum:

a. An ordinance or **Other Regulatory Mechanism** to require erosion and sediment controls, as well as sanctions to ensure compliance, to the extent allowable under law;

b. Requirements for construction site operators to implement appropriate erosion and sediment control **Best Management Practices**;

c. Requirements for construction site operators to control waste, such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site that may cause adverse impacts to water quality;

d. Procedures for site plan review which incorporate consideration of potential water quality impacts;

e. Procedures for receipt and consideration of reports of noncompliance or other information on construction related issues submitted by the public; and

f. Procedures for site inspection and enforcement of control measures.

5. Post-construction **Storm Water** management in **New Development** and **Redevelopment**. **You** must develop, implement, and enforce a program to address **Storm Water** runoff from **New Development** and **Redevelopment** projects within your jurisdiction that disturb greater than or equal to one acre, including projects less than one acre that are part of a larger **Common Plan of Development or Sale** that discharge into your **Small MS4** by June 30, 2008, or on another date established by the **Commissioner**. Your program must ensure that controls are in place that would prevent or **Reduce** water quality impacts. **You** must also select and implement a program of appropriate **BMPs** and measurable goals for this minimum control measure consisting of, at minimum:

a. Develop and implement strategies which include a combination of structural and/or non-structural **BMPs** appropriate for your community;

b. Use an ordinance or **Other Regulatory Mechanism** to address post-construction runoff from **New Development** and **Redevelopment** projects to the extent allowable under law; and

c. Ensure adequate long-term operation and maintenance of **BMPs** installed as a result of these requirements.

6. Pollution prevention/good housekeeping for municipal operations. **You** must select and implement a program of appropriate **BMPs** and measurable goals for this minimum control measure consisting of, at minimum:

a. An operation and maintenance program that includes a training component and has the ultimate goal of preventing or **Reducing** pollutant runoff from **MS4** operations. Training materials that are available from the **USEPA**, state and regional agencies, or other organizations may be used as appropriate or modified for your community. Your program must include employee training to prevent and **Reduce Storm Water** pollution from activities such as park and open space maintenance, fleet and building maintenance, new construction and land disturbances, and **Storm Water** system maintenance.

b. **You** must also:

1) Operate and maintain your **Storm Water** system in a manner so as to **Reduce** the discharge of pollutants to the **Maximum Extent Practicable**.
2) Inspect annually all structural pollution control devices, such as trap manholes, grit chambers, sumps, floatable skimmers and traps, separators, and other small settling or filtering devices.
3) Inspect, at minimum, 20% of the **MS4 Outfalls**, sediment basins and ponds each year on a rotating basis, during the effective period of this permit.
4) Inspect all exposed stockpile, storage and material handling areas at least annually.
5) Based on your inspection, determine if repair, replacement, or maintenance measures are necessary for proper operation and to prevent environmental impacts such as erosion. The necessary measures shall be completed as soon as possible, usually during the same year as the inspection. When this is not practicable, the reasons and a schedule for completion shall be submitted in the annual report.
6) Summarize the results of all inspections in the annual report. Keep records on the dates of inspection and responses to the inspections, including the date of completion of repairs and major additional protection measures.

7) Keep records of inspection results, including as appropriate, the date, antecedent weather conditions, sediment storage and capacity remaining, and any maintenance performed or recommended. After two years of inspections, if patterns of maintenance become apparent, the frequency of inspections may be adjusted. If maintenance or sediment removal is required as a result of each of the first two annual inspections, the frequency of inspection shall be increased to at least two (2) times annually, or more frequently as needed to prevent carry-over or washout of pollutants from the structures and maximize pollutant removal. If maintenance or sediment removal is not required as a result of both of the first two (2) annual inspections, the frequency may be reduced to once every two (2) years.

H. Modifications to the Storm Water Pollution Prevention Program

1. The **Commissioner** may require **You** to modify the **Storm Water Pollution Prevention Program** as needed, in accordance with the procedures of Minn. R. ch. 7001, and may consider the following factors:

   a. Discharges from the storm sewer system are impacting the quality of receiving waters;

   b. More stringent requirements are necessary to comply with state or federal regulations;

   c. Measures are necessary to meet the applicable requirements of Appendices C and D, or

   d. Additional conditions are deemed necessary to comply with the goals and requirements of the Clean Water Act or water quality standards.

2. Modifications that **You** wish to make in your **Storm Water Pollution Prevention Program**, other than modifications allowed in Part H.3 below, must be approved by the **Commissioner** in accordance with the procedures of Minn. R. ch. 7001. All requests must be in writing, setting forth schedules for compliance. The request should discuss alternative program modifications, assure compliance with requirements of the permit, and meet other requirements of the permit and applicable laws.

3. The **Storm Water Pollution Prevention Program** may only be modified by **You** without prior approval of the **Commissioner**, provided it is in accordance with the following:

   a. A **BMP** is added, and none subtracted, from the **Storm Water Pollution Prevention Program**; or

b. A less effective **BMP** identified in the **Storm Water Pollution Prevention Program** is replaced with a more effective **BMP**. The alternate **BMP** shall address the same, or similar, concerns as the ineffective or failed **BMP**; and

c. The **Commissioner** is notified of the modification in the annual report for the year the modification is made.

PART VI. EVALUATING, RECORDKEEPING AND REPORTING

A. Evaluation and Assessment

For each annual report, **You** must evaluate program compliance, the appropriateness of your identified **Best Management Practices**, and progress towards achieving your identified measurable goals.

B. Recordkeeping

You must keep records required by the NPDES permit for at least three (3) years beyond the term of the permit. **You** must submit your records to the **Commissioner** only if specifically asked to do so.

C. Public Availability

You must make your records, including your **Storm Water Pollution Prevention Program**, available to the public at reasonable times during regular business hours (see 40 CFR § 122.7 for confidentiality provision). **You** may assess a reasonable charge for copying. **You** may require a member of the public to provide advance notice.

D. Annual Reporting

You must submit annual reports to the **MPCA** by June 30 of each year. The report must cover the entire previous calendar year. Your annual report must summarize:

1. The status of compliance with permit conditions, including an assessment of the appropriateness of your identified **Best Management Practices** and progress towards achieving your identified measurable goals for each of the minimum control measures. Your assessment must be based on results of information collected and analyzed, including monitoring (if any), inspection findings, and public input received during the reporting period;

2. The **Storm Water** activities **You** plan to undertake during the next reporting cycle;

3. A change in any identified **Best Management Practices** or measurable goals for any of the minimum control measures; and

4. A statement that **You** are relying on another entity to satisfy some of your permit obligations (if applicable), and what agreements **You** have entered into in support of this effort.

E. Reporting Submittals

The applications, annual reports, **Storm Water Pollution Prevention Program**, and other submittals required by this permit shall be submitted to:

Storm Water Management Unit
Storm Water Section
Municipal Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

PART VII. APPENDIX A: STANDARD CONDITIONS

A. The **Agency's** issuance of a permit does not release the permittee from any liability, penalty, or duty imposed by Minnesota or federal statutes or rules or local ordinances, except the obligation to obtain the permit.

B. The **Agency's** issuance of a permit does not prevent the future adoption by the **Agency** of pollution control rules, standards, or orders more stringent than those now in existence and does not prevent the enforcement of these rules, standards, or orders against the permittee.

C. The permit does not convey a property right or an exclusive privilege.

D. The **Agency's** issuance of a permit does not obligate the **Agency** to enforce local laws, rules, or plans beyond that authorized by Minnesota statutes.

E. The permittee shall perform the actions or conduct the activity authorized by the permit in accordance with the plans and specifications approved by the **Agency** and in compliance with the conditions of the permit.

F. The permittee shall at all times properly operate and maintain the facilities and systems of treatment and control and the appurtenances related to them which are installed or used by the permittee to achieve compliance with the conditions of the permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. The permittee shall install and maintain appropriate backup or auxiliary facilities if they are necessary to achieve compliance with the conditions of the permit and, for all permits other than hazardous waste facility permits, if these backup or auxiliary facilities are technically and economically feasible.

G. The permittee may not knowingly make a false or misleading statement, representation, or certification in a record, report, plan, or other document required to be submitted to the **Agency** or to the **Commissioner** by the permit. The permittee shall immediately upon discovery report to the **Commissioner** an error or omission in these records, reports, plans, or other documents.

H. The permittee shall, when requested by the **Commissioner**, submit within a reasonable time the information and reports that are relevant to the control of pollution regarding the construction, modification, or operation of the facility covered by the permit or regarding the conduct of the activity covered by the permit.

I. When authorized by Minn. Stat. §§ 115.04; 115B.17, subd. 4; and 116.091, and upon presentation of proper credentials, the **Agency**, or an authorized employee or agent of the **Agency**, shall be allowed by the permittee to enter at reasonable times

upon the property of the permittee to examine and copy books, papers, records, or memoranda pertaining to the construction, modification, or operation of the facility covered by the permit or pertaining to the activity covered by the permit; and to conduct surveys and investigations, including sampling or monitoring, pertaining to the construction, modification, or operation of the facility covered by the permit or pertaining to the activity covered by the permit.

J. If the permittee discovers, through any means, including notification by the **Agency**, that noncompliance with a condition of the permit has occurred, the permittee shall take all reasonable steps to minimize the adverse impacts on human health, public drinking water supplies, or the environment resulting from the noncompliance.

K. If the permittee discovers that noncompliance with a condition of the permit has occurred which could endanger human health, public drinking water supplies, or the environment, the permittee shall, within 24 hours of the discovery of the noncompliance, orally notify the **Commissioner**. Within five days of the discovery of the noncompliance, the permittee shall submit to the **Commissioner** a written description of the noncompliance; the cause of the noncompliance; the exact dates of the period of the noncompliance; if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

L. The permittee shall report noncompliance with the permit not reported under item K as a part of the next report, which the permittee is required to submit under this permit. If no reports are required within 30 days of the discovery of the noncompliance, the permittee shall submit the information listed in item K within 30 days of the discovery of the noncompliance.

M. The permittee shall give advance notice to the **Commissioner** as soon as possible of planned physical alterations or additions to the permitted facility (**MS4**) or activity that may result in noncompliance with a Minnesota or federal pollution control statute or rule or a condition of the permit.

N. The permit is not transferable to any **Person** without the express written approval of the **Agency** after compliance with the requirements of Minn. R. 7001.0190. A **Person** to whom the permit has been transferred shall comply with the conditions of the permit.

O. The permit authorizes the permittee to perform the activities described in the permit under the conditions of the permit. In issuing the permit, the state and **Agency** assume no responsibility for damage to **Persons**, property, or the environment caused by the activities of the permittee in the conduct of its actions, including those activities authorized, directed, or undertaken under the permit. To the extent the state and **Agency** may be liable for the activities of its employees, that liability is explicitly limited to that provided in the Tort Claims Act, Minn. Stat. § 3.736.

P. This permit incorporates by reference the applicable portions of 40 CFR §§ 122.41 and 122.42 parts (c) and (d) and Minn. R. 7001.1090, which are enforceable parts of this permit.

PART VIII. APPENDIX B: DEFINITIONS

The definitions in this Part are for purposes of this permit only.

"Agency" or **"Agency members"** means the **Commissioner** and the eight persons appointed to the Minnesota Pollution Control Agency, pursuant to Minn. Stat. § 116.02, subd. 1.

"Best Management Practices" or **"BMPs"** means practices to prevent or **Reduce** the pollution of the **Waters of the State**, including schedules of activities, prohibitions of practices, and other management practices, and also includes treatment requirements, operating procedures and practices to control plant site runoff, spillage or leaks, sludge, or waste disposal or drainage from raw material storage.

"Commissioner" means the **Commissioner** of the Minnesota Pollution Control Agency or the **Commissioner's** designee.

"Common Plan Of Development Or Sale" means a contiguous area where multiple separate and distinct construction activities are planned to occur at different times on different schedules under one plan, for example, a housing development of five one-quarter-acre lots (40 CFR § 122.26(b)(15)(i)).

"Designated MS4" means an MS4 designated in accordance with Minn. R. ch. 7090.

"EPA" means the U.S. Environmental Protection Agency.

"Expanded Discharge" means a discharge that changes in volume, quality, location, or any other manner after January 1, 1988 or the effective date an outstanding resource value water was designated as described in Minn. R. 7050.0460 and 7050.0470, such that an increased loading of one or more pollutants results. In determining whether an increased loading of one or more pollutants would result from the proposed change in the discharge, the **Agency** shall compare the loading that would result from the proposed discharge with the loading allowed by the **Agency** as of January 1, 1988 or the effective date of outstanding resource value water designation. This definition does not apply to the discharge of bioaccumulative chemicals of concern, as defined in Minn. R. 7052.0010, subp. 4, to outstanding resource value waters in the Lake Superior Basin. For purposes of Minn. R. 7050.0180, an expanded discharge of a bioaccumulative chemical of concern to an outstanding resource value water in the Lake Superior Basin is defined in Minn. R. 7052.0010, subp. 18.

"General Permit" means a permit issued under Minn. R. 7001.0210 to a category of permittees whose operations, emissions, activities, discharges, or facilities are the same or substantially similar.

"Maximum Extent Practicable" "MEP" is the statutory standard (33 U.S.C. § 1342(p)(3)(B)(iii)) that establishes the level of pollutant reductions that an **Owner** or

Operator of **Regulated MS4s** must achieve. The **USEPA** has intentionally not provided a precise definition of **MEP** to allow maximum flexibility in **MS4** permitting. The pollutant reductions that represent **MEP** may be different for each **Small MS4**, given the unique local hydrologic and geologic concerns that may exist and the differing possible pollutant control strategies. Therefore, each permittee will determine appropriate **BMPs** to satisfy each of the six minimum control measures through an evaluative process. The **USEPA** envisions application of the **MEP** standard as an iterative process.

"MPCA" means the Minnesota Pollution Control Agency.

"MS4" means a **Municipal Separate Storm Sewer System**.

"Municipal Separate Storm Sewer System" means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

1. Owned or operated by a state, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to state law) having jurisdiction over disposal of sewage, industrial wastes, **Storm Water**, or other wastes, including special districts under state law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management Agency under section 208 of the CWA (33 U.S.C. § 1288) that discharges to waters of the United States;

2. Designed or used for collecting or conveying **Storm Water**;

3. Which is not a combined sewer; and

4. Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR § 122.2.

"New Development" means construction activities that create new impervious surface.

"New Discharge" For all waters that are not outstanding resource value waters **New Discharge** means a discharge that was not in existence before January 1, 1988. For outstanding resource value waters **New Discharge** means a discharge that was not in existence on the effective date the outstanding resource value water was designated as described in Minn. R. 7050.0460 and 7050.0470.

"Newspaper" means a publication containing news of general interest in the vicinity of the **MS4**. It can include other publications if the distribution includes the general population of potentially interested parties.

"Notice of Intent" as referenced in the **USEPA** documents is synonymous with the term "permit application" for the purposes of this permit.

"Other Regulatory Mechanism" means any legally enforceable document, such as a contract or other agreement that has penalties such as withholding payments, fines or other measures to prevent non compliance.

"Operator" means the **Person** with primary operational control and legal responsibility for the **Municipal Separate Storm Sewer System**.

"Outfall" means the point source where a **Municipal Separate Storm Sewer System** discharges from a pipe, ditch, or other discrete conveyance to receiving waters, or to other **Municipal Separate Storm Sewer Systems**. It does not include diffuse runoff or conveyances which connect segments of the same stream or water systems.

"Owner" means the **Person** that owns the **Municipal Separate Storm Sewer System**.

"Person" means the state or any agency or institution thereof, any municipality, governmental subdivision, public or private corporation, individual, partnership, or other entity, including, but not limited to, association, commission or any interstate body, and includes any officer or governing or managing body of any municipality, governmental subdivision, or public or private corporation, or other entity.

"Physical Alteration" except as used in Part VII.M, means the dredging, filling, draining, or permanent inundating of a **Wetland**. Restoring a degraded **Wetland** by reestablishing its hydrology is not a **Physical Alteration**.

"Rebuttable Presumption" is a presumption that may be rebutted by the evidence.

"Record of Decision" means a record of the comments and the permittee's response to comments where such record is required in this permit.

"Redevelopment" refers to alterations of a property that change the "footprint" of a site or building in such a way that results in the disturbance of equal to or greater than one (1) acre of land. The term is not intended to include such activities as exterior remodeling, which would not be expected to cause adverse **Storm Water** quality impacts and offer no new opportunity for **Storm Water** controls.

"Reduce" means **Reduce** to the "**Maximum Extent Practicable**" unless otherwise defined in the context in which it is used.

"Regulated MS4" means an **MS4** that is regulated pursuant to 40 CFR § 122.32(a)(1), or an **MS4s** that is designated for coverage by the **Commissioner**.

"Selected MS4" means **MS4s** listed in Part XI (Appendix E).

"Small Municipal Separate Storm Sewer System" means all separate storm sewers that are:

1. Owned or operated by the United States, a state, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to state law) having jurisdiction over disposal of sewage, industrial wastes, **Storm Water**, or other wastes, including special districts under state law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States.

2. Not defined as "large" or "medium" **Municipal Separate Storm Sewer Systems** pursuant to 40 CFR §122.26 paragraphs (b)(4) and (b)(7) or designated under paragraph (a)(1)(v).

3. This term includes systems similar to separate storm sewer systems in municipalities, such as systems at military bases, large hospital or prison complexes, and highways and other thoroughfares. The term does not include separate storm sewers in very discrete areas, such as individual buildings.

"Small MS4" means a **Small Municipal Separate Storm Sewer System**.

"Storm Water" means **Storm Water** runoff, snowmelt runoff, surface runoff and drainage.

"Storm Water Pollution Prevention Program" or **"SWPPP"** is a compilation of **BMPs** to address the six minimum control measures and other provisions of the **MS4** permit, that is designed and managed to **Reduce** the discharge of pollutants from your **MS4** to the **Maximum Extent Practicable** as appropriate to your community.

"Total Maximum Daily Load" or **"TMDL"** is the process established by the **USEPA** for the allocation of pollutant loads, including **Storm Water**, to a particular water body or reach of a water body.

"USEPA" or **"EPA"** means the U.S. Environmental Protection Agency.

"Waters of the State" means all streams, lakes, ponds, marshes, watercourses, waterways, wells, springs, reservoirs, aquifers, irrigation systems, drainage systems and all other bodies or accumulations of water, surface or underground, natural or artificial, public or private, which are contained within, flow through, or border upon the state or any portion thereof.

"Wetlands" are those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. **Wetlands** generally include swamps, marshes, bogs, and similar areas. Constructed **Wetlands** designed for wastewater treatment are not **Waters of the State**. **Wetlands** must have the following attributes:

1. A predominance of hydric soils;

2. Inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of hydrophytic vegetation typically adapted for life in a saturated soil condition; and

3. Under normal circumstances support a prevalence of such vegetation.

"You" means the **Owner**, **Operator** or permittee as appropriate.

PART IX. APPENDIX C: LIMITATIONS ON COVERAGE

Contents of Appendix C:

A. ***Discharges to Waters With Prohibited Discharges*** *(pages 25-26)*

B. ***Discharges to Waters With Restricted Discharges*** *(pages 26-28)*

C. ***Discharges to Trout Waters*** *(page 28)*

D. ***Discharges to Wetlands*** *(page 28)*

E. ***Discharges Requiring Environmental Review*** *(page 28)*

F. ***Discharges Affecting Threatened or Endangered Species or Their Habitat*** *(page 29)*

G. ***Discharges Affecting Historic or Archeological Sites*** *(page 29)*

H. ***Discharges Affecting Source Water Protection Areas*** *(page 29)*

This part describes more stringent requirements for discharges that meet the following specified criteria, A through H. Whenever two or more requirements, restrictions, or prohibitions apply, both or all must be met. Whenever two or more requirements, restrictions or prohibitions conflict, the more restrictive conditions must be met.

A. **Discharges to Waters with Prohibited Discharges** *(Minn. R. 7050.0180, subp. 3, 4 and 5)*. This permit does not authorize **New or Expanded Discharges** to waters, or discharges adversely impacting waters, where the applicable water quality standards prohibit **New or Expanded Discharges** as described in Minn. R. 7050.0180, subp. 3, 4, and 5 unless the following requirements are met:

1. **List. You** must identify as part of your application for permit the Waters with Prohibited Discharges to which your **MS4** discharges. The list must be included with your application, to be submitted within 90 days after the permit effective date on page 1 of this permit or for **Designated MS4s** in accordance with Part IV.B.

2. **Map. You** must mark on U.S.G.S. watershed or topographic maps of 1:24,000 scale or better at minimum the DNR minor subwatersheds in your jurisdiction that discharge in whole or in part to Waters with Prohibited Discharges. **You** must provide a narrative estimate of the percent impervious surface based on current land use, the percent expected future impervious surface based on zoning or comprehensive plans, and other information that may significantly affect your runoff to the listed waters. The map must be included with your application, to be submitted within 90 days after the permit

effective date on page 1 of this permit or for **Designated MS4s** in accordance with Part IV.B.

3. **Assessment. You** must then assess how your **Storm Water Pollution Prevention Program** can be reasonably modified to eliminate **New or Expanded Discharges** to Waters with Prohibited Discharges. This assessment must be developed for **New or Expanded Discharges** created from 1988 until the year 2020. **You** must present this assessment, together with your proposed changes to your **Storm Water Pollution Prevention Program,** for public comment during the annual public comment period required in the permit, prior to your first annual report (see Part VI.D) or prior to the schedule in Appendix E for **Selected MS4s.**

4. **Assessment Submittal. You** must submit the assessment from Part IX.A.3 above, including your response to any public comments and proposed changes to your **Storm Water Pollution Prevention Program,** (a) with your first annual report, (b) on another later date if established for your **MS4** by the **Commssioner**, or (c) in accordance with the schedule in Appendix E for **Selected MS4s**. The assessment will be reviewed by the **Commissioner**, who will provide opportunity for public input and hearing prior to denial or approval of your proposed **Storm Water Pollution Prevention Program**. The **MPCA** reserves the right to incorporate as much available information as possible in the decision making process, including the right to independently develop and evaluate potential alternatives to the discharge.

5. **Implementation. You** must implement your approved plan, including all approved **BMPs**, in accordance with the schedule in the approved **Storm Water Pollution Prevention Program.**

B. Discharges to Waters with Restricted Discharges *(Minn. R. 7050.0180, subp.6, 6a, and 6b)*. This permit does not authorize **New or Expanded Discharges** to waters where the applicable water quality standards restrict **New or Expanded Discharges**, unless such discharges are in accordance with Minn. R. 7050.0180, subpart 6, 6a, and 6b, and other applicable rules, and the following requirements. For **MS4s** that have discharges to outstanding resource value waters listed in Minn. R. 7050.0180, subp. 6, 6a or 6b (listed waters, or Waters with Restricted Discharges), the **MPCA** makes a **Rebuttable Presumption** that those **MS4s** have or will create a **New or Expanded Discharge** to a listed water. The following requirements create a schedule to bring discharges to listed waters into compliance:

1. In order to allow a **New or Expanded Discharge** to Waters with Restricted Discharges, the **MPCA** must determine that there are no prudent and feasible alternatives to the **New or Expanded Discharge**. The determination will be based on your demonstration. This demonstration should include, but is not limited to developing a plan to address prudent and feasible alternatives to the discharge. If **You** intend to argue that there are no prudent and feasible

alternatives to the discharge to these waters, **You** must develop a plan to restrict the discharge to the extent necessary to preserve the existing high quality, or to preserve the wilderness, scientific, recreational, or other special characteristics that make the listed water an outstanding resource value water.

2. Here are the specific actions **You** must take:

   a. **List. You** must identify as part of your application for permit the waters with restricted discharges to which your **MS4** discharges. The list must be included with your application, to be submitted within 90 days after the permit effective date on page 1 of this permit or for **Designated MS4s** in accordance with Part IV.B.

   b. **Map. You** must mark on U.S.G.S. watershed or topographic maps of 1:24,000 scale or better at minimum the DNR minor subwatersheds in your jurisdiction that discharge in whole or in part to waters with restricted discharges. **You** must provide a narrative estimate of the percent impervious surface based on current land use, the percent of future expected impervious surface based on zoning or comprehensive plans, and other information that may significantly affect your runoff to the listed waters. **You** must submit this map with your application within 90 days after the permit effective date on page 1 of this permit or other later date if established by the **Commissioner.**

   c. **Assessment. You** must then assess how your **Storm Water Pollution Prevention Program** can be reasonably altered to eliminate **New or Expanded Discharges** to waters with restricted discharges. This assessment must be developed for **New or Expanded Discharges** produced from 1988 until the year 2020. Where **You** intend to argue that there are no prudent and feasible alternatives **to New or Expanded Discharges** to these waters, **You** must propose measures **You** will implement to restrict the discharge to the extent necessary to preserve the existing high quality, or to preserve the wilderness, scientific, recreational, or other special characteristics that make the listed waters outstanding resource value waters. Measures that can be proposed include ordinances and zoning changes or other **BMPs. You** must present this assessment, together with your proposed changes to your **Storm Water Pollution Prevention Program,** for public comment during the annual public comment period required in the permit, prior to your first annual report (see Part VI.D) or prior to the schedule in Appendix E for **Selected MS4s.**

   d. **Assessment Submittal. You** must submit the assessment from Part IX.B.2.c above, and your response to any public comments, with your plan and proposed changes to your **Storm Water Pollution Prevention Program** and submit it with your first annual report, or on another later date if established for your **MS4** by the **Commissioner,** or according to the schedule in Appendix E for **Selected MS4s**. The plan and proposed changes to the **Storm Water Pollution Prevention Program** will be reviewed by the **Commissioner**, who will provide opportunity for public input and hearing pursuant to Minn. R. ch. 7001 prior to denial or approval of your proposed **Storm Water Pollution Prevention**

Program modifications. The **MPCA** reserves the right to incorporate as much available information as possible in the decision making process, including the right to independently develop and evaluate potential prudent and feasible alternatives to the discharge.

e. **Implementation. You** must implement your approved **Storm Water Pollution Prevention Program**, including all **BMPs** in accordance with the schedule described in the approved **Storm Water Pollution Prevention Program**.

C. **Discharges Adversely Impacting Trout Waters** *(Minn. R. 6264.0050 subp. 2 and 4)*. The following requirements apply to Trout Waters listed in Minn. R. 6264.0050, subp. 2 and 4:

1. This permit does not authorize **New or Expanded Discharges** adversely impacting Trout Waters unless, at minimum, **You** establish administrative procedures or other measures to assure that **You** make the following determinations and document the basis for your decision:

   a. That there is no feasible and prudent alternative to the proposed discharge; and

   b. All prudent and feasible measures needed to avoid or **Reduce** impacts to Trout Waters, and to preserve the existing high quality of the water will be implemented (see Part IX.C.2 below).

2. If the discharge cannot be avoided, **You** must consider measures to protect water quality and prevent temperature increases. Acceptable measures include reduce the impervious surfaces, diversion away from the stream and use of filter strips, infiltration, biofiltration, or enhanced grass swales to treat runoff before discharge to the Trout Water. Innovative alternatives to ponds are specifically encouraged for Trout Water discharges if they provide equivalent treatment.

D. **Discharges to Wetlands** *(Minn. R. 7050.0130, subp. F; also 7050.0186)*. This permit does not authorize **Physical Alterations** to **Wetlands**, or other discharge adversely affecting **Wetlands**, if the alteration will have a significant adverse impact to the designated uses of a **Wetland**. Any **Physical Alterations** to **Wetlands** that will cause a potential for a significant adverse impact to a designated use must be implemented in accordance with the avoidance, minimization and mitigation requirements of Minn. R. 7050.0186 and other applicable rules.

E. **Discharges Requiring Environmental Review** *(Minn. Stat. ch. 116D, and 42 U.S.C. §§ 4321 – 4370 f)*. This permit does not replace or satisfy any environmental review requirements, including those under the Minnesota Environmental Policy Act (Minn. Stat. ch. 116D), the National Environmental Policy Act (42 U.S.C. §§ 4321 – 4370 f), and rules implementing those laws. Any environmental review required of **You** by law, including preparation of environmental review documents such as environmental assessment worksheets, environmental impact statements, or environmental assessments, must be completed in accordance with those requirements.

F. **Discharges Affecting Threatened or Endangered Species.** This permit does not replace or satisfy any review requirements for Threatened or Endangered Species, from discharges whose direct, indirect, interrelated, interconnected, or independent impacts would jeopardize a listed Threatened or Endangered Species or adversely modify a designated critical habitat. For any project resulting in a discharge having the potential to adversely impact Threatened or Endangered species, or their critical habitat, **You** must conduct your required review and coordination with appropriate agencies in accordance with those requirements.

G. **Discharges Affecting Historic or Archeological Sites.** This permit does not replace or satisfy any review requirements for Historic or Archeological Sites from discharges which adversely affect properties listed or eligible for listing in the National Register of Historic Places or adversely affecting known or discovered archeological sites. For any project resulting in a discharge having the potential to adversely impact Historic or Archeological Sites, including significant anthropological sites and any burial sites, **You** must conduct your required review and coordination with the Minnesota State Historic Preservation Officer or other appropriate agencies in accordance with those requirements.

H. **Discharges Affecting Source Water Protection Areas** *(Minn. R. 4720.5100 – 4720.5590).* **You** shall incorporate **BMPs** into your **Storm Water Pollution Prevention Program** to protect any of the following drinking water sources that your **MS4** discharge may affect, and **You** shall include the map of these sources with the **Storm Water Pollution Prevention Program** if they have been mapped:

1. Wells and source waters for drinking water supply management areas identified as vulnerable under Minn. R. 4720.5205, 4720.5210, and 4720.5330, and

2. Source water protection areas for surface intakes identified in the source water assessments conducted by or for the Minnesota Department of Health under the federal Safe Drinking Water Act, U.S.C. §§ 300j – 13.

PART X. APPENDIX D: NONDEGRADATION FOR SELECTED MS4s

The requirements of this section apply only to **MS4s** called **Selected MS4s** as described in Part XI (Appendix E). Certain **MS4s** have been selected to perform the requirements of this part because their size and growth may be closely correlated with increased **Storm Water** flows and pollutant loading. Nondegradation review applies to all significant **New or Expanded Discharges** to all waters but does not negate the applicable requirements for outstanding resource value waters, requirements for special classes of waters, other requirements in Appendix C or the general requirements of the permit.

A. Selected MS4s

The basic requirement for all **MS4s** regulated under this permit is to develop a **Storm Water Pollution Prevention Program** that meets the requirements of the permit. An additional process is required of a limited number of permittees (30) that are listed in Appendix E. These **Selected MS4s** must submit to the **Commissioner** information described below to determine whether additional control measures beyond those of the permit Parts I through IX can be reasonably taken to minimize the impacts of the discharges. Selection, for purposes of this permit, is described in Appendix E.

B. Loading Assessment

Each **Selected MS4** must assess the change in **Storm Water** discharge loading for its permitted area using a pollutant loading water quality model that, at minimum, addresses changes in Average Annual Flow Volume, Total Suspended Solids, and Phosphorus. This modeling will be based on two time periods: from 1988 (1988-1990) to the present (2000-2005), and from the present to 2020. The **Selected MS4s** must use a simple model, or another more complex model that they find to be more appropriate, that addresses the parameters of concern. This may include a model that the **Selected MS4** has already used. Other assessment methods may be used if they can be shown to be as effective at quantifying the increase in loading as the modeling methods. The models and/or other methods will be used as part of the assessment to develop the Nondegradation Report, to help in selecting appropriate **BMPs** that address nondegradation, to determine whether additional control measures can reasonably be taken to **Reduce** pollutant loading, and for a few **Selected MS4s** that elect to do so, to evaluate the significance of the **New or Expanded Discharge**.

C. Nondegradation Report

Selected MS4s that have significant **New or Expanded Discharges** are required to complete a Nondegradation Report and, upon approval, to incorporate its findings on **BMPs** that address nondegradation into their **Storm Water Pollution Prevention Program.** The **BMPs** shall address changes in pollutant loadings as far as is reasonable and practical through future development. Additionally, the **BMPs** shall address, as far as is reasonable and practical, the negative impacts of increased **Storm Water** discharge volumes that cause increased depth and duration of inundation of **Wetlands** having the potential for a significant adverse impact to a designated use of the **Wetland**, or changes in stream morphology that have the potential for a significant adverse impact to a designated use of the streams.

The Nondegradation Report must include consideration of the Loading Assessment, which must include analysis of flow and may include removal of pollutants by **BMPs** already initiated. For purposes of this **General Permit**, 1988 levels consistently attained means runoff that would have been produced under approximately average conditions of rainfall. Local **Storm Water** management plans and other pertinent factors may also be considered. **BMPs** implemented by other parties may be considered when those **BMPs** affect the **Storm Water** from the area of the **Selected MS4**. If the pollutant loadings cannot be **Reduced** to levels consistently attained in 1988, the Report must describe reasonable and practical **BMPs** that the **Selected MS4** plans to incorporate into a modified **Storm Water Pollution Prevention Program**. The **Selected MS4** must consider alternatives, explain which alternatives have been studied but rejected and why, and propose alternatives that are reasonable and practical. The Report must give high priority to **BMPs** that address impacts of future growth, such as ordinances for **New Development**. Where increases in pollutant loading have already occurred due to past development, the Report must consider retrofit and mitigation options (**BMPs**) that the **Selected MS4** determines to be reasonable, practical and appropriate for the community. The **Selected MS4** is responsible for developing any site specific cost/benefit, social, and environmental information that the **Selected MS4** wishes to bring to the **Agency's** attention. The **Selected MS4** must incorporate the **BMPs** into a modified **Storm Water Pollution Prevention Program** and include an implementation schedule that addresses **New Development** and retrofit **BMPs** it proposes to implement.

D. Public Participation

Prior to submittal to the **MPCA**, the proposed **Storm Water Pollution Prevention Program** modifications to address nondegradation will be public noticed at the local level as required in the permit (Part V.G.1.e). Each **Selected MS4** shall also submit its **Storm Water Pollution Prevention Program** modifications to address nondegradation to the appropriate local water authority (e.g. watershed organizations or county water planning authority) in time to allow for their review and comment. The Nondegradation Report explaining the proposed **BMPs** and the entire **Storm Water Pollution Prevention Program** must be made available to the public and local water authority upon request.

E. Submittals for Selected MS4s

Selected MS4s must submit their proposed changes to the **Storm Water Pollution Prevention Program**, reports addressing nondegradation for all waters (and restricted waters or prohibited waters if applicable), together with other supporting documents, to the **MPCA** in accordance with the schedule in Appendix E. This submittal must include:

1. The Loading Assessment;

2. The Nondegradation Report;

3. The proposed **Storm Water Pollution Prevention Program** modifications to address nondegradation;

4. The public and local water authority comments on the proposed **Storm Water Pollution Prevention Program** modifications to address nondegradation, with a **Record of Decision** on the comments; and

5. An application to modify the permit.

F. MPCA Review

The **MPCA** will review the above submittals in accordance with Minn. R. ch. 7001. After consideration of the Loading Assessment, the Nondegradation Report, public and local water authority comments, the **Record of Decision** by the **Selected MS4**, and other pertinent information, the **MPCA** will make a determination on the preliminary approval of the proposed **Storm Water Pollution Prevention Program**. The role of the **MPCA** during the review process will generally be limited to reviewing the information presented by the **Selected MS4** and comments made by others during the review process. However, the **MPCA** reserves the right to incorporate as much available information as possible in the decision making process, including the right to independently develop and evaluate potential reasonable and practical alternatives.

G. Notice and Preliminary Determination

The **MPCA** will provide statewide public notice and opportunity for hearing on any **MPCA** determination of intent to deny or approve the **Storm Water Pollution Prevention Program** modifications to be implemented under this permit. The **MPCA** will provide public and **MPCA** comments to the **Selected MS4**. The **Selected MS4** will have the opportunity to respond to the comments prior to the **MPCA** making a final determination.

H. Final Determination

The **Commissioner** will make a final determination on the modifications to the **Storm Water Pollution Prevention Program** in accordance with Minn. R. ch. 7001.

I. Implementation of the Approved Storm Water Pollution Prevention Program

Following approval by the **MPCA** (as described in Part X.H above), the approved **Storm Water Pollution Prevention Program** modifications, including any changes required by the **MPCA**, must be implemented by the **Selected MS4** in accordance with the schedule in the approved **Storm Water Pollution Prevention Program** and modifications.

PART XI. APPENDIX E: SELECTED MS4s

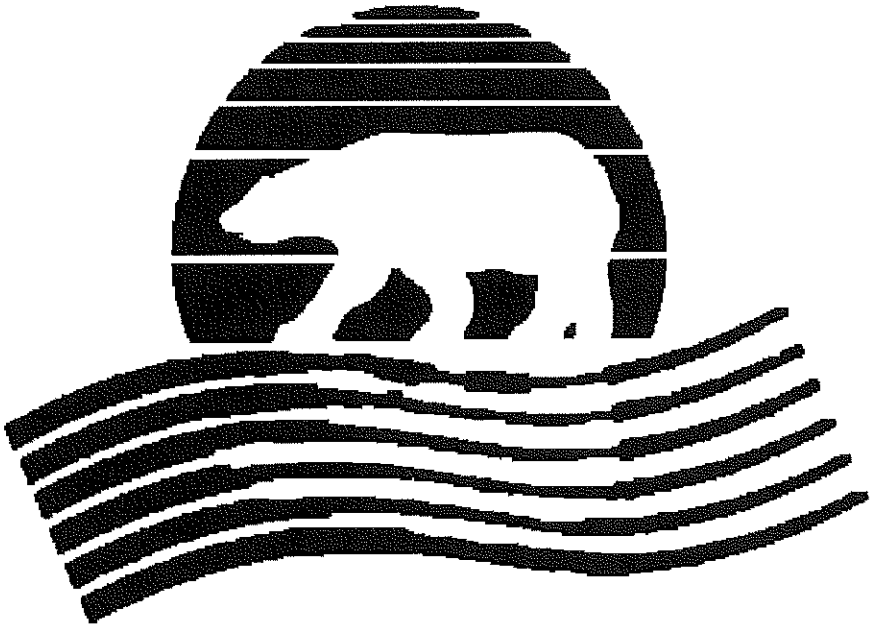
This part describes the schedule of submittals of the items listed in Part X (Appendix D), item E to the **MPCA** for review and approval. The **Commissioner** has selected the **MS4s** listed below for further nondegradation review. The selection was based on the population growth experienced by the community during three time periods: from 1990 to 2000, based on census data; from 2000 to 2003, based on projections by the State Demographer and Metropolitan Council; and from 2000 to 2020, also based on the State Demographer and Metropolitan Council projections. The **Commissioner** also considered the size of the community as represented by the 2000 census. The **Commissioner** may also determine that additional **MS4s** be selected based on the same factors, or other factors in accordance with Minn. R. ch. 7001 and other applicable rules.

The following **Selected MS4s** shall submit the items listed in Part X (Appendix D), item E, to the **MPCA** for review and approval, postmarked on or before the listed dates.

	Selected MS4	Submittal date
1	Rochester	15 months after the effective date of the Permit
2	Woodbury	15 months after the effective date of the Permit
3	Maple Grove	15 months after the effective date of the Permit
4	Lakeville	15 months after the effective date of the Permit
5	Eden Prairie	15 months after the effective date of the Permit
6	Eagan	16 months after the effective date of the Permit
7	Plymouth	16 months after the effective date of the Permit
8	Blaine	16 months after the effective date of the Permit
9	Bloomington	16 months after the effective date of the Permit
10	Duluth	16 months after the effective date of the Permit
11	Brooklyn Park	17 months after the effective date of the Permit
12	Shakopee	17 months after the effective date of the Permit
13	Apple Valley	17 months after the effective date of the Permit
14	St. Cloud	17 months after the effective date of the Permit
15	Burnsville	17 months after the effective date of the Permit
16	Prior Lake	18 months after the effective date of the Permit
17	Maplewood	18 months after the effective date of the Permit
18	Coon Rapids	18 months after the effective date of the Permit
19	Andover	18 months after the effective date of the Permit
20	Elk River	18 months after the effective date of the Permit
21	Savage	19 months after the effective date of the Permit
22	Farmington	19 months after the effective date of the Permit
23	St. Louis Park	19 months after the effective date of the Permit
24	Edina	19 months after the effective date of the Permit
25	Minnetonka	19 months after the effective date of the Permit
26	Chanhassen	20 months after the effective date of the Permit
27	Chaska	20 months after the effective date of the Permit
28	Inver Grove Heights	20 months after the effective date of the Permit
29	Rosemount	20 months after the effective date of the Permit
30	Cottage Grove	20 months after the effective date of the Permit

APPENDIX E

STORMWATER POLLUTION PREVENTION PLAN



TOWN OF WHITE BEAR, MINNESOTA

Date: **May 31, 2006**
Project No. **13597.000**

TKDA
ENGINEERS • ARCHITECTS • PLANNERS

1500 Piper Jaffray Plaza
444 Cedar Street
Saint Paul, MN 55101-2140

(651) 292-4400
(651) 292-0083 Fax
www.tkda.com

White Bear Township Storm Water Pollution Prevention Plan

BMPS

Following are the BMPs included in this SWPPP. BMPs, 1c-1, 1c-2, 2b-1, 3a-1, 3d-1, 3e-1, 4b-1, 5a1 and 6a2 were adapted from a MPCA "Sample SWPPP".

1a-1 Distribute Educational Materials
1b-1 Implement an Education Program
1c-1 Education Program: Public Education and Outreach
1c-2 Education Program: Public Participation
1c-3 Education Program: Illicit Discharge Detection and Elimination
1c-4 Education Program: Construction Site Run-off Control
1c-5 Education Program: Post-Construction Stormwater Management in New Development and Redevelopment
1c-6 Education Program: Pollution Prevention/Good Housekeeping for Municipal Operations
1d-1 Coordination of Education Program
1e-1 Annual Public Meeting
2a-1 Comply with Public Notice Requirements
2b-1 Solicit Public Input and opinion on the Adequacy of the SWPPP
2c-1 Consider Public Input
3a-1 Storm Sewer System Map
3b-1 Regulatory Control Program
3c-1 Illicit Discharge Detection and Elimination Plan
3d-1 Public and Employee Illicit Discharge Information Program
3e-1 Identification of Non Stormwater Discharges and Flows
4a-1 Ordinance or other Regulatory Mechanism
4b-1 Construction Site Implementation of Erosion and Sediment Control BMPs
4c-1 Waste Controls for Construction Site Operators
4d-1 Procedure for Site Plan Review
4e-1 Establishment of Procedures for the Receipt and Consideration of Reports of Stormwater Noncompliance
4f-1 Establishment of Procedures for Site Inspections and Enforcement
5a-1 Development and Implementation of Structural and/or Non-structural BMPs
5b-1 Regulatory Mechanism to Address Post Construction Runoff from New Development and Redevelopment
5c-1 Long-term Operation and Maintenance of BMPs
6a-1 Municipal Operations and Maintenance Program
6a-2 Street Sweeping**
6b-2 Annual Inspection of All Structural Pollution Control Devices
6b-3 Inspection of a Minimum of 20 percent of the MS4 Outfalls, Sediment Basins and Ponds Each Year on a Rotating Basis
6b-4 Annual Inspection of All Exposed Stockpile, Storage and Material Handling Areas
6b-5 Inspection Follow-up Including the Determination of Whether Repair, Replacement, or Maintenance Measures are Necessary and the Implementation of the Corrective Measures
6b-6 Record Reporting and Retention of all Inspections and Responses to the Inspections
6b-7 Evaluation of Inspection Frequency

BMP Summary Sheet

Minimum Control Measure 1: PUBLIC EDUCATION AND OUTREACH

Key to Unique BMP ID Numbers	Required BMP Title	Permit Reference
1a-1	Distribute Educational Materials	**V.G.1.a**
1b-1	Implement an Education Program	**V.G.1.b**
1c-1	Education Program: Public Education and Outreach	**V.G.1.c**
1c-2	Education Program: Public Participation	**V.G.1.c**
1c-3	Education Program: Illicit Discharge Detection and Elimination	**V.G.1.c**
1c-4	Education Program: Construction Site Run-off Control	**V.G.1.c**
1c-5	Education Program: Post-Construction Stormwater Management in New Development and Redevelopment	**V.G.1.c**
1c-6	Education Program: Pollution Prevention/Good Housekeeping for Municipal Operations	**V.G.1.c**
1d-1	Coordination of Education Program	**V.G.1.d**
1e-1	Annual Public Meeting	**V.G.1.e**
	Additional BMP Summary Sheet (Copy as Necessary)	

BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 1-PUBLIC EDUCATION AND OUTREACH

Unique BMP Identification Number: 1a-1

***BMP Title:** Distribute Educational Materials

***BMP Description:**

In cooperation with the appropriate County and appropriate Water Management Organizations, stormwater pamphlets and fliers promoting stormwater education and positive behaviors will be developed and made publicly available. Public service organizations may help provide distribution, which will include posting, handouts, and displays throughout the Township.

***Measurable Goals:**

- Number of stormwater-related materials developed and distributed.
- Number of people informed and participating.

***Timeline/Implementation Schedule:**

2006:

- Develop stormwater handout information.
- Establish pamphlets racks in common areas of the Township Administrative Office.
- Distribute pamphlets and other stormwater information at public meetings or Township events.

2007 - 2010:

- Update the developer, construction and engineering practitioner community mailing list annually as well as mail educational materials at least once a year.
- Continue with the distribution of SWPPP information, revising as necessary after soliciting comments and suggestions

Specific Components and Notes:

[Instruction Note: Include any additional notes relevant to the specific purpose of each BMP and how the BMPs for the minimum control measure have been modified from past practice based on experience and measures].

***Responsible Party for this BMP:**

Name: William Short

Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

E-mail: Bill.Short@ci.white-bear-township.mn.us

**Indicates a REQUIRED field. Failure to complete any required field will result in rejection of the application due to incompleteness.*

BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: PUBLIC EDUCATION AND OUTREACH

Unique BMP Identification Number: 1b-1

***BMP Title:** Implement an Education Program

***BMP Description:**

In cooperation with the appropriate County and appropriate Water Management Organizations, the Township will develop and implement an educational program that individually addresses each minimum control measure for the selected audience groups. The minimum control measures include: (1) public education and outreach, (2) public participation, (3) illicit discharge detection and elimination, (4) construction site storm water runoff control, (5) post construction storm water management in new development and redevelopment, and (6) pollution prevention/good housekeeping for municipal operations. The audience groups include Township staff, general public, and contractors.

***Measurable Goals:**

- Number of educational materials developed and distributed.
- Number of educational workshops developed and presented.
- Number of people attending workshops.

***Timeline/Implementation Schedule:**

2006:

- Develop a procedure for creating and implementing an educational program.

2007 - 2010:

- Develop and implement an educational program. Evaluate and modify the educational program as necessary to meet permit goals.

Specific Components and Notes:

[Instruction Note: Include any additional notes relevant to the specific purpose of each BMP and how the BMPs for the minimum control measure have been modified from past practice based on experience and measures].

***Responsible Party for this BMP:**

Name: William Short

Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

E-mail: Bill.Short@ci.white-bear-township.mn.us

**Indicates a REQUIRED field. Failure to complete any required field will result in rejection of the application due to incompleteness.*

BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: PUBLIC EDUCATION AND OUTREACH

Unique BMP Identification Number: 1c-1

***BMP Title:** Education Program: Public Education and Outreach

***Audience(s) Involved:**

General public including Township residents, homeowners, business owners, and school children (students K-12).

***Educational Goals for Each Audience:**

Increase public awareness and understanding of stormwater issues within the community. Inform and educate the public about the impacts of stormwater runoff on water quality.

***Activities Used to Reach Educational Goals:**

1) In cooperation with appropriate County and appropriate Water Management Organizations, highlight stormwater issues through Township sponsored community events and programs that focus on public participation. such as:
   - Volunteer community cleanup days.
   - Volunteer river, stream, and pond cleanup program.
   - Volunteer native tree and shrub planting program.
   - Volunteer storm drain stencil program.
2) In cooperation with appropriate County and appropriate Water Management Organizations , establish a stormwater hotline for citizens to report illegal dumping.
3) Articles in the community newsletter that highlight seasonal stormwater issues and stormwater related community events and programs.
4) Stormwater information on the Township web site or in cooperation with appropriate County and appropriate Water Management Organizations
5) Stormwater educational materials provided at public places.
   - Stormwater poster display and educational guides at the Township Administrative Office and local public library.
   - Signage in public places

***Activity Implementation Plan:**

2006:

- In cooperation with the appropriate County and appropriate Water Management Organizations, develop stormwater page on a web site and post for public access.
- In cooperation with the appropriate County and appropriate Water Management Organizations, develop a plan for sponsoring and implementing the volunteer public participation events and programs. This plan could include holding community cleanup days on a periodic basis, promoting County tree and shrub planting programs and promoting school programs to stencil storm drains.

2006 - 2008:

- In cooperation with the appropriate County and appropriate Water Management Organizations, research what educational materials are available and effective and have these materials in place for the public to view by the end of 2007.

2007 - 2009:

- Evaluate the attendance data for trends.
- Review public education outreach efforts.

2006 - 2010:

- Track number and location of illegal dumping incidents reported.
- Publish stormwater articles in the community newsletter or on a web page.

***Performance Measures:**

- In cooperation with the appropriate County and appropriate Water Management Organizations, complete a plan and implement volunteer public participation events and programs.
- Cleaner waters documented by measures such as before and after photographs.
- Number of storm drains is marked by 2010 in targeted neighborhoods.
- In cooperation with appropriate County and appropriate Water Management Organizations, published articles on the appropriate web site.
- In cooperation with the appropriate County and appropriate Water Management Organizations, track the number of "hits" on the appropriate web site stormwater page.
- Track increase/decrease in the number of beach closings.

***Responsible Party for this BMP:**

Name:	William Short
Department:	White Bear Township Clerk Treasurer
Phone:	651-747-2758
E-mail:	Bill.Short@ci.white-bear-township.mn.us

**Indicates a REQUIRED field. Failure to complete any required field will result in rejection of the application due to incompleteness.*

BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: PUBLIC EDUCATION AND OUTREACH

Unique BMP Identification Number: 1c-2

***BMP Title:** Education Program: Public Participation

***Audience(s) Involved:**

General public including Township residents, homeowners, and business owners.

***Educational Goals for Each Audience:**

1) Increase public awareness and understanding of stormwater issues within the community.
2) Inform and educate the public about the impacts of stormwater runoff on water quality and what they can do to actively protect local lakes and streams from polluted stormwater runoff.
3) Inform and educate the public about how the Township manages stormwater runoff through its' Stormwater Pollution Prevention Program (SWPPP).

***Activities Used to Reach Educational Goals:**

1) The Township will report in the community newsletter on activities related to managing stormwater and implementing the SWPPP. Topics for the newsletter may include information about the water quality of our Township lakes and streams; events and programs the public can participate in to raise their awareness about stormwater impacts; specific stormwater management activities the Township is implementing; and the stormwater budget/fees.
2) In cooperation with the appropriate County and appropriate Water Management Organizations, a public information meeting (in addition to the annual meeting on the SWPPP) will be held to update citizens on the Townships'progress toward implementing the SWPPP, and to provide information on stormwater related budget/fee issues. To encourage citizens to attend, the Township will plan the public information meeting to coincide with another Township sponsored event. The Township will also consider providing some type of stormwater related promotional item for Park Cleanup Day participants (e.g. "raingarden" seed packets, plants)

***Activity Implementation Plan:**

2006 - 2010:

- In cooperation with the appropriate County and appropriate Water Management Organizations, periodically publish articles on stormwater management and the SWPPP .
- In cooperation with the appropriate County and appropriate Water Management Organizations, hold one combined public information meeting/recognition event annually. Provide notice of the meeting 30 days prior to the meeting/event date.

Performance Measures:

- In cooperation with the appropriate County and appropriate Water Management Organizations, publish stormwater articles periodically.
- In cooperation with the appropriate County and appropriate Water Management Organizations, complete public notice.
- In cooperation with the appropriate County and appropriate Water Management Organizations, track the number of citizens attending the meeting/event.
- In cooperation with the appropriate County and appropriate Water Management Organizations, track the number of questions about the SWPPP/stormwater issues addressed at the meeting.
- In cooperation with the appropriate County and appropriate Water Management Organizations, at the end of

2007, the Township will evaluate the effectiveness of the Education Program for Public Participation and make adjustments as needed to increase public awareness and participation.

***Responsible Party for this BMP:**

Name:	William Short
Department:	White Bear Township Clerk Treasurer
Phone:	651-747-2758
E-mail:	Bill.Short@ci.white-bear-township.mn.us

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BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: PUBLIC EDUCATION AND OUTREACH

Unique BMP Identification Number: 1c-3

***BMP Title:** Education Program: Illicit Discharge Detection and Elimination

***Audience(s) Involved:**

Activities planned under the Illicit Discharge Detection and Elimination Measures portion of the Storm Water Pollution Prevention Program (SWPPP) will be directed towards employees of the Township, with an emphasis on Physical Plant employees.

***Educational Goals for Each Audience:**

The SWPPP activities under Minimum Control Measure (MCM) 3 will focus on development, implementation, and enforcement of management strategies that will lead to the reduction, elimination and the impact of illicit pollutant discharges into the stormwater system throughout the Township.

[**Instruction Note:** Define the educational goal of the BMP and how they are associated with each audience].

***Activities Used to Reach Educational Goals:**

The Township will educate its employees on the hazards of improper waste disposal and ways to detect and eliminate illicit discharges. The educational program will include procedures in locating priority areas likely to have illicit discharges; procedures for tracing the source of illicit discharge; procedures for removing the source of discharge; and the procedures for program evaluation and assessment. This information will be provided through educational training, information brochures, posters, web page and inspections of the storm drain system.

[**Instruction Note:** Outline the specific activities that will be in place to ensure that the educational goals are met].

***Activity Implementation Plan:**

2006:

- Develop and begin educational program training

2007 - 2010:

- Assess goals and continue educational program training

[**Instruction Note:** Define how you will put each specified activity into place. Also indicate the specific timeline that you will follow. Include major milestones and the dates by which each will be implemented].

***Performance Measures:**

- The number of educational fliers and/or materials distributed.
- Attendance numbers at training sessions.
- The number of locations determined to have the potential for illicit discharges.
- The number of illicit discharges reported.
- The number of corrective measures taken to prevent illicit discharges.

[**Instruction Note:** Outline how you will measure the success of this BMP. Determine a baseline from which the measurements will be made. Briefly describe how you will quantify the success of an increase in education].

***Responsible Party for this BMP:**

Name: William Short

Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

E-mail: Bill.Short@ci.white-bear-township.mn.us

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BMP Summary Sheet

MS4 Name: White Bear Township
Minimum Control Measure: PUBLIC EDUCATION AND OUTREACH
Unique BMP Identification Number: 1c-4

***BMP Title:** Education Program: Construction Site Run-off Control

***Audience(s) Involved:**

Activities planned under the Construction Site Storm Water Runoff Control portion of the Storm Water Pollution Prevention Program (SWPPP) will be directed toward contractors, construction site operators, inspectors, and enforcement personnel of the Township.

***Educational Goals for Each Audience:**

The SWPPP activities implemented under this will focus on program development, implementation, and enforcement of management strategies that will reduce or eliminate the impacts of stormwater runoff into the storm sewer system from any construction activity that results in a land disturbance of greater than or equal to one acre.

[**Instruction Note**: Define the educational goal of the BMP and how they are associated with each audience].

***Activities Used to Reach Educational Goals:**

In cooperation with appropriate County and appropriate Water Management Organizations develop procedures to educate contractors on construction site Best Management Practices (BMPs), inspections and enforcement of installed erosion and sedimentation control measures. This program will address contractor BMP educational and training measures.

[**Instruction Note:** Outline the specific activities that will be in place to ensure that the educational goals are met].

***Activity Implementation Plan:**

2006:

- In cooperation with appropriate County and appropriate Water Management Organizations develop procedures and educate contractors on BMPs and inspections.

2007 - 2010:

- Begin BMP enforcement.

[**Instruction Note:** Define how you will put each specified activity into place. Also indicate the specific timeline that you will follow. Include major milestones and the dates by which each will be implemented].

***Performance Measures:**

- The number of enforcement actions taken.
- The number of site inspections.
- The number of contractors trained.

[**Instruction Note:** Outline how you will measure the success of this BMP. Determine a baseline from which the measurements will be made. Briefly describe how you will quantify the success of an increase in education].

***Responsible Party for this BMP:**

Name: William Short
Department: White Bear Township Clerk Treasurer
Phone: 651-747-2758
E-mail: Bill.Short@ci.white-bear-township.mn.us

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BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: PUBLIC EDUCATION AND OUTREACH

Unique BMP Identification Number: 1c-5

***BMP Title:** Education Program: Post-Construction Stormwater Management in New Development and Redevelopment

***Audience(s) Involved:**

Activities planned under the Post-Construction Storm Water Management in New Development and Redevelopment portion of the Storm Water Pollution Prevention Program will be directed toward developers, contractors, construction site operators, inspectors and enforcement personnel.

***Educational Goals for Each Audience:**

The SWPPP activities under this Control Measure will focus on development, implementation, and enforcement of a program that will reduce or eliminate the impacts of stormwater runoff from new development and re-development projects that disturb greater than or equal to one acre, including projects that are less than one acre and are part of a larger development plan, that discharge into the storm sewer system.

[**Instruction Note:** Define the educational goal of the BMP and how they are associated with each audience].

***Activities Used to Reach Educational Goals:**

The Township will provide information about educational outreach on developing, implementing, and enforcing a program that will reduce or eliminate the impacts of stormwater runoff from new development and re-development projects disturbing greater than or equal to one acre, including projects that are less than one acre and are part of a larger development plan, that discharge into the stormwater conveyance system throughout the Township.

[**Instruction Note:** Outline the specific activities that will be in place to ensure that the educational goals are met].

***Activity Implementation Plan:**

2006:

- Develop information about existing educational programs.

2007 - 2010:

- Provide information about existing educational programs.

[**Instruction Note:** Define how you will put each specified activity into place. Also indicate the specific timeline that you will follow. Include major milestones and the dates by which each will be implemented].

***Performance Measures:**

- Number of flyers, posters, or other public education tools distributed.
- Number of training programs available to Township staff and contractors.

[**Instruction Note:** Outline how you will measure the success of this BMP. Determine a baseline from which the measurements will be made. Briefly describe how you will quantify the success of an increase in education].

***Responsible Party for this BMP:**

Name: William Short

Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

E-mail: Bill.Short@ci.white-bear-township.mn.us

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BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: PUBLIC EDUCATION AND OUTREACH

Unique BMP Identification Number: 1c-6

***BMP Title:** Education Program: Pollution Prevention/Good Housekeeping for Municipal Operations

***Audience(s) Involved:**

Activities planned under the Pollution Prevention (Good Housekeeping) portion of the Storm Water Pollution Prevention Program will be directed primarily toward Township personnel.

***Educational Goals for Each Audience:**

The SWPPP activities implemented under this Minimum Control Measure will focus on developing and implementing general procedures for an operations and maintenance program that will reduce or eliminate the impacts of stormwater pollution from open space maintenance, snow disposal, vehicle and building maintenance, land disturbances, and stormwater conveyance system maintenance.

[**Instruction Note:** Define the educational goal of the BMP and how they are associated with each audience].

***Activities Used to Reach Educational Goals:**

The Township will provide its personnel with information about existing educational outreach programs that will reduce or eliminate the impacts of stormwater runoff from facilities and maintenance operations that discharge into the stormwater conveyance system.

[**Instruction Note:** Outline the specific activities that will be in place to ensure that the educational goals are met].

***Activity Implementation Plan:**

2006:

- Develop information about existing educational outreach programs.

2007 - 2010:

- Provide information about existing educational outreach programs.

[**Instruction Note:** Define how you will put each specified activity into place. Also indicate the specific timeline that you will follow. Include major milestones and the dates by which each will be implemented].

***Performance Measures:**

- Number of flyers, posters, or other public education tools distributed.
- Number of training programs offered to Township staff.

***Responsible Party for this BMP:**

Name: William Short

Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

E-mail: Bill.Short@ci.white-bear-township.mn.us

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BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: PUBLIC EDUCATION AND OUTREACH

Unique BMP Identification Number: 1d-1

***BMP Title:** Coordination of Education Program

***BMP Description:** Coordination of education program with other groups.

[Instruction Note: You must describe how your education program is coordinated with and makes effective use of other stormwater education programs being conducted in your area by other entities as appropriate for your MS4. This is including, but not limited to community groups; nonprofit organizations; lake conservation districts; soil and water conservation districts; watershed districts; watershed management organizations; school districts; University of Minnesota Extension; and county, regional, state and federal government.
There are many sources of information as well as many groups that have educational goals that are the same as or parallel to your community needs. Be aware of and make use of these programs].

***Measurable Goals:**

- Number of consistent messages delivered (educational, promotional or motivational) through all media.
- Number of instances when educational program is coordinated.

***Timeline/Implementation Schedule:**

2006:

- Develop procedures for coordination of educational programs.

2007 - 2010:

- Implement the program. Evaluate the program for strength and weaknesses. Implement improved methods.

Specific Components and Notes:

[Instruction Note: Include any additional notes relevant to the specific purpose of each BMP and how the BMPs for the minimum control measure have been modified from past practice based on experience and measures].

***Responsible Party for this BMP:**

Name: William Short

Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

E-mail: Bill.Short@ci.white-bear-township.mn.us

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BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: PUBLIC EDUCATION AND OUTREACH

Unique BMP Identification Number: 1e-1

***BMP Title:** Annual Public Meeting

***BMP Description:**

Conduct annual Stormwater Planning/Advisory Workshops to develop recommendations in coordination with other entities such as community groups and appropriate Water Management Organization. It's mission will be to (1) identify the audience or audiences involved, (2) educational goals for each audience in terms of increased awareness, increased understanding, acquired skills, and/or desired changes in behavior, (3) activities used to reach educational goals for each audience, (4) activity implementation plans, including assigning responsibilities for each activity and schedule, and (5) developing performance measures that can be used to determine success in reaching educational goals.

Location of meeting:

The public informational meeting will be held at the Township Hall or in a place that is generally convenient to persons expected to attend the meeting. Notice of the public meeting will be provided 30 days prior and will include the date, time, and meeting location, and include location of a public copy of the Township's SWPPP. Distribution of this notice to the community will be published through the Township's official newspaper. The community will be encouraged to attend, allowing its members to discuss various viewpoints and provide input concerning appropriate stormwater management policies and Best Management Practices. A copy of the meeting notice will be sent to MPCA, appropriate Township and County officials, and all other persons who have requested that they be informed of such a public meeting.

***Measurable Goals:**

- Number of Annual Public meetings conducted.
- Notice of public meeting provided.
- Annual report to MPCA submitted.

***Timeline/Implementation Schedule:**

2006:

- Develop procedure for conducting the Annual Public Meeting.

2007 - 2010:

- Implement and evaluate the procedure established for Annual Public Meetings.

Specific Components and Notes:

[**Instruction Note:** Include any additional notes relevant to the specific purpose of each BMP and how the BMPs for the minimum control measure have been modified from past practice based on experience and measures].

***Responsible Party for this BMP:**

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Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

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BMP Summary Sheet

Minimum Control Measure 2: PUBLIC PARTICIPATION/INVOLVEMENT

Key to Unique BMP ID Numbers	Required BMP Title	Permit Reference
2a-1	Comply with Public Notice Requirements	**V.G.2.a**
2b-1	Solicit Public Input and opinion on the Adequacy of the SWPPP	**V.G.2.b**
2c-1	Consider Public Input	**V.G.2.c**
	Additional BMP Summary Sheet (Copy as Necessary)	

BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 2-PUBLIC PARTICIPATION/INVOLVEMENT

Unique BMP Identification Number: 2a-1

***BMP Title:** Comply with Public Notice Requirements

***BMP Description:**

Notice of the public meeting will be provided 30 days prior to the meeting. The notice must contain a reference to the Storm Water Pollution Prevention Program, the date, time, and meeting location, a concise description of the manner in which the meeting will be conducted and include location of a public copy of the Township's SWPPP. Notice of the public meeting will be provided 30 days prior and will include the date, time, and meeting location, and include location of a public copy of the Township's SWPPP. Distribution of this notice to the community will be published through the Township's official newspaper. The community will be encouraged to attend, allowing its members to discuss various viewpoints and provide input concerning appropriate stormwater management policies and Best Management Practices. A copy of the meeting notice will be sent to the MPCA, appropriate Township and County officials, and all other persons who have requested that they be informed of such a public meeting.

Alternative advertising methods need to be used whenever possible, including postings at bus stops, announcements in flyers, telephone notifications, and multilingual announcements.

***Measurable Goals:**

- Number of public meetings conducted.
- Number of educational surveys conducted.
- Number and methods of alternative advertising methods used.

***Timeline/Implementation Schedule:**

2006:

- Develop a distribution program.
- Develop advertising methods.

2007 - 2010:

- Implement the distribution program.
- Implement advertising methods.
- Monitor the program.

Specific Components and Notes:

Instruction Note: Include any additional notes relevant to the specific purpose of each BMP and how the BMPs for the minimum control measure have been modified from past practice based on experience and measures].

***Responsible Party for this BMP:**

Name: William Short

Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

E-mail: Bill.Short@ci.white-bear-township.mn.us

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BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 2-PUBLIC PARTICIPATION/INVOLVEMENT

Unique BMP Identification Number: 2b-1

***BMP Title:** Solicit Public Input and Opinion on the Adequacy of the SWPPP

***BMP Description:**

1) In cooperation with the appropriate County and appropriate Water Management Organizations, the Township will use the education and outreach efforts outlined on BMP Summary Sheet 1c-2 (Education Program: Public Participation) for providing information to the general public about how the Township manages stormwater runoff through its Stormwater Pollution Prevention Program (SWPPP), to encourage the public to learn about the SWPPP, and to facilitate public input and comment on the SWPPP.
2) If the annual public meeting on the SWPPP is scheduled to occur during a regular meeting of the Town Board, the Township will request that the SWPPP be placed on the meeting agenda at a time that will be conducive to the public attending and providing input on the SWPPP (i.e. not at the end of the agenda).
3) At the annual meeting, the Township will provide a presentation on the purpose, goals, and requirements of the SWPPP to educate, inform, and encourage citizens to provide input and comment on the SWPPP.
4) The Township will provide opportunity for interested persons to make oral statements or provide written comments on the SWPPP at the meeting. A reasonable amount of time will be made available at the meeting for a questions and comments relating to the SWPPP. Persons not able to attend the meeting may submit written comments on the SWPPP within the time identified in the public notice for the meeting.
5) The Township will also solicit public input and provide opportunity for comment on the SWPPP at any other subsequent public meetings, as needed, regarding modifications of or amendments to the SWPPP.

***Measurable Goals:**

1) Increase citizen's understanding of the impacts of stormwater runoff and increase public input on the SWPPP. Evaluate the level of public participation and input on the SWPPP; review the Education Program for Public Participation and make adjustments as needed to increase public participation/involvement on the SWPPP.
2) Track the number of attendees at the annual public meeting on the SWPPP.
3) Prepare and provide a presentation on the SWPPP.
4) Track the number of oral and written comments received on the SWPPP, and the number of questions addressed at the annual public meeting. A summary of the comments submitted on the SWPPP and the questions addressed at the meeting will be made available on the Township web site stormwater page.
5) Hold additional public meeting(s) regarding modifications and/or amendments to the SWPPP; track the level of public input.

***Timeline/Implementation Schedule:**

2006 - 2010:

- In cooperation with the appropriate County and appropriate Water Management Organizations, implement the education and outreach efforts according to the timeline/implementation schedule in BMP Summary Sheet 1c-2.

2007 - 2009:

- Review the Education Program for Public Participation, make adjustments as needed.

2006 - 2010:

- Hold a public meeting on the SWPPP annually.

Specific Components and Notes:

The Township staff will pose questions or initiate discussion at the meeting in an effort to encourage the public to ask questions and submit comments on the SWPPP.

***Responsible Party for this BMP:**

Name:	William Short
Department:	White Bear Township Clerk Treasurer
Phone:	651-747-2758
E-mail:	Bill.Short@ci.white-bear-township.mn.us

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BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 2-PUBLIC PARTICIPATION/INVOLVEMENT

Unique BMP Identification Number: 2c-1

***BMP Title:** Consider Public Input

***BMP Description:**

The Township will dedicate one meeting per year to allow public involvement in the SWPPP process. The community will be encouraged to attend, allowing members to discuss various view points and provide input concerning appropriate stormwater management policies and Best Management Practices.

***Measurable Goals:**

- Number of informed community members.
- Attendance numbers at the annual meeting.
- Recommendations and action taken as a result of the meeting.

***Timeline/Implementation Schedule:**

2006 - 2010:

- An annual meeting will be held every January so recommendations can be reviewed and applied to the annual SWPPP summary report.

Specific Components and Notes:

[Instruction Note: Include any additional notes relevant to the specific purpose of each BMP and how the BMPs for the minimum control measure have been modified from past practice based on experience and measures].

***Responsible Party for this BMP:**

Name: William Short

Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

E-mail: Bill.Short@ci.white-bear-township.mn.us

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BMP Summary Sheet

Minimum Control Measure 3: ILLICIT DISCHARGE DETECTION AND ELIMINATION

Key to Unique BMP ID Numbers	Required BMP Title	Permit Reference
3a-1	Storm Sewer System Map	**V.G.3.a**
3b-1	Regulatory Control Program	**V.G.3.b**
3c-1	Illicit Discharge Detection and Elimination Plan	**V.G.3.c**
3d-1	Public and Employee Illicit Discharge Information Program	**V.G.3.d**
3e-1	Identification of Non Stormwater Discharges and Flows	**V.G.3.e**
	Additional BMP Summary Sheet (Copy as Necessary)	

BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 3-ILLICIT DISCHARGE DETECTION AND ELIMINATION

Unique BMP Identification Number: 3a-1

***BMP Title:** Storm Sewer System Map

***BMP Description:**

Identify (1) ponds, streams, lakes, and wetlands that are part of the conveyance system, (2) structural pollution control devices (grit chambers, separators, etc.), (3) all pipes and conveyances that are at least 24 inches in diameter, and (4) outfalls, including discharges from the Township drainage system to other MS4s or waters and wetlands that are not part of the Township drainage system, (5) structures that discharge stormwater directly into groundwater and overland discharge points, and (6) all other points of discharge from the Township outlets.

***Measurable Goals:**

- The number of pollution control devices recorded.
- The number of discharge points identified.
- The linear feet of conveying system.

***Timeline/Implementation Schedule:**

2006 - 2010:

- A map will be developed by June 30, 2008 and periodically updated. The map will be made publicly available.

Specific Components and Notes:

[**Instruction Note:** Include any additional notes relevant to the specific purpose of each BMP and how the BMPs for the minimum control measure have been modified from past practice based on experience and measures].

***Responsible Party for this BMP:**

Name: William Short

Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

E-mail: Bill.Short@ci.white-bear-township.mn.us

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BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 3-ILLICIT DISCHARGE DETECTION AND ELIMINATION

Unique BMP Identification Number: 3b-1

***BMP Title:** Regulatory Control Program

***BMP Description:**

The Regulatory Control Program establishes ways the illicit discharge is detected and eliminated. Other BMPs need to be established that would enable illicit discharge to be detected and eliminated.

[**Instruction Note:** You must, to the extent allowable under law, effectively prohibit, through ordinance or regulatory mechanism, non-Stormwater discharges into your sewer system and implement appropriate enforcement procedures and actions.

The Township will develop and implement a program to detect and address non-stormwater discharges, including illegal dumping, to your system.

The Program to detect and address illicit discharges is the central component of this measure. The plan is dependent upon several factors including the MS4's available resources, size of staff, and degree and character of its illicit discharges. There are four steps of a recommended plan:

- Procedures for locating priority areas likely to have illicit discharges
- Procedures for tracing the sources of an illicit discharge
- Procedures for removing the source of the discharge
- Procedures for program evaluation and assessment

***Measurable Goals:**

- Regulatory Program is reviewed
- Other BMPs are implemented

***Timeline/Implementation Schedule:**

2006:

- Review and modify ordinances and/or policies and enforcement procedures and actions that may help prevent illicit discharges to stormwater systems (i.e. secondary containment of fuel products and hazardous material ordinances)

2007:

- Purchase equipment necessary for the implementation of the modified hazardous materials cleanup procedures and train employees.

2008 - 2010:

- Evaluate the Regulatory Program.

Specific Components and Notes:

[**Instruction Note:** Include any additional notes relevant to the specific purpose of each BMP and how the BMPs for the minimum control measure have been modified from past practice based on experience and measures].

***Responsible Party for this BMP:**

Name: William Short

Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

E-mail: Bill.Short@ci.white-bear-township.mn.us

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BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 3-ILLICIT DISCHARGE DETECTION AND ELIMINATION

Unique BMP Identification Number: 3c-1

***BMP Title:** Illicit Discharge Detection and Elimination Plan

***BMP Description:**

The Township will develop a program to detect and identify illicit discharges, including a plan to control and eliminate the contributors, which will adhere to the following steps:

- Locate the problem area by using public complaints
- Visual screening of outfalls during the dry weather, and or during regular system maintenance and inspection activities
- Find the source of illicit discharge
- Remove or correct the problem
- Document the actions taken and summarize for the annual report

If the Township identifies any of the following categories of non-stormwater flows as significant contributors of pollutants, the Township will develop a plan to control and eliminate the contributors to the storm sewer system:

- Water line flushing
- Landscape irrigation
- Diverted stream flows
- Rising ground waters
- Uncontaminated ground water infiltration
- Uncontaminated pumped ground water
- Discharges from potable water sources
- Foundation drains
- Air conditioning condensation
- Irrigation water
- Springs
- Water from crawl space pumps
- Footing drains
- Lawn watering
- Individual residential car washing
- Chlorinated water discharges
- Street wash water
- Flows from fire-fighting activities

***Measurable Goals:**

- The number of illicit discharges reported and identified.
- The number of illicit discharges prevented, stopped or removed.

***Timeline/Implementation Schedule:**

2006:

- Develop and implement an illicit discharge detection program.

2008 - 2010:

- Continue detection and elimination programs.

2010:

- Mitigate potential illicit discharge sites.
- Continue detection program

Specific Components and Notes: **[Instruction Note:** Include any additional notes relevant to the specific purpose of each BMP and how the BMPs for the minimum control measure have been modified from past practice based on experience and measures].
***Responsible Party for this BMP:** Name: William Short Department: White Bear Township Clerk Treasurer Phone: 651-747-2758 E-mail: Bill.Short@ci.white-bear-township.mn.us

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BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 3-ILLICIT DISCHARGE DETECTION AND ELIMINATION

Unique BMP Identification Number: 3d-1

***BMP Title:** Public and Employee Illicit Discharge Information Program

***BMP Description:**

In cooperation with the appropriate County and appropriate Water Management Organizations, the Township will use the education efforts outlined on BMP Summary Sheet 1c-3 (Education Program: Illicit Discharge Detection and Elimination) for providing information to the general public concerning the hazards associated with illegal discharges and the improper disposal of wastes. The Township will develop a separate effort to provide training to Township employees. This training will focus on those Township employees that are involved in activities out in the community (e.g. Public Works/Engineering and Parks Department field staff) which may impact stormwater quality including; road salt and sand application, landscaping, and other activities. The Township intends to provide each employee with broad based training followed by periodic retraining which will focus on specific, yet to be determined, issues.

***Measurable Goals:**

1) See BMP Summary Sheet 1c-3 for Measurable Goals concerning public education efforts regarding Illicit Discharge Detection and Elimination.
2) Develop a training program for educating Township employees about the hazards associated with illegal discharges and the improper disposal of wastes which relate to their work activities.
3) Train all Township employees who are involved in activities which could possibly result in illicit discharges to stormwater.
4) Develop a training program to provide annual retraining, with specific focused training efforts, to Township employees.
5) Implement annual retraining and focused training efforts.

***Timeline/Implementation Schedule:**

See BMP Summary Sheet 1c-3 for Timeline/Implementation Schedule concerning public education efforts regarding Illicit Discharge Detection and Elimination.

2006:

- In cooperation with the appropriate County and appropriate Water Management Organizations, develop a training program for educating Township employees about the hazards associated with illegal discharges and the improper disposal of wastes which relate to their work activities.

2007:

- Train all Township employees who are involved in activities which could possibly result in illicit discharges to stormwater.

2008:

- In cooperation with the appropriate County and appropriate Water Management Organizations, develop a training program to provide annual retraining and focused training efforts to Township employees and implement this training.

2009 - 2010:

- Continue annual retraining and focused training efforts.

Specific Components and Notes:

To identify areas which may be addressed as part of retraining/focused training efforts, the Township will develop a process for conducting an illicit discharge evaluation of Township public works projects.

***Responsible Party for this BMP:**

Name:	William Short
Department:	White Bear Township Clerk Treasurer
Phone:	651-747-2758
E-mail:	Bill.Short@ci.white-bear-township.mn.us

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BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 3-ILLICIT DISCHARGE DETECTION AND ELIMINATION

Unique BMP Identification Number: 3e-1

***BMP Title:** Identification of Non Stormwater Discharges and Flows

***BMP Description:**

The Township will develop a process to evaluate whether any of the following categories of non-stormwater discharges or flows are significant contributors of pollutants to its MS4: water line flushing, landscape irrigation, diverted stream flows, rising ground waters, uncontaminated ground water infiltration, uncontaminated pumped ground water, discharges from potable water sources, foundation drains, air conditioning condensation, irrigation water, springs, water from crawl space pumps, footing drains, lawn watering, individual residential car washing, flows from riparian habitats and wetlands, dechlorinated swimming pool discharges, street wash water, and discharges or flows from fire fighting activities.

For any non-stormwater discharges or flows which the Township finds to be a significant contributor of pollutants to the MS4, the Township will develop an action plan to evaluate and address the impact the discharge is having on stormwater quality.

***Measurable Goals:**

1) Develop a process to investigate and evaluate the potential for the non-stormwater discharges identified in permit Part V.G.3.e (see above) to be significant contributors of pollutants to our MS4.
2) Conduct investigation and evaluation of non-stormwater discharges and flows.
3) For those non-stormwater discharges or flows identified as significant contributors of pollutants to our MS4, develop an action plan to evaluate and address the impact the discharge is having on stormwater quality.
4) Implement the action plan for significant non-stormwater discharges and flows.

***Timeline/Implementation Schedule:**

2006:

- Develop a process to investigate and evaluate non-stormwater discharges and flows.

2007:

- Conduct and investigation and evaluation of non-stormwater discharges and flows and develop action plans for those which are identified as being significant contributors of pollutants to our MS4.

2008:

- Implement the action plans for significant non-stormwater discharges and flows.

2009 - 2010:

- Continue with an action plan concerning significant non-stormwater discharges and flows.
- Evaluate the implementation phase of the action plans and make adjustments, as necessary, to prepare for a permanent program for the identification of non-stormwater discharges.

Specific Components and Notes:

In cooperation with the appropriate County and appropriate Water Management Organizations, the Township plans to develop a public education component to inform residents about the need and procedures to dechlorinate swimming pool water prior to discharge. In cooperation with the appropriate County and appropriate Water Management Organizations, an article on proper swimming pool discharge from residential pools will be developed (see BMP Summary Sheet 1c-1). This public education component will be further developed as outlined on BMP Summary Sheet 1c-3.

***Responsible Party for this BMP:**	
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Department:	White Bear Township Clerk Treasurer
Phone:	651-747-2758
E-mail:	Bill.Short@ci.white-bear-township.mn.us

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BMP Summary Sheet

Minimum Control Measure 4: CONSTRUCTION SITE STORMWATER RUNOFF CONTROL

Key to Unique BMP ID Numbers	Required BMP Title	Permit Reference
4a-1	Ordinance or other Regulatory Mechanism	**V.G.4.a**
4b-1	Construction Site Implementation of Erosion and Sediment Control BMPs	**V.G.4.b**
4c-1	Waste Controls for Construction Site Operators	**V.G.4.c**
4d-1	Procedure for Site Plan Review	**V.G.4.d**
4e-1	Establishment of Procedures for the Receipt and Consideration of Reports of Stormwater Noncompliance	**V.G.4.e**
4f-1	Establishment of Procedures for Site Inspections and Enforcement	**V.G.4.f**
	Additional BMP Summary Sheet (Copy as Necessary)	

BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 4-CONSTRUCTION SITE STORMWATER RUNOFF CONTROL

Unique BMP Identification Number: 4a-1

***BMP Title:** Ordinance or other Regulatory Mechanism

***BMP Description:**

The Township will update and adopt ordinances and policies to reflect erosion, sedimentation and pollution control plan. Also include certification requirements for staff. Refine necessary procedures for the submittal, review, approval, and enforcement of erosion and sediment control plans.

***Measurable Goals:**

- Township site certification and inspection results.

***Timeline/Implementation Schedule:**

2006:

- Adopt and enforce the Township ordinances with respect to erosion and sedimentation control.

2007 - 2010:

- Continue enforcing compliance measures adopted by the Township.

Specific Components and Notes:

[**Instruction Note:** Include any additional notes relevant to the specific purpose of each BMP and how the BMPs for the minimum control measure have been modified from past practice based on experience and measures].

***Responsible Party for this BMP:**

Name: William Short

Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

E-mail: Bill.Short@ci.white-bear-township.mn.us

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BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 4-CONSTRUCTION SITE STORMWATER RUNOFF CONTROL

Unique BMP Identification Number: 4b-1

***BMP Title:** Construction Site Implementation of Erosion and Sediment Control BMPs

***BMP Description:**

In cooperation with the appropriate County and appropriate Water Management Organizations, the Township will select ten (10) BMPs that are found to be the most effective in keeping erosion under control and containing sediment on the construction site and off the streets. These ten (10) BMPs will be in an Erosion and Sediment Control Handbook (and are highlighted in the Township's stormwater ordinance) that the Township gives to all builders, contractors, and developers. Once selected, periodically, the Township will host a BMP Workshop for all local builders, contractors, and developers. .

***Measurable Goals:**

1) In cooperation with the appropriate County and appropriate Water Management Organizations, 10 BMPs will be selected.
2) The development of the Erosion and Sediment Control Handbook.
3) The number of builder/contractor/developer workshops held.

***Timeline/Implementation Schedule:**

During the year following the completion of the stormwater ordinance and the selection of the ten (10) BMPs, start the implementation of these BMPs.

2006 - 2010:

- In cooperation with the appropriate County and appropriate Water Management Organizations, hold periodic workshops.

2007 - 2010:

- Evaluate the addition of new BMPs that the BMP Review Board feels are justifiable.

Specific Components and Notes:

***Responsible Party for this BMP:**

Name: William Short

Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

E-mail: Bill.Short@ci.white-bear-township.mn.us

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BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 4-CONSTRUCTION SITE STORMWATER RUNOFF CONTROL

Unique BMP Identification Number: 4c-1

***BMP Title:** Waste Controls for Construction Site Operators

***BMP Description:**

The Township will develop and implement a program to control and eliminate construction site waste that may impact stormwater runoff. This program will address construction entrances, vehicle maintenance, equipment washing areas, and proper waste disposal.

***Measurable Goals:**

- The reduction of site wastes with respect to construction.
- Identify requirements for construction site operators to implant appropriate control of construction site waste.
- Frequency of inspection and maintenance activities.

***Timeline/Implementation Schedule:**

2006:

- Develop a plan to control and eliminate construction site waste.

2007 - 2010:

- Implement plans to control and eliminate site waste.

Specific Components and Notes:

[**Instruction Note:** Include any additional notes relevant to the specific purpose of each BMP and how the BMPs for the minimum control measure have been modified from past practice based on experience and measures].

***Responsible Party for this BMP:**

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Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

E-mail: Bill.Short@ci.white-bear-township.mn.us

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BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 4-CONSTRUCTION SITE STORMWATER RUNOFF CONTROL

Unique BMP Identification Number: 4d-1

***BMP Title:** Procedure for Site Plan Review

***BMP Description:**

The Township will include in any preconstruction activity, a review of regulated construction site plans submitted by the contractor for the implementation and routine maintenance of sedimentation and erosion controls that incorporate consideration of potential water quality impacts before any construction begins.

***Measurable Goals:**

- The number of site plan reviews.
- The number of reports of storm water noncompliance incidents at construction sites.

***Timeline/Implementation Schedule:**

2006:

- Begin reviewing preconstruction site plans.

2007 - 2010:

- Continue review of site plans.

Specific Components and Notes:

[Instruction Note: Include any additional notes relevant to the specific purpose of each BMP and how the BMPs for the minimum control measure have been modified from past practice based on experience and measures].

***Responsible Party for this BMP:**

Name: William Short

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Phone: 651-747-2758

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BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 4-CONSTRUCTION SITE STORMWATER RUNOFF CONTROL

Unique BMP Identification Number: 4e-1

***BMP Title:** Establishment of Procedures for the Receipt and Consideration of Reports of Stormwater Noncompliance

***BMP Description:**

The Township will refine the inspection program for inclusion of procedures for receipt and consideration of reports of non-compliance or other information on construction related issues submitted by the public.

***Measurable Goals:**

- Number of complaints about construction procedures.

***Timeline/Implementation Schedule:**

2006:

- Develop a plan to evaluate construction SWPPPs and complaints about construction activity.

2007 - 2010

- Implement the plan.

Specific Components and Notes:

[Instruction Note: Include any additional notes relevant to the specific purpose of each BMP and how the BMPs for the minimum control measure have been modified from past practice based on experience and measures].

***Responsible Party for this BMP:**

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BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 4-CONSTRUCTION SITE STORMWATER RUNOFF CONTROL

Unique BMP Identification Number: 4f-1

***BMP Title:** Establishment of Procedures for Site Inspections and Enforcement

***BMP Description:** The Township will ensure construction sites operate in accordance with this SWPPP and the project specific construction SWPPP. The Township will review SWPPP site plans for construction activities, including the following:

1. Description of the activity, proposed timetable, amount of area disturbed, and any outfalls to the storm conveyance system or water body
2. Map or drawing of the site showing the boundaries, soil disturbance limits, stormwater drainage pattern, location of receiving waters and/or storm inlets, storage areas for materials, and stormwater management controls
3. Description of the method of storage, disposal, and handling of materials which have the potential to be released with stormwater
4. Description of the BMPs to control erosion and sedimentation during all phases of construction
5. Description of methods to address sediment tracking on roads, recovering sediments, and spill prevention and response procedures
6. Site inspection procedure providing at least one inspection every 7 days and within 24 hours after any storm event of greater than 0.50 inches of rain per 24 hours period

Site Inspection Records will be kept for the date and time of inspections, the name of the inspector, and the date and amount of last precipitation event. All incidents of erosion, sediment accumulation, or spills will be documented. The record will include the location and description of the incident, estimated quality of material or size of area affected, and a brief explanation of potential cause and remedial action taken.

[**Instruction Note:** Procedures for site inspection and enforcement of control measures. Procedures for site inspections and enforcement of control measures could include steps to identify priority sites for inspection and enforcement based on the nature of the construction activity, topography, and the characteristics of solid and receiving water quality.

Inspections give the MS4 an opportunity to provide additional guidance and education, issue warnings or assess penalties. MS4s are encouraged to provide appropriate educational and training measures to construction site operators. Finally, MS4s may decide to require a stormwater pollution prevention plan for construction sites within your jurisdiction that discharge into your system].

***Measurable Goals:**

- Steps to identify procedures for site inspections.
- Steps to identify procedures for enforcements.
- Number of site inspections scheduled and reasons.
- Number of enforcements implemented, following inspections.

***Timeline/Implementation Schedule:**

2006:

- Review procedures for site inspections and enforcement of control measures.

2007:

- Educate contractors.

2008 - 2010:

- Evaluate the procedures and implement improvements.
- Develop a program for special waters of concern to the community.

Specific Components and Notes:
***Responsible Party for this BMP:** Name: William Short Department: White Bear Township Clerk Treasurer Phone: 651-747-2758 E-mail: Bill.Short@ci.white-bear-township.mn.us

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BMP Summary Sheet

Minimum Control Measure 5: POST-CONSTRUCTION STORMWATER MANAGEMENT IN NEW DEVELOPMENT AND REDEVELOPMENT

Key to Unique BMP ID Numbers	Required BMP Title	Permit Reference
5a-1	Development and Implementation of Structural and/or Non-structural BMPs	**V.G.5.a**
5b-1	Regulatory Mechanism to Address Post Construction Runoff from New Development and Redevelopment	**V.G.5.b**
5c-1	Long-term Operation and Maintenance of BMPs	**V.G.5.c**
	Additional BMP Summary Sheet (Copy as Necessary)	

BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 5-POST-CONSTRUCTION STORMWATER MANAGEMENT IN NEW DEVELOPMENT AND REDEVELOPMENT

Unique BMP Identification Number: 5a-1

***BMP Title:** Development and Implementation of Structural and/or Non-structural BMPs

***BMP Description:**

Post-construction stormwater management in areas that have recently undergone construction (new development or re-development) is necessary because runoff from these areas significantly impact surface water quality. As runoff flows over areas altered by construction, it picks up harmful sediment and chemicals which are then deposited in surface waters. A second type of post-construction impact is the interruption of natural infiltration of rainfall by the new impervious surfaces associated with construction projects. The result is increased volumes of stormwater reaching streams. The end result is the scouring of river systems and flooding.

A combination of structural (wet detention ponds) and non-structural (swales) BMPs work well for managing post-construction stormwater. Wet detention basins allow sediment to settle out of the water column as well as controlling the discharge of stormwater to receiving waters. Swales allow sediment and other pollutants to drop out of stormwater runoff.

***Measurable Goals:**

1) Update wet detention pond design standards annually along with investigating new post-construction BMPs.
2) Update the storm sewer map periodically.

***Timeline/Implementation Schedule:**

2006 - 2010:

- Review and update structural and non-structural BMPs.
- Continue to conduct reviews of all construction projects with stormwater management being a major component and focus of the review.

Specific Components and Notes:

1) All wet detention ponds should be designed to NURP Standards.
2) The wet detention ponds should release stormwater at a rate that is consistent with the Township ordinance.
3) Review site plans to make sure that infiltration of stormwater is investigated and incorporated when feasibile.

***Responsible Party for this BMP:**

Name: William Short

Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

E-mail: Bill.Short@ci.white-bear-township.mn.us

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BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 5-POST-CONSTRUCTION STORMWATER MANAGEMENT IN NEW DEVELOPMENT AND REDEVELOPMENT

Unique BMP Identification Number: 5b-1

***BMP Title:** Regulatory Mechanism to Address Post Construction Runoff from New Development and Redevelopment

***BMP Description:**

Measures for Controlling Post-Construction Runoff:

With respect to development and re-development projects, the Township will regulate post-construction runoff in accordance with their procedures. In addition, the Township will review its procedures to limit surface runoff volumes and reduce water runoff pollutant loadings.

***Measurable Goals:**

- The number of ordinances the Township adopts.
- The number of BMP measures the Township develops.

***Timeline/Implementation Schedule:**

2006:

- Adopt or revise, as necessary, ordinances with respect to controlling post-construction runoff.
- Develop internal quality control measures.

2006 - 2010:

- Continue compliance measures.

Specific Components and Notes:

***Responsible Party for this BMP:**

Name: William Short

Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

E-mail: Bill.Short@ci.white-bear-township.mn.us

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BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 5-POST-CONSTRUCTION STORMWATER MANAGEMENT IN NEW DEVELOPMENT AND REDEVELOPMENT

Unique BMP Identification Number: 5c-1

***BMP Title:** Long-term Operation and Maintenance of BMPs

***BMP Description:**

BMP Inspection & Maintenance Program:

The Township will develop an inspection and maintenance program to ensure the effectiveness of post-construction stormwater control BMPs. All BMPs will be inspected for continued effectiveness and structural integrity at regular inspection intervals. Inspections will document whether the BMP is performing correctly, note any damage to the BMP, and repair any damage to the BMP.

***Measurable Goals:**

- The frequency of inspection and maintenance provided.
- The number of problems identified and remedied.

***Timeline/Implementation Schedule:**

2006:

- Evaluate the inspection and maintenance program.

2006 - 2010:

- Implement the inspection and maintenance program.

Specific Components and Notes:

***Responsible Party for this BMP:**

Name: William Short

Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

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BMP Summary Sheet

Minimum Control Measure 6: POLLUTION PREVENTION/GOOD HOUSEKEEPING

Key to Unique BMP ID Numbers	Required BMP Title	Permit Reference
6a-1	Municipal Operations and Maintenance Program	V.G.6.a
6a-2	Street Sweeping**	
6b-2	Annual Inspection of All Structural Pollution Control Devices	V.G.6.b.2
6b-3	Inspection of a Minimum of 20 percent of the MS4 Outfalls, Sediment Basins and Ponds Each Year on a Rotating Basis	V.G.6.b.3
6b-4	Annual Inspection of All Exposed Stockpile, Storage and Material Handling Areas	V.G.6.b.4
6b-5	Inspection Follow-up Including the Determination of Whether Repair, Replacement, or Maintenance Measures are Necessary and the Implementation of the Corrective Measures	V.G.6.b.5
6b-6	Record Reporting and Retention of all Inspections and Responses to the Inspections	V.G.6.b.6
6b-7	Evaluation of Inspection Frequency	V.G.6.b.7
	Additional BMP Summary Sheet (Copy as Necessary)	

BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 6-POLLUTION PREVENTION/GOOD HOUSEKEEPING

Unique BMP Identification Number: 6a-1

***BMP Title:** Municipal Operations and Maintenance Program

***BMP Description:**

Storm Drain System Maintenance Program:

The Township has in place an on-going storm drain inspection and cleaning program to reduce pollutants, trash, and debris. At a minimum, yearly cleaning and inspection includes storm drain grates, detention pond, pump station, catch basins, and other appurtenances. Based on inspection results, or repairs, measures will be determined for proper operation.

***Measurable Goals:**

- The number of inspections
- The amount of trash, sediment, or other pollutants removed during cleaning

***Timeline/Implementation Schedule:**

2006 - 2010:

- Continue the storm drain inspection and cleaning program
- Evaluate the program periodically and make modifications, if necessary

Specific Components and Notes:

[Instruction Note: Include any additional notes relevant to the specific purpose of each BMP and how the BMPs for the minimum control measure have been modified from past practice based on experience and measures].

***Responsible Party for this BMP:**

Name: William Short

Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

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BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 6-POLLUTION PREVENTION/GOOD HOUSEKEEPING

Unique BMP Identification Number: 6a-2

***BMP Title:** Street Sweeping**

***BMP Description:**

The Township will review its Street Sweeping Program for all Township owned and paved streets and parking lots. The Township intends to sweep these impervious surfaces at least once a year, in the spring. Street sweeping will begin as early in the spring as weather allows.

***Measurable Goals:**

1) Review the Street Sweeping Program.
2) Implement or expand, as necessary, Street Sweeping Program.

***Timeline/Implementation Schedule:**

2006 - 2010:

- Implement or expand the Street Sweeping Program.
- Evaluate program effectiveness and make changes, if needed.
- Revise the program to include necessary changes and develop a schedule for the implementation of these changes.

Specific Components and Notes:

1) The Township (or contracted service) will sweep all paved Township streets and parking lots at least once a year in the spring. The Township will track and record the amount of street sweeping wastes collected to assist in the evaluation of this additional street sweeping.

***Responsible Party for this BMP:**

Name: William Short

Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

E-mail: Bill.Short@ci.white-bear-township.mn.us

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BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 6-POLLUTION PREVENTION/GOOD HOUSEKEEPING

Unique BMP Identification Number: 6b-2

***BMP Title:** Annual Inspection of All Structural Pollution Control Devices

***BMP Description:**

Inspect annually all structural pollution control devices, such as trap manholes, grit chambers, sumps, floatable skimmers and traps, separators, and other small settling or filtering devices.

***Measurable Goals:**

- Number of inspections and pollution control devices inspected.
- Number of non-functional pollution control devices inspected.

***Timeline/Implementation Schedule:**

2006 - 2010:

- Review the Pollution Prevention Plan (annual inspection procedures).
- Perform annual inspections.
- Review maintenance schedules for BMPs.

2010:

- Assess the compliance rate for BMP maintenance schedules.

Specific Components and Notes:

***Responsible Party for this BMP:**

Name: William Short

Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

E-mail: Bill.Short@ci.white-bear-township.mn.us

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BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 6-POLLUTION PREVENTION/GOOD HOUSEKEEPING

Unique BMP Identification Number: 6b-3

***BMP Title:** Inspection of a Minimum of 20 percent of the MS4 Outfalls, Sediment Basins and Ponds Each Year on a Rotating Basis

***BMP Description:**

This Best Management Practice (BMP) is required for inspection of minimum 20 percent of MS4 Outfalls, Sediment Basins and Ponds each year on the rotating basis, so that all are inspected over the entire permit period (5 years).

***Measurable Goals:**

- Number of inspections conducted each year, percent of total.
- Number of MS4 Outfalls, Sediment Basins and Ponds each inspected each year.

***Timeline/Implementation Schedule:**

2006:

- Set-up a program and procedures for inspections.

2007 - 2010:

- Evaluate the inspections procedures.
- Continue inspections.

Specific Components and Notes:

[**Instruction Note:** Include any additional notes relevant to the specific purpose of each BMP and how the BMPs for the minimum control measure have been modified from past practice based on experience and measures].

***Responsible Party for this BMP:**

Name: William Short

Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

E-mail: Bill.Short@ci.white-bear-township.mn.us

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BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 6-POLLUTION PREVENTION/GOOD HOUSEKEEPING

Unique BMP Identification Number: 6b-4

***BMP Title:** Annual Inspection of All Exposed Stockpile, Storage and Material Handling Areas

***BMP Description:**

This BMP requires all stockpiles such as salt, lumber, parts, and coal piles to be inspected annually. Some temporary stockpiles such as topsoil from construction activity would not be inspected under this requirement but would be required to be inspected in accordance with construction permits, ordinances, or policy. Stockpiles such as salt which are used only seasonally but are used each year are not temporary stockpiles and would be required to be inspected under this requirement. As with all inspections, if patterns of maintenance become apparent, the frequency of inspections should be adjusted.

***Measurable Goals:**

- Sites identified for areas of all exposed Stockpile, Storage, and Material Handling Areas.
- Number of inspections of all exposed Stockpile, Storage, and Material Handling Areas.

***Timeline/Implementation Schedule:**

2006:

- Develop a Pollution Prevention Plan (annual inspection procedures) with specific BMPs.

2006-2010:

- Establish a maintenance schedule for implemented BMPs.
- Ascertain the compliance rate for maintenance of implemented BMPs.

Specific Components and Notes:

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Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

E-mail: Bill.Short@ci.white-bear-township.mn.us

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BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 6-POLLUTION PREVENTION/GOOD HOUSEKEEPING

Unique BMP Identification Number: 6b-5

***BMP Title:** Inspection Follow-up Including the Determination of Whether Repair, Replacement, or Maintenance Measures are Necessary and the Implementation of the Corrective Measures

***BMP Description:**

Based on the inspection, determine if repair, replacement, or maintenance measures are necessary for proper operation and to prevent environmental impacts, such as erosion. The necessary measures shall be completed as soon as possible, usually during the same year as the inspection. When it is not practicable, the reasons and a schedule for completion shall be submitted in the annual report.

***Measurable Goals:**

- Number of recommendations made following the inspections
- Number of follow-up actions taken after the inspections

***Timeline/Implementation Schedule:**

2006:

- Develop a plan (annual inspection procedures) for inspection follow-up.

2006 – 2010:

- Continue inspections and followup maintenance.
- Evaluate inspection procedures annually.

2010

- Ascertain compliance rate for BMP maintenance schedules.

Specific Components and Notes:

[Instruction Note: Include any additional notes relevant to the specific purpose of each BMP and how the BMPs for the minimum control measure have been modified from past practice based on experience and measures].

***Responsible Party for this BMP:**

Name: William Short

Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

E-mail: Bill.Short@ci.white-bear-township.mn.us

**Indicates a REQUIRED field. Failure to complete any required field will result in rejection of the application due to incompleteness.*

BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 6-POLLUTION PREVENTION/GOOD HOUSEKEEPING

Unique BMP Identification Number: 6b-6

***BMP Title:** Record Reporting and Retention of All Inspections and Responses to the Inspections

***BMP Description:**

Summarize the results of outfall inspections in the annual report and include the dates of inspection and date of completion of major additional protection measures. Keep records of inspection results, date, antecedent weather conditions, sediment storage and capacity remaining, and any maintenance performed or recommended.

***Measurable Goals:**

- Number of records maintained.
- Any relevant inspection - lab results.
- Any maintenance performed or recommended.
- Sediment storage and capacity remaining.

***Timeline/Implementation Schedule:**

2006:

- Develop a plan for record reporting and retention.

2007 - 2010:

- Implement the plan for record reporting and retention.

Specific Components and Notes:

[Instruction Note: Include any additional notes relevant to the specific purpose of each BMP and how the BMPs for the minimum control measure have been modified from past practice based on experience and measures].

***Responsible Party for this BMP:**

Name: William Short

Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

E-mail: Bill.Short@ci.white-bear-township.mn.us

**Indicates a REQUIRED field. Failure to complete any required field will result in rejection of the application due to incompleteness.*

BMP Summary Sheet

MS4 Name: White Bear Township

Minimum Control Measure: 6-POLLUTION PREVENTION/GOOD HOUSEKEEPING

Unique BMP Identification Number: 6b-7

***BMP Title:** Evaluation of Inspection Frequency

***BMP Description:**

Keep records of inspection results, date, antecedent weather conditions, sediment storage, and capacity remaining, and any maintenance performed or recommended. After two years of inspections, if patterns of maintenance become apparent, the frequency of inspections may be adjusted. If maintenance or sediment removal is required because of each of the first two annual inspections, the frequency of inspections may be adjusted.

If maintenance or sediment removal is required because of each of the first two annual inspections, the frequency of the first two annual inspections, the frequency of inspection shall be increased to at least two(2) times annually or more frequently as needed to prevent carry-over or washout of pollutants from the structures and maximize pollutant removal. If maintenance or sediment removal is not required because of both of the first two annual inspections, the frequency may be reduced to once every two years.

***Measurable Goals:**

- The number of inspections and results summarized each year.
- Any maintenance performed or recommended.

***Timeline/Implementation Schedule:**

2006:

- Establish procedures for annual inspections.

2007 - 2010:

- Implement annual inspections.
- Evaluate the inspection frequency and make adjustments accordingly.

Specific Components and Notes:

[Instruction Note: Include any additional notes relevant to the specific purpose of each BMP and how the BMPs for the minimum control measure have been modified from past practice based on experience and measures].

***Responsible Party for this BMP:**

Name: William Short

Department: White Bear Township Clerk Treasurer

Phone: 651-747-2758

E-mail: Bill.Short@ci.white-bear-township.mn.us

**Indicates a REQUIRED field. Failure to complete any required field will result in rejection of the application due to incompleteness.*

APPENDIX F

ANNUAL REPORT for 2008
MUNICIPAL SEPARATE STORM SEWER SYSTEMS (MS4s)
Reporting period January 1, 2008 to December 31, 2008
Due June 30, 2009

USE OF THIS FORM IS MANDATORY By completing this Annual Report form, you are providing the Minnesota Pollution Control Agency (MPCA) with a summary of your status of compliance with permit conditions, including an assessment of the appropriateness of your identified best management practices (BMPs) and progress towards achieving your identified measurable goals for each of the minimum control measures as required by the MS4 Permit. If an MS4 determines that program status or compliance with the permit can not be adequately reflected within the structure of this form additional explanation and/or information may be referenced in an attachment. This form has significant limitations and provides only a snap shot of MS4 compliance with the conditions in the Permit. After reviewing the information MPCA staff may need to contact the MS4 to clarify or seek additional information. MPCA enforcement policy is to provide the opportunity to respond to any alleged violations before any enforcement action is taken.

Submit your annual report by June 30, 2009 to:

Minnesota Pollution Control Agency
Municipal Division
520 Lafayette Road North
St. Paul, MN 55155-4194

This Annual Report may be submitted electronically via email to the MPCA MS4 Program mailbox: ms4permit@pca.state.mn.us. If submitting electronically, this form must be sent via email from the person that is duly authorized to sign this form under the Owner/Operator Certification section. A confirmation email will be sent in response to electronic submissions. If you would like to obtain an electronic copy of the MS4 Annual Report for 2008 form, please visit: www.pca.state.mn.us/water/stormwater/stormwater-ms4.html.

If you have further questions, please contact one of these MPCA staff members (call toll-free 800-657-3864). Note new numbers effective November 2008:

- Keith Cherryholmes 651-757-2270
- Joyce Cieluch 218-846-7387
- Scott Fox 651-757-2368
- Amy Garcia 651-757-2377

Minimum Control Measure 1: Public Education and Outreach [V.G.1]

White Bear Township
Name of MS4

Bill Short, Clerk / Treasurer
Name of Contact Person

(651) 747-2758 — bill.short@ci.white-bear-township.mn.us
Telephone (including area code) — Email Address

1281 Hammond Road
Mailing Address

White Bear Township — Minnesota — 55110
City — State — ZIP code

A. The permit requires each MS4 to implement a public education program to distribute educational materials to the community or conduct equivalent outreach activities about the impacts of stormwater discharges on water bodies and steps that the public can take to reduce pollutants in stormwater runoff. [Part V.G.1.a] **NOTE:** Please indicate which of the following distribution methods you used during the 2008 calendar year. Indicate the number distributed in the spaces provided (enter "0" if the method was not used or "NA" if the data does not exist)::

Media type	Number of media	Number of times published	Circulation/Audience
Example: Brochures:	*3 different brochures*	*published 5 times*	*about 10,000*
Brochures:			
Newsletter:	Town Life Magazine	6 Times Annually	about 4,500
Posters:			
Newspaper articles:			
Utility bill inserts:			
Radio ads:			
Television ads:			
Cable Access Channel:			
Other: website links	Rice Creek and VLAWMO	Continuous	Unknown

If you use a stormwater Web site as a tool to distribute stormwater educational materials:

What is the URL: http://ricecreek.org/ and http://www.vlawmo.org/

How many hits to the stormwater page during 2008: Unknown

Did you hold stormwater related events, presentations to schools or other such activities ☐ **Yes** ☒ **No**

If yes, please describe: _____

B. What stage of development would you assign to each area of your stormwater education program? (If there are multiple components for a Minimum Control Measure (MCM) check the one box that most accurately reflects the overall stage for that MCM). You may include an attachment if further explanation is desired.

MCM 1: ☐ Not started ☐ Research ☐ Development ☒ Early Implementation ☐ Program in place
MCM 2: ☐ Not started ☐ Research ☐ Development ☒ Early Implementation ☐ Program in place
MCM 3: ☐ Not started ☐ Research ☐ Development ☒ Early Implementation ☐ Program in place
MCM 4: ☐ Not started ☐ Research ☐ Development ☒ Early Implementation ☐ Program in place
MCM 5: ☐ Not started ☐ Research ☐ Development ☒ Early Implementation ☐ Program in place
MCM 6: ☐ Not started ☐ Research ☐ Development ☒ Early Implementation ☐ Program in place

C. Have you developed partnerships with other MS4s, watershed districts, local or state governments, educational institutions, etc. to assist you in fulfilling the requirements for Minimum Control Measure 1?	☒ **Yes** ☐ **No**
D. List those entities with which you have a partnership to meet the requirements of this MCM and describe the nature of the agreement(s) (list if level of effort exceeded 10 hours): RCWD and VLAWMO website links	

Minimum Control Measure 2: Public Participation/Involvement [V.G.2]

A. Did you hold a public meeting to present accomplishments for calendar year 2008 and to discuss your Stormwater Pollution Prevention Program (SWPPP)? [Part V.G.1.e] If no, explain: _____	☒ **Yes** ☐ **No**
B. What was the date of the public meeting? April 6, 2009	
C. How many citizens attended specifically for stormwater (excluding board/council members and staff/hired consultants)? 0 (zero)	
D. Was the public meeting a stand-alone meeting for stormwater or was it combined with some other function such as a City Council meeting?	☐ **Stand-alone** ☒ **Combined**
E. Each MS4 must receive and consider input from the public prior to submittal of your annual report. Did you receive written and/or oral input on your SWPPP? [Part V.G.2.b.1-3].	☒ **Yes** ☐ **No**

F. Have you revised your SWPPP in response to comments received from the public in calendar year 2008 or early 2009 (if meeting held in 2009)? [Part V.G.2.c] If *yes*, describe. Attach a separate sheet if necessary: _____	☐ Yes ☒ No

Minimum Control Measure 3: Illicit Discharge Detection and Elimination [V.G.3]

The permit requires MS4s to develop, implement and enforce a program to detect and eliminate illicit discharges as defined in 40 CFR 122.26(b)(2) in your SWPPP. You must also select and implement a program of appropriate BMPs and measurable goals for this minimum control measure.

A. Have you completed a storm sewer system map in accordance with the requirements of the permit? (MPCA assumes that completed maps will still need updates and corrections as changes occur). If *yes*, describe the form in which the map is available: ☐ Hardcopy only ☐ GIS system ☒ CAD ☐ Other system: _____ If *no*, please explain: _____ **NOTE:** The storm sewer system map was to be completed by June 30, 2008. [Part V.G.3.a]	☒ Yes ☐ No
B. Has an ordinance or other regulatory mechanism been adopted to prohibit illicit discharges or other non-stormwater discharges from entering your system? Provide the date for the most relevant part of the regulatory mechanism that was adopted or estimated date of adoption: December 2009	☐ Yes ☒ No
C. Have you completed the tasks associated with the schedule listed on BMP Summary Sheet 3c-1 in your program for illicit discharge detection and elimination? (attach additional information if needed) Indicate the status of development for tasks associated with BMP Summary Sheet 3c-1: ☐ Not started ☐ Research ☐ Development ☒ Implementation ☐ Program in place	☒ Yes ☐ No
D. Have you completed the tasks associated with the schedule listed on BMP Summary Sheet 3d-1 for your Public and Employee Illicit Discharge Information Program? Indicate the status of development for tasks associated with BMP Summary Sheet 3d-1: ☐ Not started ☐ Research ☐ Development ☒ Implementation ☐ Program in place	☒ Yes ☐ No

Minimum Control Measure 4: Construction Site Stormwater Runoff Control [V.G.4]

The permit requires that each MS4 **develop, implement, and enforce a program** to reduce pollutants in any stormwater runoff to your small MS4 from construction activities within your jurisdiction that result in a land disturbance of equal to or greater than one acre, including the disturbance of less than one acre of total land area that is part of a larger common plan of development or sale if the larger common plan will ultimately disturb one or more acres (include if your MS4 established a smaller site size). [Part V.G.4.]

A. Have you adopted an ordinance or other regulatory mechanism that regulates stormwater runoff from construction activities that results in a land disturbance of greater than or equal to one acre and/or less than one acre that is part of a common plan of development or sale that will ultimately disturb one acre or more? **NOTE:** Your regulatory mechanism must be fully developed and implemented within six months from the extension of permit coverage.	☒ Yes ☐ No
B. A complete copy of your erosion and sediment control ordinance or other regulatory mechanism addressing the requirements of Part V.G.4 of the Permit must be submitted with this Annual Report. This documentation may be submitted in hard copy, as a separate electronic file, or electronically attached to this Annual Report. Have you submitted a copy of your erosion and sediment control ordinance or other regulatory mechanism? Check here if you have **No Regulatory Authority** ☐	☒ Yes ☐ No

C. The following are among the criteria used to evaluate the effectiveness of this program. Which of the following BMP components and pollution prevention management measures have been incorporated into your regulatory mechanism? Check all that apply and include a citation for each checked measure outlining specifically where it can be located in the documents submitted with this Annual Report. If you are utilizing the "Other Regulatory Mechanism" option, please respond in the same manner and follow the above submittal procedures.

BMP Component/P2 Measure	**Citation** (Ordinance, Rule, Statute, Code, MOU, or other official agreement, page #, paragraph, line item, or other reference)
☒ Temporary erosion controls	Ordinance 8
☐ Record keeping for rainfall and inspections	____
☒ Permanent erosion controls	Ordinance 8
☐ Waste controls for hazardous waste	____
☒ Waste controls for solid waste	Ordinance 31
☐ Dewatering and basin draining	____
☐ Regular inspections by site operators	____
☒ Site plan submittal including erosion and sediment control BMPs	Ordinance 8
☒ BMP maintenance	Ordinance 8
☒ Site plan review and approval prior to activity on site	Ordinance 8
☐ Permanent stormwater management facility approval	____
☐ Other: ____	____

D. Your ordinance or regulatory mechanism must include sanctions to ensure compliance and contain enforcement mechanisms. Which of the following enforcement mechanisms are contained in your ordinance or regulatory mechanism? Check all existing and added sanctions for 2008. Include with each checked measure a citation outlining where each mechanism can be located in the documents submitted with this Annual Report.

Enforcement Mechanism	**Citation** (Ordinance, Rule, Statute, Code, MOU, or other official agreement, page #, paragraph, line item, or other reference)
☒ Verbal warnings	Ordinance 8
☒ Written warnings	Ordinance 8
☒ Stop-work orders	Ordinance 8
☐ Fines	____
☒ Forfeit of security bond money	Ordinance 8
☒ Withholding of certificate of occupancy	Ordinance 8
☐ Other: ____	____

E. Identify which of the following types of enforcement actions you used for construction activities during the reporting period, indicate the number of actions or note those for which you do not have authority:

	Number of actions	
☒ Yes Notice of violation	#20	No Authority ☐

☐ Yes Administrative fines	#____	No Authority ☐
☐ Yes Stop Work Orders	#____	No Authority ☐
☐ Yes Civil penalties	#____	No Authority ☐
☐ Yes Criminal actions	#____	No Authority ☐
☐ Yes Administrative orders	#____	No Authority ☐

F. Does your regulatory mechanism address the regulation of construction sites which disturb less than one acre? If yes please cite where this is addressed in the documents submitted with the Annual Report	☒ **Yes** ☐ **No** Ord. 8
G. How many construction sites were inspected for compliance with your erosion and sediment control regulatory mechanism during the 2008 calendar year	26
H. On average, how many times each, or with what frequency, are construction sites inspected (e.g., weekly, monthly, etc.)?	monthly
I. Do you prioritize certain construction sites for more frequent inspections? If yes, based on what criteria? Depending on size of disturbance and proximity to receiving water bodies.	☒ **Yes** ☐ **No**

Minimum Control Measure 5: Post-construction Stormwater Management in New Development and Redevelopment [V.G.5]

The permit requires each MS4 to develop, implement, and enforce a program to address stormwater runoff from new development and redevelopment projects within your jurisdiction that disturb an area greater than or equal to one acre, including projects less than one acre that are part of a larger common plan of development or sale that discharge into your small MS4. Your program must ensure that controls are in place that would prevent or reduce water quality impacts. You must also select and implement a program of appropriate BMPs and measurable goals for this minimum control measure. **NOTE:** The MS4 permit requirements associated with this minimum control measure were required to be fully developed and implemented by June 30, 2008.

A. Have you developed and implemented strategies which include requirements for a combination of structural and/or non-structural BMPs appropriate for your community?	☒ **Yes** ☐ **No**
B. Is an ordinance or other regulatory mechanism currently in place to address post-construction runoff from new development and redevelopment projects to the extent allowable under law? Provide the date the regulatory mechanism was adopted or estimated date of adoption: March 2000.	☒ **Yes** ☐ **No**
C. Is a plan in place to ensure adequate long-term operation and maintenance of BMPs installed as a result of these requirements?	☒ **Yes** ☐ **No**

D. How are you funding the long-term operation and maintenance of your stormwater management system? (Check all that apply)

- ☒ Grants
- ☒ Stormwater utility fee
- ☐ Taxes
- ☐ Other: _____

Minimum Control Measure 6: Pollution Prevention/Good Housekeeping for Municipal Operations [V.G.6]

The permit requires each MS4 to develop and implement an operation and maintenance program that includes a training component and has the ultimate goal of preventing or reducing pollutant runoff from municipal operations. Your program must include employee training to prevent and reduce stormwater pollution from activities such as park and open space maintenance, fleet and building maintenance, new construction and land disturbances, and stormwater system maintenance.

A. Is your MS4 current on development of all the BMPs listed in the BMP Summary Sheets for MCM 6 as indicated in the timeline/implementation schedules? If no, explain: ☒ **Yes** ☐ **No**

B. Indicate the total number of structural pollution control devices (for example-grit chambers, sumps, floatable skimmers, etc) within your MS4, how many were inspected, and calculate the percent inspected. Enter "0" if your MS4 does not contain structural pollution control devices or "NA" if the data does not exist:

	Total Number	Number Inspected	Percentage
Structural Pollution Control Devices:	7	7	100%

C. Did you repair, replace, or maintain any structural pollution control devices? ☐ **Yes** ☒ **No**

D. For each BMP below, indicate the total number within your MS4, how many of each BMP type were inspected, and calculate the percent inspected:

Structure/Facility Type	Total Number	Number Inspected	Percentage
Outfalls to receiving waters	49	10	20%
Sediment basins/ponds	93	19	20%
TOTAL	142	29	20%

Section 7: Impaired Waters Review

The permit requires that any MS4 that discharges to a Water of the State which appears on the current U.S. EPA approved list of impaired waters under Section 303(d) of the Clean Water Act review whether changes to your SWPPP may be warranted to reduce the impact of your discharge [Part IV.D]

A. MPCA has provided an MS4 Mapping tool which provides information for compliance with the permit and water quality rules. It can also help MS4 staff and stakeholders view relationships between an MS4 and various other water features in the layers including impaired waters. Please go to the MS4 Mapping tool located at http://www.pca.state.mn.us/water/stormwater/stormwater-ms4.html by clicking on "MS4 mapping tool" under "Maps of MS4s" and rate this web mapping tool for its usefulness in helping you identify impaired waterbodies your MS4 may discharge to, including impaired waters as defined on the 303d listing (This request is optional) :

☐ Not Useful at all ☒ Somewhat Useful ☐ Useful ☐ Very Useful ☐ Other:_____

Check here if your MS4 has no impaired waters: ☐

Additional Comments on the MS4 Mapping Tool can be emailed to: paul.leegard@pca.state.mn.us

Section 8: Additional SWPPP Issues

A. Did you make a change to any identified BMPs or measurable goals in your SWPPP since your last report? [Part V.H.] If *yes*, explain: _____ ☐ **Yes** ☒ **No**

B. Briefly list the BMPs using their unique SWPPP identification numbers you have changed in your SWPPP or any measurable goals that will be changed in your updated SWPPP, and why they have changed: *(Attach a separate sheet if necessary)* N/A

C. Did you rely on any other entities (MS4s, consultants or contractors) to implement any portion of ☒ **Yes** ☐ **No**

your SWPPP? If *yes,* please identify them and list activities they assisted with: The Township has a consulting Engineer who assists with the SWPPP Implementation.	

Owner or Operator Certification

The person with overall administrative responsibility for SWPPP implementation must sign the annual report. This person must be duly authorized and should be the person who signed the MS4 permit application or a successor.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete (Minn. R. 7001.0070). I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment (Minn. R. 7001.0540).

x [signature] JUNE 20, 2009

Authorized Signature (This person must be duly authorized to sign the annual report for the MS4. Electronic submissions must be sent from this person's email address to qualify for Authorized Signature status) — Date

Short	Bill	Clerk / Treasurer
Last Name	First Name	Title
1281 Hammond Road		
Mailing Address		
White Bear Township	Minnesota	55110
City	State	ZIP code
(651) 747-2758	bill.short@city.white-bear-township.mn.us	
Telephone (include area code)	E-mail Address	

established water table or critical storm event, whichever is higher.
AMENDED May 18, 1992 effective May 27, 1992
AMENDED March 26, 1979 effective April 6, 1979

5-34. POLE BUILDINGS. The construction of pole barns/buildings is prohibited in the Town.
AMENDED November 16, 1987 effective December 2, 1987

5-35. DOCKS.

A. No dock, lift or the boat it serves may be located any closer than ten (10) feet from the site side property line.

B. No dock shall be so located as to: (1) obstruct reasonable use or access to any other dock, or (2) present a potential safety hazard. No dock shall be located or designed so that it unreasonably or unnecessarily requires or tends to encourage using it to encroach upon any other authorized dock use area.

C. NON-CONFORMING USES> From and after the effective date of this Ordinance amendment docks and other structures in the lake shall be in conformity with the provisions of this Ordinance amendment and any of the same which are not in conformance shall be regarded as non-conforming. All non-conforming uses shall be terminated no later than 1 year after the effective date of this Ordinance amendment.
AMENDED November 19, 1990 effective November 28, 1990

5-36. EROSION AND SEDIMENT CONTROL

SECTION A. PURPOSE. In response to the Metropolitan Water Management Act and the Town Water Management Plan and the need for erosions and sediment control for land development, the purpose of this ordinance is to control or eliminate erosion and sedimentation within the Town of White Bear. It is designed to preserve land value throughout the Town of White Bear; to prevent the pollution of streams, lakes, wetlands, and other watercourses by sediment and related construction materials, to establish design standards and specifications for practices and planning activities which prevent soil erosion and sedimentation; to preserve and enhance the natural beauty and aesthetics of the community; and to protect the health, safety, and welfare of the citizens of the Town of White Bear.

SECTION B. SCOPE. Except as exempted by Section 6, any person, firm, corporation or buisness proposing land disturbance activity within the Town of White Bear shall apply to the Town for the approval of the erosion and sediment control plan. No land shall be developed until the plan is approved by the Town and conforms to the standards set forth herein.

1. Erosion and Sediment Practice Specificaions or Practice. "Erosion and Sediment Practice Specifications" or "Practice" means the management procedures, techniques, and methods to control soil erosion and sedimentation as officially adopted by the district.

2. Developer. "Developer" means a person, partnership or corporation engaged in a land disturbance activity.

3. District. "District" means the Ramsey Soil and Water Conservation District organized and operated under Minnesota Statutes, Chapter 40.

4. Erosion. "Erosion" means any process that wears away the surface of the land by the action of water, wind, ice, or gravity. "Erosion" can be accelerated by the activities of man and nature.

5. Erosion and Sediment Control Plan. "Erosion and Sediment Control Plan" means a document containing the requirements of Section C that when implemented will decrease soil erosion on a parcel of land.

6. Land Disturbance Activity. "Land Disturbance Activity" means land change that may result in soil erosion from water or wind and the movement of sediments into or upon waters or lands of Ramsey County, including clearing, grading, excavating, transporting and filling of land. "Land Disturbance Activity" does not mean:

(a). Minor land disturbance activities such as home gardens and individuals home landscaping, repairs and maintenance work;

(b). Septic tank lines or drainage fields unless included in an overall plan for a land disturbance activity relating to construction of a building to be served by a septic tank system;

(c). Tilling, planting or harvesting of agricultural, horticultural, or silvicultural crops;

(d). Installation of fence, sign, telephone, and electric poles and other kinds of posts or poles; and

(e). Emergency work to protect life, limb, or property and emergency repairs, except if the land disturbing activity would have required an approved erosion and sediment control plan except for the emergency, then the land area disturbed shall be shaped and stabilized in accordance with the requirement of the local plan-approving authority or the district when applicable.

7. Ramsey County Erosion and Sediment Control Handbook or Handbook. "Ramsey County Erosion and Sediment Control Handbook" or "Handbook" means a handbook which contains the Erosion and Sediment Control Practice specifications to control soil erosion and sedimentation. The "Ramsey County Erosion and Sediment Control Handbook" must be adopted by the Ramsey Soil and Water Conservation District. The "Ramsey County Erosion and Sediment Control Handbook" may include but is not limited to: United States Department of Agriculture, Soil Conservation Service Field Office Technical guide and other recognized technical procedures adopted by the Ramsey Soil

Water Conservation District.

8. Sediment. "Sediment" means solid mineral or organic material, that, in suspension, is being transported, or has been moved from its original site by air, water, gravity, or ice, and has been deposited at another location.

9. Sedimentation. "Sedimentation" means the process or action of depositing sediment, that is determined to have been caused by erosion.

SECTION C. EROSION AND SEDIMENT CONTROL PLAN. A person engaged in a land disturbance activity must submit an erosion and sediment control plan that will prevent soil erosion or sediment from damaging adjacent land, bodies of water, watercourses or wetlands to the Town for its approval.

1. The erosion and sediment control plan must address the following criteria:

(a) Stabilization of denuded areas and soil stockpiles;
(b) Establishment of permanent vegetation;
(c) Protection of adjacent properties;
(d) Timing and stabilization of sediment trapping measures;
(e) Use of sediment basins;
(f) Cut and fill slopes;
(g) Stormwater management criteria for controlling off-site erosion;
(h) Stabilization of waterways and outlet;
(i) Storm-sewer inlet protection;
(j) Working in or crossing waterbodies;
(k) Underground utility construction;
(l) Construction access routes;
(m) Disposition of temporary measures; and
(n) Maintenance of practices.

2. PLAN. The erosion and sediment control plan shall include:

(a) Location map with major streets and landmarks;
(b) Project description;
(c) Property boundary and lot lines;
(d) Utility lines;
(e) Existing contours;
(f) Existing drainage flow patterns;
(g) Existing vegetation
(h) Soils;
(i) Critical erosion areas;
(j) Final contours;
(k) Final drainage flow patterns;
(l) Final vegetation and permanent stabilization;
(m) Location and description of erosion and sediment control practices;
(n) Location and description of stormwater management controls; and;

(o) Description of the maintenance of erosion and sediment control practices.

SECTION D. RAMSEY COUNTY EROSION AND SEDIMENT CONTROL HANDBOOK. The Handbook shall be the reference for Erosion and Sediment Control Practice specifications used in the Town of White Bear.

1. Approval. All erosion and sediment control practice specifications must be approved and adopted by the District.

SECTION E. REVIEW. The Town appoints the Code Enforcement Officer to review the erosion and sediment control plan. The Code Enforcement Officer shall review the erosion and sediment control plan within 7 days of receiving the plans from the developer. The Town shall notify the develper of its decision after receipt of comments from the appointed reviewer and no more than 30 days after receiving the plans from the developer.

1. Permit Required. If the appointed reviewer determines that the erosion and sediment control plan meets the requirements of this ordinance, the Town shall issue a permit that authorizes the land disturbance activity contingent upon the implementation and completion of the erosion and sediment control plan.

2. Denial. If the appointed reviewer determines that the erosion and sediment control plan does not meet the requirements of this ordinance, the Town shall not issue a permit for the land disturbance activity. The erosion and sediment control plan shall be re-submitted for approval before the land disturbance activity begins. All land use and building permit shall be suspended until the developer has an approved erosion and sediment control plan.

SECTION F. MODIFICATION OF PLAN. An approved erosion and sediment control plan may be modified upon submission of an application for modification to the Town and subsequent approval by the Town. In reviewing such application, the Town may require additional reports and data.

SECTION G. BOND REQUIREMENT. Upon approval of an erosion and sediment control plan, the Town may require the developer to post a performance bond, cash or certified check to insure completion of the erosion and sediment control plan.

SECTION 2. SEVERABILITY. Should any section, subdivision, clause or other provision of this ordinance be held to be invalid by any court of competent jurisdiction, such decision shall not affect the validity of the Ordinance as a whole, or of any part thereof, other than the part held to be invalid.

SECTION 3. EFFECTIVE DATE. This Ordinance shall take effect and be in force from and after its passage and publication.

Amended Aug. 5, 1991 effective Aug. 14, 1991

APPENDIX G

WHITE BEAR TOWNSHIP

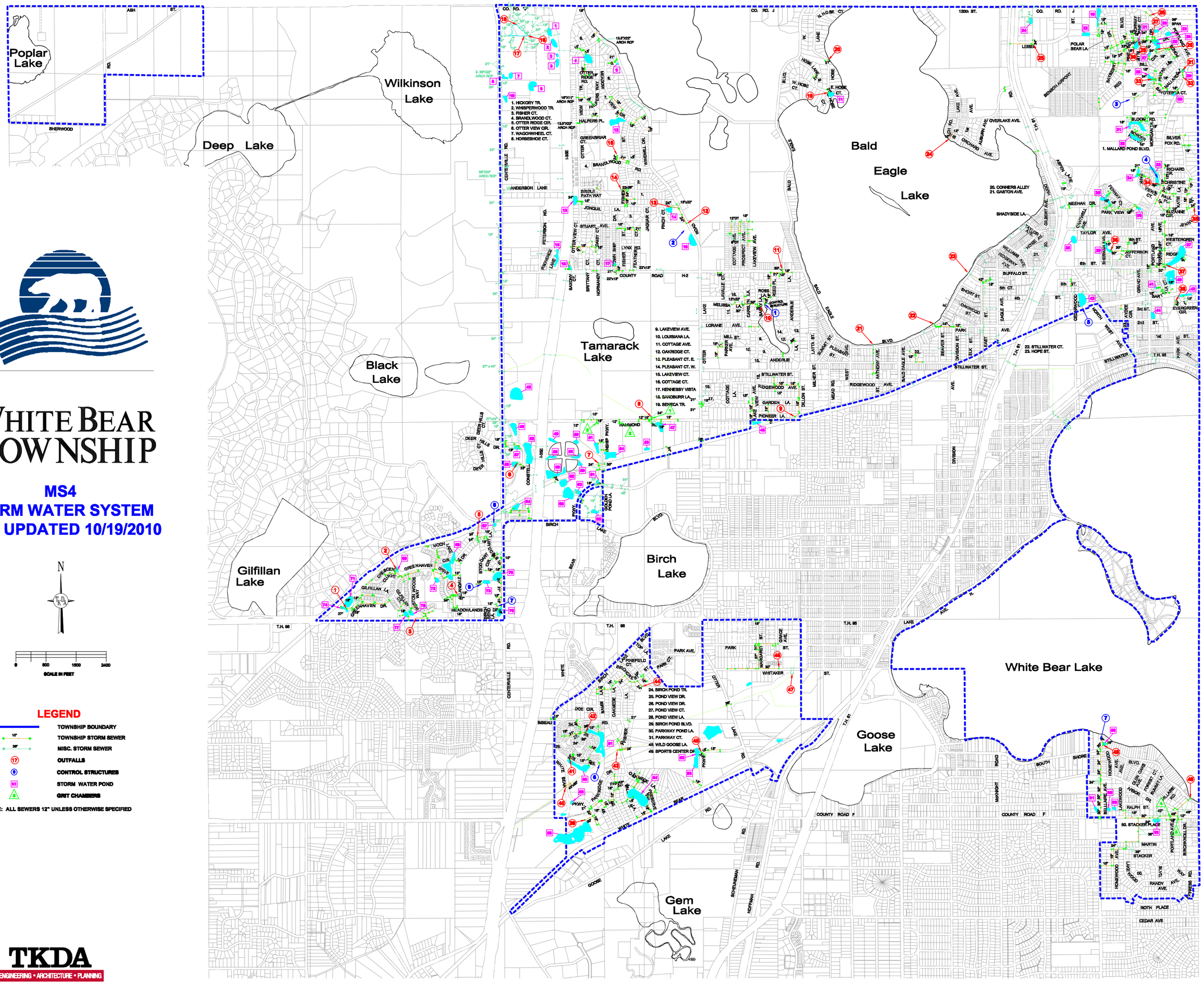
MS4
STORM WATER SYSTEM
LAST UPDATED 10/19/2010

N

0 800 1600 2400
SCALE IN FEET

LEGEND

- TOWNSHIP BOUNDARY
- 10" TOWNSHIP STORM SEWER
- 36" MISC. STORM SEWER
- 17 OUTFALLS
- 8 CONTROL STRUCTURES
- 83 STORM WATER POND
- 8 GRIT CHAMBERS

NOTE: ALL SEWERS 12" UNLESS OTHERWISE SPECIFIED

TKDA
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