

Wellhead Protection Plan Unit Well 13 City of Madison, Wisconsin



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EXECUTIVE SUMMARY

This Wellhead Protection Plan (WHPP) has been prepared for City of Madison Unit Well 13. The primary goals of this WHPP are to define the WHPA for Unit Well 13 and establish specific criteria for protection of Unit Well 13 and groundwater resources in the WHPA including management strategies to maintain a high quality water supply, free of contamination. The primary goal of wellhead protection (WHP) planning is to protect water supply wells from contamination and, thereby, protect people who obtain their water supply from those wells. This WHPP was prepared to meet the requirements of the Wisconsin Administrative Code (WAC), Chapter NR 811, Section 16(5), for wellhead protection (WHP) planning.

Unit Well 13 is located at 1201 Wheeler Road in the north-central part of the City of Madison. Land use in the area surrounding Well 13 is comprised of primarily residential properties and undeveloped land, to the north of Wheeler Road. Construction of Unit Well 13 was completed in 1959. Unit Well 13 cased to 128 feet and is 780 feet deep. It is open to both the upper and lower bedrock (sandstone) aquifers, and has a design capacity of approximately 2,300 gallons per minute (gpm).

As part of the Dane County regional hydrologic study, a regional groundwater flow model was prepared for Dane County and was used to delineate time-related (5-, 50-, and 100-year time of travel (TOT)) zones of contribution (ZOCs) for municipal wells (Update Krohelski et. al., 2000) including Unit Well 13. The ZOCs for Unit Well 13 extend primarily to the north and northeast, east and south-southwest in the simulated upgradient groundwater flow directions.

Figure 3-5 shows the wellhead protection area (WHPA) for Unit Well 13. Two zones of protection are within the WHPA. Zone A is defined by the 5-year TOT ZOC. Zone B is defined by a 1,200-foot fixed radius around Unit Well 13. The WHPA will provide a conservative protection zone to account for changes in pumping rates, pumping duration, and interference drawdown from other existing and future wells.

As part of the WHP planning activities, a contaminant source inventory (CSI) was performed for the WHPA of Unit Well 13 in November and December, 2010. Known potential and existing contaminant sources within the Unit Well 13 WHPA include storm and sanitary sewers; closed leaking underground storage tank (LUST) sites; active above ground storage tank (AST) sites, closed UST sites, road salt use; and potential use of pesticide, herbicide, and nutrients on garden plots and on residential and commercial lawns.

Programs and activities to be used by the City of Madison and others for WHPA management at Unit Well 13 are grouped into five principal categories as follow:

1. Existing Programs
 - a. Clean Sweep Collection Program
 - b. On-site waste disposal (septic) system maintenance
 - c. Private well abandonment
 - d. Land application of sludge and septage
 - e. Spill notification and awareness of remedial investigation and cleanup

2. Land Use Controls
 - a. Existing zoning/WHP overlay zoning and ordinance
3. Intergovernmental Cooperation
 - a. Land use planning and site plan review
4. Monitoring
 - a. CSI maintenance
 - b. Water quality monitoring
5. Public Education and Awareness
 - a. Availability of WHPP
 - b. Public informational meetings
 - c. News releases
 - d. Informational materials distributed to residents in WHPA
 - e. Land use and contaminant source awareness
 - f. School programs

The Madison Water Utility has an existing water conservation program and encourages water conservation. The Utility has formulated a contingency plan for providing water in the event that Unit Well 13, or one or more of the City's other water supply wells become contaminated or out of service. Well 13 is part of the Main Pressure Zone. Other wells in the Main Pressure Zone can serve this area in the event Unit Well 13 is out of service.

This WHPP was prepared to provide measures to protect the City's water supply from becoming contaminated through the release of regulated or unregulated hazardous substances to the groundwater supply. The City has an existing WHP ordinance and overlay zoning district. The WHP ordinance and overlay zoning district helps ensure that no new potential contaminant sources are located in the Unit Well 13 WHPA. The ideas and actions presented in this WHPP should assist the City in their goal of maintaining a safe and plentiful water supply for years to come.

1.0 INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

This WHPP has been prepared for the City of Madison Unit Well 13. The primary objectives of this WHPP are to define the WHPA for Unit Well 13 and establish specific criteria for protection of Unit Well 19 and groundwater resources in the WHPA including management strategies to maintain a high quality water supply, free of contamination. The primary goal of wellhead protection (WHP) planning is to protect municipal water supply wells from contamination and, thereby, protect people who obtain their water supply from those wells.

The term “wellhead” refers to the physical structure (well) at the land surface through which groundwater is withdrawn from a subsurface water-bearing formation (aquifer). A WHPA is defined by federal law as “the surface and subsurface area surrounding a water well or wellfield, through which contaminants are reasonably likely to move toward and reach such water well or wellfield” (United States Environmental Protection Agency (USEPA), 2005).

This WHPP was prepared for Unit Well 13 to conform to the requirements of the Wisconsin Administrative Code, Chapter NR 811, Section 16(5), for WHP planning, a copy of which is included in Appendix A. The project scope as defined by the Water Utility included the following tasks:

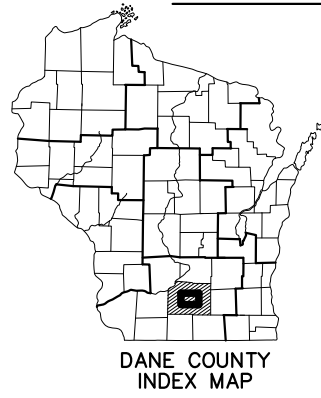
1. Research available information regarding the geology and hydrogeology of the well sites and aquifer parameters.
2. Research well construction and proposed operation of Unit Well 13.
3. Coordinate with the Utility to obtain the previously delineated WHPA's, which include the modeled 5, 50, and 100-year Time of Travel (TOT) capture zones for Unit Well 19, and a 1,200 foot set-back radius around Well 13.
4. Perform a Potential Contaminant Source Inventory (CSI) to identify and characterize existing and potential contamination sources within a ½ -mile radius and within the recharge are equivalent to the 100-year TOT capture zone delineated for Unit Well 13.
5. Assist with the development of WHP management strategies.

1.2 LOCATION AND BACKGROUND

Unit Well 13 is located at 1201 Wheeler Road, on the far north-central side of the City of Madison, approximately 1/2-mile south of Cherokee Lake. The well site is located in the NE¼, NW¼ of Section 25, Township 8 North, Range 9 East, Dane County, Wisconsin. Construction of Unit Well 13 was completed in 1959. Figure 1-1 shows the location of Unit Well 13 and other water system facilities in the City of Madison. A portion of the survey plat showing the well site is included in Appendix B.

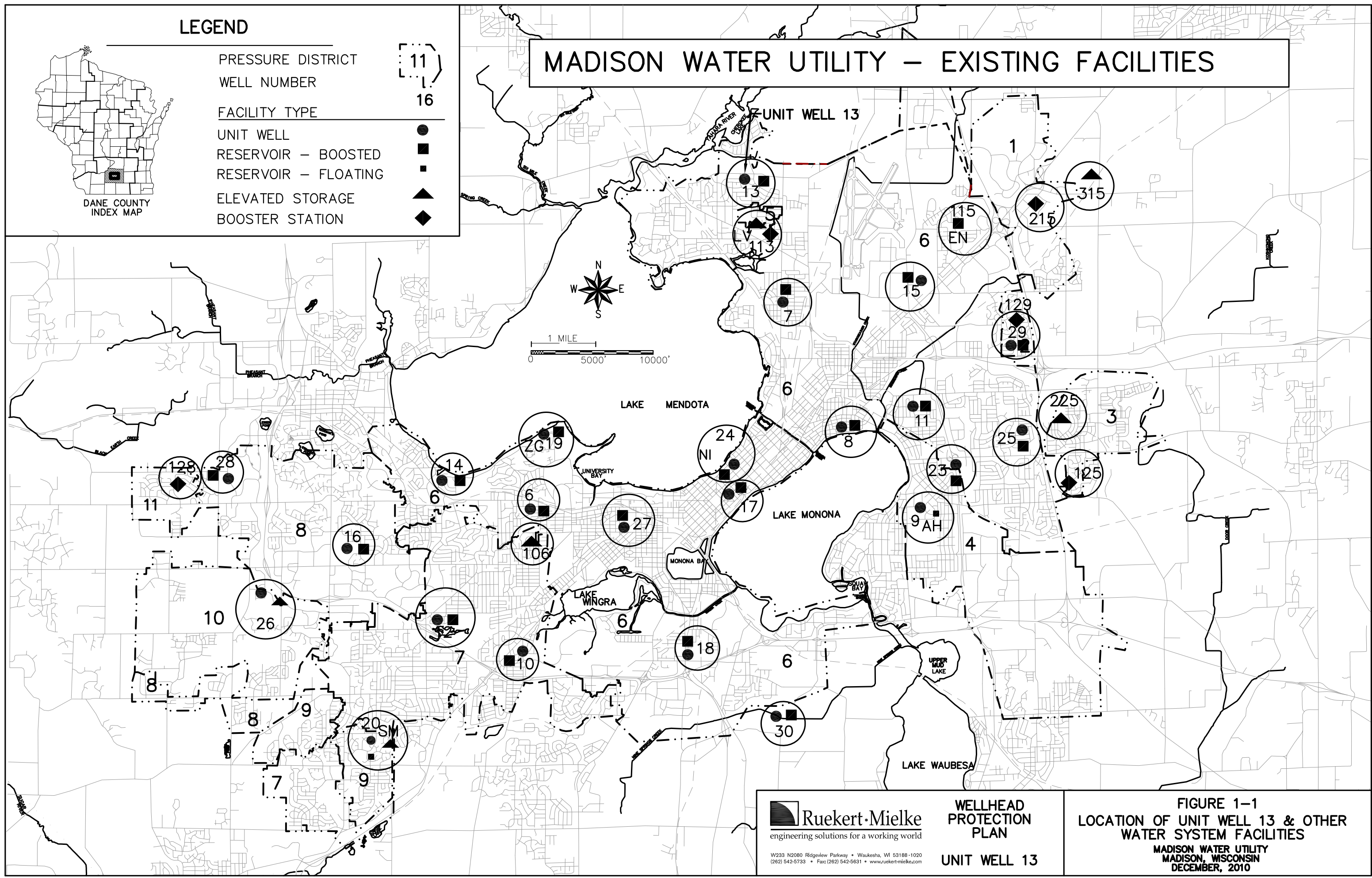
The Madison Water Utility provides water service to more than 62,000 locations in the City of Madison, Town of Madison, Shorewood Hills, Maple Bluff, Blooming Grove, and Town of Burke.

LEGEND



- PRESSURE DISTRICT 11
- WELL NUMBER 16
- FACILITY TYPE
- UNIT WELL
- RESERVOIR – BOOSTED
- RESERVOIR – FLOATING
- ELEVATED STORAGE
- BOOSTER STATION

MADISON WATER UTILITY – EXISTING FACILITIES



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**WELLHEAD
PROTECTION
PLAN**

UNIT WELL 13

**FIGURE 1-1
LOCATION OF UNIT WELL 13 & OTHER
WATER SYSTEM FACILITIES**
MADISON WATER UTILITY
MADISON, WISCONSIN
DECEMBER, 2010

The Utility serves approximately 235,000 people and consists of 22 deep wells, 28 booster pumping facilities, 24 ground storage reservoirs and approximately 840 miles of water transmission and distribution mains. The water system is divided into 10 pressure districts, or zones. Unit Well 13 is located in Pressure District 6, the City's Main Pressure Zone. The nearest Utility well to Unit Well 13 is Well 7, which is located approximately 2 miles south-southeast of Unit Well 13, and is also in Pressure District 6.

1.3 UNIT WELL 13

Unit Well 13 is constructed to a depth of 780 feet. The well is cased with 24-inch OD steel casing, which is grouted to a depth of 128 feet below ground surface (ft bgs). A 23-inch diameter open well bore extends from 128 feet to 780 ft bgs.

Sandstone bedrock was encountered at a depth of 60 feet in Unit Well 13. The lithology encountered in the open well bore was predominantly clean sandstone, which graded to limy, or dolomitic, sandstone throughout the formation open to the well bore. A very thin shaly zone was identified by the driller in the samples obtained from between about 240 to 242 ft bgs (no samples were returned to the surface from 242 to 245 ft bgs). A zone of conglomerate was encountered near the suspected base of the Mount Simon formation between the depths of 760 feet and 780 feet.

Following completion of Unit Well 13, the well was test pumped at a rate of 2,400 gpm for 40-hours, and had a specific capacity of 24.0 gallons per minute per foot of drawdown (gpm/ft). At the time of the original test pumping the static (non-pumping) water level in Unit Well 13 was 10 feet below ground surface. The most recent static water level measurement was 30.1 feet, as measured on January 26, 2011. A well construction report and formation log prepared by the WGNHS are in Appendix C.

2.0 HYDROGEOLOGIC CONDITIONS

2.1 LAND USE, TOPOGRAPHY, AND DRAINAGE

Unit well 13 is located in the far north central portion of the City of Madison, approximately 2580 feet south of Cherokee Lake and the Yahara River and 7,100 feet north-northeast of Lake Mendota. Land use in the area surrounding Well 13 is generally comprised of residential property, with undeveloped areas to the north of Wheeler Road. Current zoning immediately around Unit Well 13 is Single Family Residential (R1). A copy of the City of Madison zoning map, which identifies the location of Unit Well 13 is included in Appendix D. The nearest neighboring municipality to Unit Well 13 is the Town of Westport, which is located directly north of the well site, on the north side of Wheeler Road.

Unit Well 13 is located in an area covered by a relatively thin veneer of glacial till. The topography in the immediate vicinity of Unit Well 13 relatively flat to gently undulating, and slopes gently to the north, towards a wetland area in the Town of Westport. The drainage from Unit Well 13 is predominantly to the north, into the wetland. The ground surface elevation at Unit Well 13 is approximately 861 feet above mean sea level (MSL).

2.2 GEOLOGY

The area was glaciated by the Green Bay Lobe during the Wisconsin Stage. The various bedrock formations and unconsolidated deposits in the Madison area range from Precambrian-age basement bedrock to recent soils. The bedrock from oldest to youngest includes Precambrian-age rhyolite and/or granite and Cambrian-age bedrock units consisting of sandstone, siltstone, dolomite, and shale.

Figure 2-1 is a geologic cross-section through Unit Wells 13, 15, and 25. A formation log for strata encountered at Unit Well 13 is in Appendix C. A brief description of the stratigraphic sequence encountered in Unit Well 13 follows.

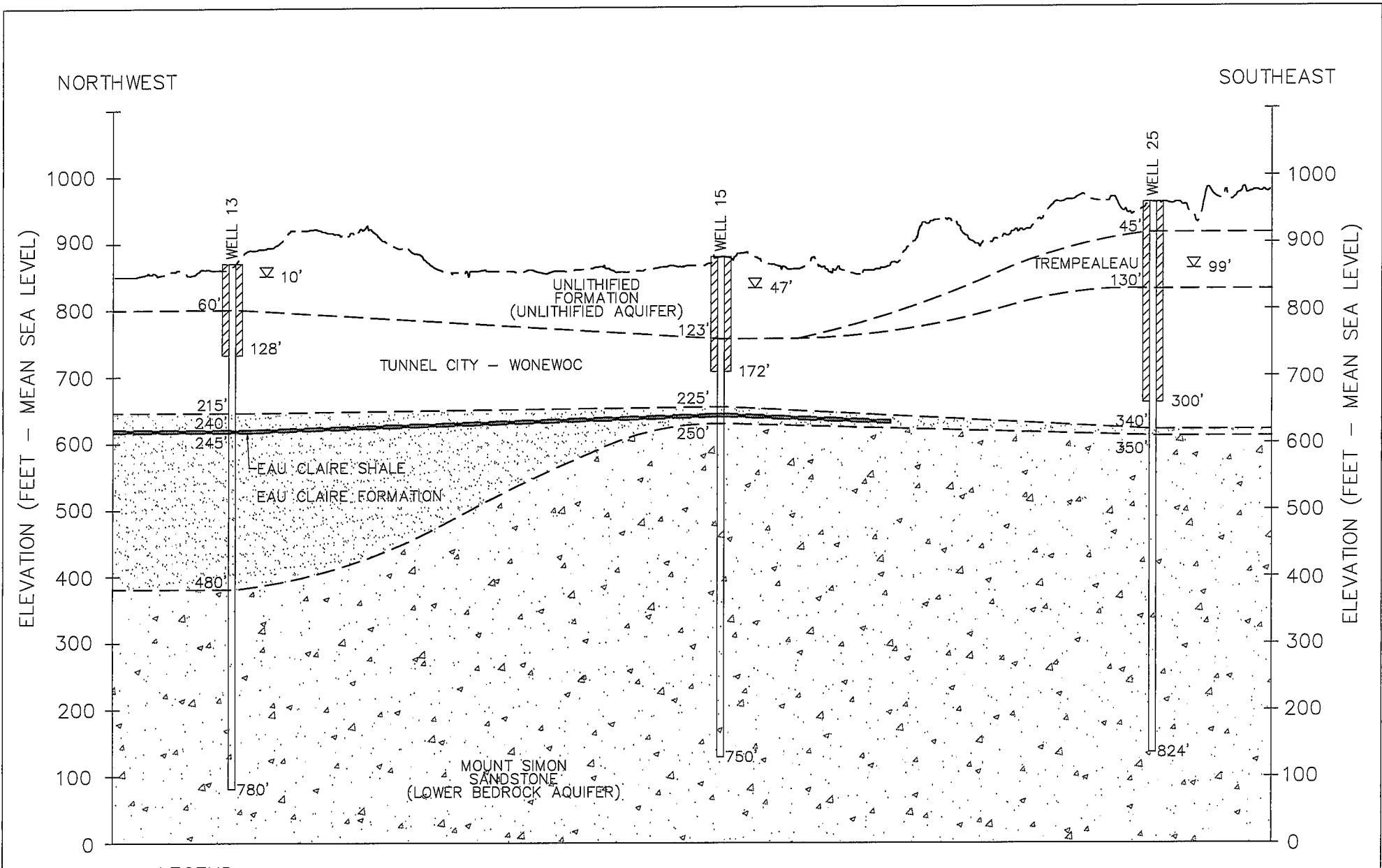
2.2.1 Precambrian Basement Bedrock

Precambrian-age bedrock was not encountered in Unit Well 13, 15, or 25.

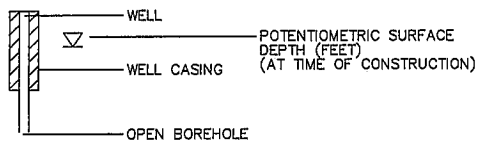
2.2.2 Cambrian Bedrock

Cambrian-age rocks encountered in Unit Well 13 include, in ascending order, the following units: Mount Simon Formation, Eau Claire Formation, Wonewoc Formation, and the Tunnel City Group.

The overall attitude of the Cambrian-age bedrock formations in the Madison area are generally relatively flat lying in the east-west direction and dip slightly to the south. The cross-section prepared for the Well 13 area (Figure 2-1) shows a much thicker section of the Eau Claire Formation at Unit Well 13, as compared to Unit Wells 15 and 25. As shown, the Mount Simon sandstone was encountered approximately 230 feet deeper at Unit Well 13, as compared to Unit Well 15. The occurrence and thickness of the upper Tunnel City Group bedrock is variable because it is the upper erosional surface. The strata above the Tunnel City Group at Unit



LEGEND




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FIGURE 2-1

GEOLOGIC CROSS-SECTION THROUGH MADISON UNIT WELLS 13, 15 & 25

MADISON, WISCONSIN
 NOVEMBER, 2010

Well13 consist of unconsolidated deposits (silt, clay and sandy material). A very thin and non-continuous dolomitic, silty-shale layer ranging in thickness from approximately 2 feet at Unit Well 13 to 10 feet at Unit Well 15 is present in the Eau Claire Formation. The shale pinches out between Unit Wells 15 and 25. Soil samples, or cuttings, were not available for the upper 300 feet of Unit Well 15. The thickness of the shale at this well was based on the results of a natural gamma geophysical log, which was conducted by WGNHS personnel.

2.2.3 Unlithified Deposits

The bedrock in the vicinity of Unit Well 13 is covered by unlithified (unconsolidated) glacial till and alluvial deposits. Clayton and Attig (1997) classify the local near surface unlithified deposits in the immediate vicinity of Unit Well 13 as part of the Horicon Member of the Holy Hill Formation, which were deposited by the Green Bay Lobe. Clayton and Attig (1997) report that the near surface formation is uniform till deposited during the last part of the Wisconsin Glaciation, with the surficial geology generally consisting of a smooth streamlined topography with drumlins.

The driller described the unconsolidated deposits encountered at Unit Well 13 as sand, gravel and till. Upon closer inspection, the WGNHS classified the material as fine to coarse dolomitic sand and gravel, and brown to grey very stony till.

Surficial soils in the immediate vicinity of Unit Well 13 consist of the Orion silt loam, Dresden silt loam, and the St. Charles silt loam (NRCS web Soil Survey, 2008). The McHenry, St. Charles, and Dodge silt loam are considered to have good contaminant attenuation potential. The Dane County Regional Planning Commission (DCRPC) assigned a risk classification of moderate to high from surface activities in the Unit Well 13 Well Protection Zone on the basis of several factors including soil properties, depth to water, and depth to bedrock, (DCRPC, 1999).

2.3 HYDROGEOLOGY

In the Unit Well 13 study area, groundwater occurs within the lower bedrock aquifer, the upper bedrock aquifer, and the unconsolidated (sand and gravel) aquifer. Municipal and industrial wells are constructed into the lower and deeper bedrock aquifer. It appears that no private or residential wells are present in the upper bedrock aquifer or sand and gravel aquifer in the WHPA of Unit Well 13. Review of the available private well data bases indicate that one active private well is present in the upper bedrock aquifer or sand and gravel aquifer in the WHPA of Unit Well 13. A brief discussion of the aquifers at the site follows.

2.3.1 Lower Bedrock Aquifer

The Mount Simon Formation and lower part of the Eau Claire Formation comprise the lower bedrock aquifer. Precambrian-age bedrock forms the base of the lower bedrock aquifer, while the shale layer in the Eau Claire Formation acts as the upper confining unit. Water occurs within the lower bedrock aquifer in horizontal and vertical fractures, along bedding planes, and in the more porous and less well cemented portions of the lower sandstone formations. The saturated thickness of the lower bedrock aquifer appears to be approximately 535 feet thick in Unit Well 13. The hydraulic conductivity of the lower bedrock aquifer is estimated to be approximately 10 feet per day (ft/day) (Krohelski et. al., 2000).

The grouted casing in Unit Well 13 is set to a depth of 128 feet below ground surface, which is at the base of the Tunnel City Group and 112 feet above the top of the Eau Claire Shale. This means that Unit Well 13 is open to both the upper and lower bedrock aquifer and water levels measured in Well 13 are not representative of either aquifer because of leakage and mixing between the two. However, for reporting purposes, the static water level in Unit Well 13 as measured upon completion of the well in July 1959, was approximately 10 feet below ground surface.

The simulated potentiometric surface in the lower bedrock (Mount Simon) aquifer using 2000 head data is presented in Figure 4 of Appendix E, and indicates that the general direction of deep groundwater flow is toward Unit Well 13 from north, northwest, and northeast. The 2030 simulated potentiometric surface in the Mount Simon aquifer is presented in Figure 6 of Appendix E, and indicates that the general direction of deep groundwater flow will remain from the north, northwest, and northeast, toward Unit Well 13 (DCRPC, 2004). The potentiometric surface elevation in the vicinity of Unit Well 13 is between approximately 850 and 855 feet MSL in both 2000 and 2030.

The storativity of the lower bedrock aquifer is estimated to be approximately 0.0003, and the porosity is estimated to be approximately 30 percent (Bradbury, 2001). The porosity of the Eau Claire Formation is estimated to be 5 percent (Bradbury, 2001).

2.3.2 Upper Bedrock Aquifer

The upper bedrock aquifer occurs in the upper part of the Eau Claire Formation above the Eau Claire shale confining unit and within the Wonewoc Formation and Tunnel City Group. Water in the upper bedrock occurs within fractures, along bedding planes, and in the interstitial porosity of sandstone.

At Unit Well 13, the thickness of the bedrock above the shale confining layer in the Eau Claire Formation is 110 feet. The elevation of the water table surface at Unit Well 13 was not measured. The elevation of the simulated water table surface in the vicinity of Unit Well 13 is estimated to be between approximately 850 and 855 feet above MSL (Figure 3 [DCRPC, 2004] in Appendix F). The saturated thickness of the upper bedrock aquifer at Well 19 is estimated at approximately 230 feet.

The hydraulic conductivity of the upper bedrock aquifer is estimated to be approximately 5 ft/day (Krohelski et. al., 2000). The porosity of the formations is estimated to be approximately 5 percent (Bradbury, 2001).

2.3.3 Sand and Gravel Aquifer

The sand and gravel aquifer (or upper unconsolidated aquifer) occurs in the relatively shallow sand and gravel deposits (when present). The unlithified materials in the vicinity of Unit Well 13 are moderately thick, although the driller did not report the depth at which saturated formation was encountered in the unlithified materials during drilling activities. The hydraulic parameters of the upper sand and gravel aquifer can vary significantly (by several orders of magnitude) over very short distances (tens of feet). For modeling purposes, Krohelski, et. al., 2000, assumed a hydraulic conductivity of 7 ft/day and a porosity of 20 percent for the sand and gravel aquifer.

2.3.4 Groundwater Flow System

The average annual precipitation in the City of Madison area is reported to be approximately 30 to 30.5 inches per year (Cline, 1965; Cotter et. al., 1969). Cline (1965) estimated that the amount of recharge to the groundwater reservoir in the Upper Yahara River basin was approximately 6 inches/year (in/yr). The estimated recharge rate in Dane County ranges from 0.3 to 6.7 in/yr and has an average value of 2.6 in/yr (Swanson, 1996).

Recharge to the unconsolidated aquifer and shallow bedrock aquifers is provided by precipitation that infiltrates into the unlithified material and into the upper bedrock aquifer. In some areas, a small percentage of water moves downward from the upper bedrock aquifer through the Eau Claire shale confining layer and into the lower bedrock aquifer. Map 7 in Appendix E shows the location of Well 13, and areas of recharge to and discharge from the lower bedrock (Mount Simon) aquifer (Bradbury et. al, 1999; DCRPC 1999). Discharge from the unlithified and shallow bedrock aquifers is to pumping wells and/or to surface waters (lakes, streams, and wetlands) in the area. Locally, discharge from the lower bedrock aquifer is primarily to pumping wells.

3.0 WELLHEAD PROTECTION AREA DELINEATION

This chapter describes methodologies used to define the Zone of Influence (ZOI) and zone of capture (ZOC) for Unit Well 13.

3.1 ZOI

The ZOI for Unit Well 13 was estimated in accordance with Wisconsin Department of Natural Resources (DNR) requirements, and was based on 30 days of continuous pumping at full capacity, assuming no recharge to the aquifer. The ZOI for Unit Well 13 was determined using the Jacob modified nonequilibrium equation to estimate the theoretical drawdown in the well, followed by calculating the slope of the cone of depression. The ZOI was then determined by graphical analysis to be approximately 3,800 feet. These estimated ZOI is considered to offer a conservative estimate of the extent of the ZOI because the Jacob modified nonequilibrium equation does not account for recharge to the aquifer, aquifer heterogeneity, or the effects of potential hydraulic boundaries. For the ZOI calculation, it was assumed that the entire open borehole (open to the lower sandstone bedrock aquifer), supplies water to Unit Well 13. Distance–drawdown calculations are presented in Appendix G.

3.2 GROUNDWATER MODEL DEVELOPMENT AND ZOC DELINEATION

As part of the Dane County regional hydrologic study, a regional groundwater flow model was prepared for Dane County and was used to delineate time-related ZOCs for municipal wells (Krohelski et. al., 2000) including Unit Well 13. The Dane County regional hydrologic study was conducted cooperatively by the WGNHS, DCRPC, and the United States Geological Survey (USGS). The USGS modular groundwater modeling code (MODFLOW (McDonald & Harbaugh, 1988)) was used to simulate groundwater flow. After the calibrated groundwater flow model was prepared, PATH3D (Zheng, 1991) was used to determine time-related ZOCs.

The model domain covers an area of 50 by 60 miles and is divided into 144,000 nodes. Each node has regular spacing of 1,312.4 feet (400 meters) on a side. The grid has 200 rows and 240 columns (Krohelski et. al., 2000).

In 2002, the groundwater flow model was converted from a three-layer model to a four-layer model, with Layer 1 representing the sand and gravel aquifer, Layer 2 representing the upper bedrock aquifer, Layer 3 representing the Eau Claire Formation, and Layer 4 representing the lower bedrock aquifer. The model was recalibrated and various boundary conditions were modified (DCRPC, 2001). Other aquifer parameters input into the model were as described in Chapter 2, and in Krohelski et. al. 2000.

To determine the most conservative pumping regime (yielding the largest TOT and resultant capture zones), four groundwater flow simulations were performed using the calibrated model and different pumping rates for existing and known future municipal supply wells in Dane County (Bradbury, 1998). Simulation No. 1 was performed using the projected pumping rates from municipal wells for the year 2030. Total City of Madison 2030 pumping is projected to be 44.328 million gallons per day (MGD). For Simulation No. 1, the projected 2030 total pumpage was distributed evenly among the City's existing and planned wells to obtain an average rate of

approximately 1.44 MGD. Pumping at a rate of 1.44 MGD is equivalent to pumping continuously at a rate of approximately 1000 gallons per minute (gpm).

Simulation No. 2 was performed using the “maximum sustained pumping rate” or “one-half design capacity” (Bradbury, 1998). The maximum sustained pumping rate (one-half design capacity) for Unit Well 13 is 1.656 MGD, and is equivalent to pumping continuously at a rate of 1,150 gpm.

Simulation No. 3 was performed using full design capacity. Full capacity for Unit Well 13 is 3.312 MGD, which is equivalent to pumping continuously at a rate of 2,300 gpm.

Simulation No. 4 was performed using the average pumping rate during the maximum pumpage year for Unit Well 13. The maximum pumpage year for Unit Well 13 was 2000, with a calculated average pumping rate of 1,816 gpm, which is equivalent to 2.615 MGD.

PATH3D (Zheng, 1991) was used to determine the time-related ZOCs for Unit Well 13. Particles were input in the model around Unit Well 13 and then tracked backward from the well to the calculated model points where they would theoretically enter the groundwater flow system.

3.3 ZOC

The area that recharges or contributes water to Unit Well 19 is defined as the zone of capture (ZOC), or more commonly referred to as the capture zone. The areal extent of the capture zone depends on the pumping rate, amount of horizontal and vertical recharge, aquifer hydraulic characteristics, pumping duration, and other stresses such as interference from other pumping wells. It is beneficial to know the extent of the capture zone because contaminants introduced to the aquifer within the confines of the capture zone may be drawn to Unit Well 13 as the well is pumped over time.

Figure 3-1 shows the 5-, 50-, and 100-year TOT ZOCs for Unit Well 13 based on the projected 2030 pumping rate (Simulation No. 1). Figure 3-2 shows the 5-, 50-, and 100-year TOT ZOCs for Unit Well 13 based on the one-half design capacity pumping rate (Simulation No. 2). Simulation No. 3 is illustrated in Figure 3-3, and shows the 5-, 50-, and 100-year TOT ZOCs for Unit Well 13 based on the full design capacity pumping rate. Figure 3-4 shows the 5-, 50-, and 100-year TOT ZOCs for Unit Well 13 based on the average pumping rate for Unit Well 13 for the maximum year (Simulation No. 4).

The capture zones for each of the four simulations are similar in shape, with the size of the ZOC's increasing as the well is pumped at a higher rate. The general shape of the modeled capture zones for unit well 13 are generally semi-circular, with the capture zones somewhat extend toward the north, northwest, and southeast, in the simulated upgradient groundwater flow direction. The inferred direction of the downgradient flow is generally to the southeast, south, and southwest. Table 3-1 summarizes the upgradient and downgradient extent of capture zones for the various pumping simulations. The ZOCs delineated using the Simulation No. 3 pumping rates (pumping continuously at full capacity) are generally more conservative (larger in size) compared to the ZOCs delineated using Simulations 1, 2, and 4.

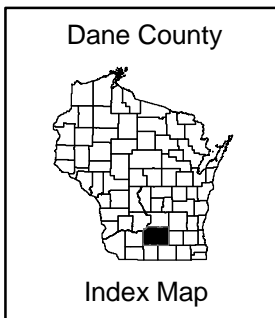
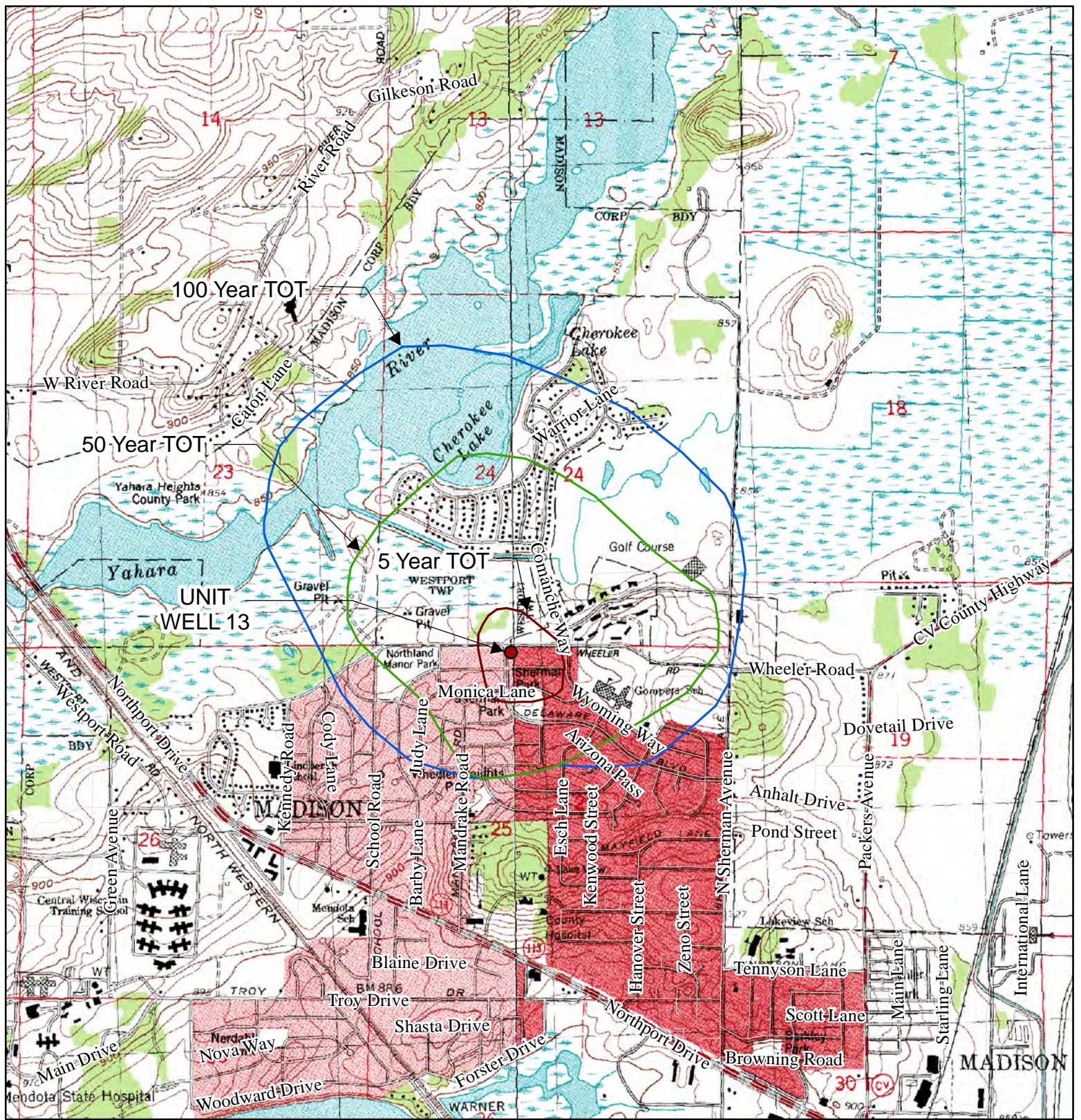
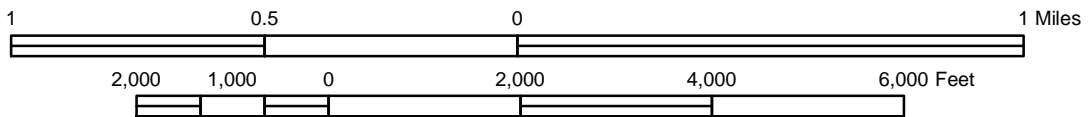


FIGURE 3-1
 5, 50, 100 YEAR T.O.T. Z.O.C.s ASSUMING
 PROJECTED 2030 PUMPING RATE
 UNIT WELL 13
 MADISON, WISCONSIN



SOURCE: USGS 15 MINUTE QUADRANGLE,
 MADISON WEST, WISCONSIN, 1983

Scale 1:24,000

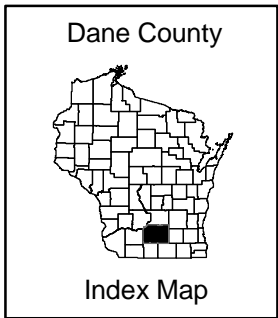
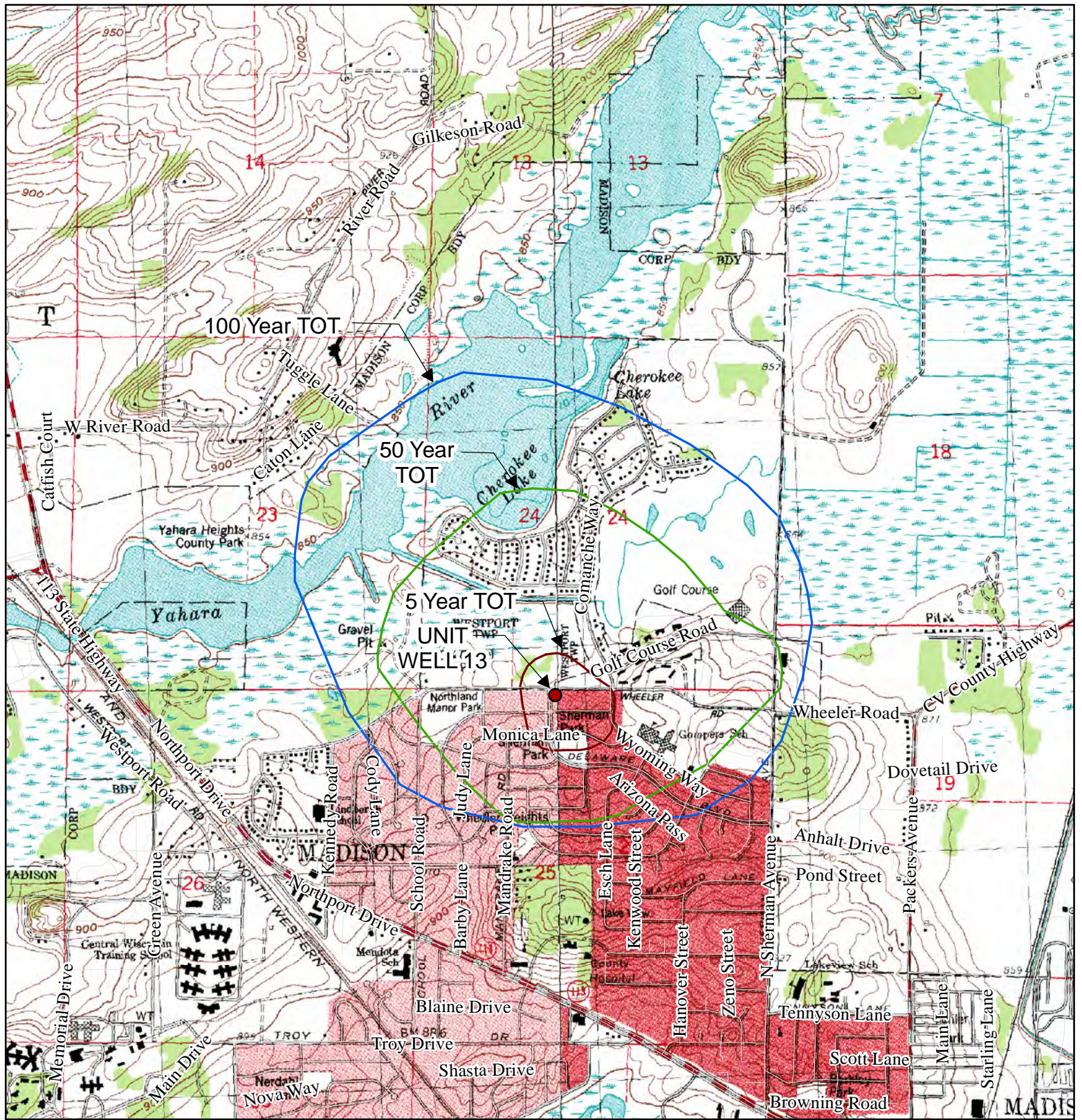
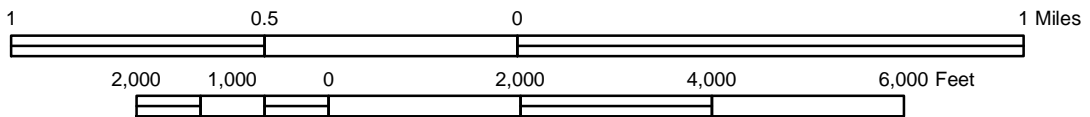


FIGURE 3-2

5, 50, 100 YEAR T.O.T. Z.O.C.s ASSUMING
 50 PERCENT CAPACITY PUMPING RATE
 UNIT WELL 13
 MADISON, WISCONSIN



SOURCE: USGS 15 MINUTE QUADRANGLE,
 MADISON WEST, WISCONSIN, 1983

Scale 1:24,000

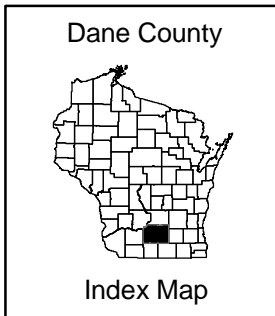
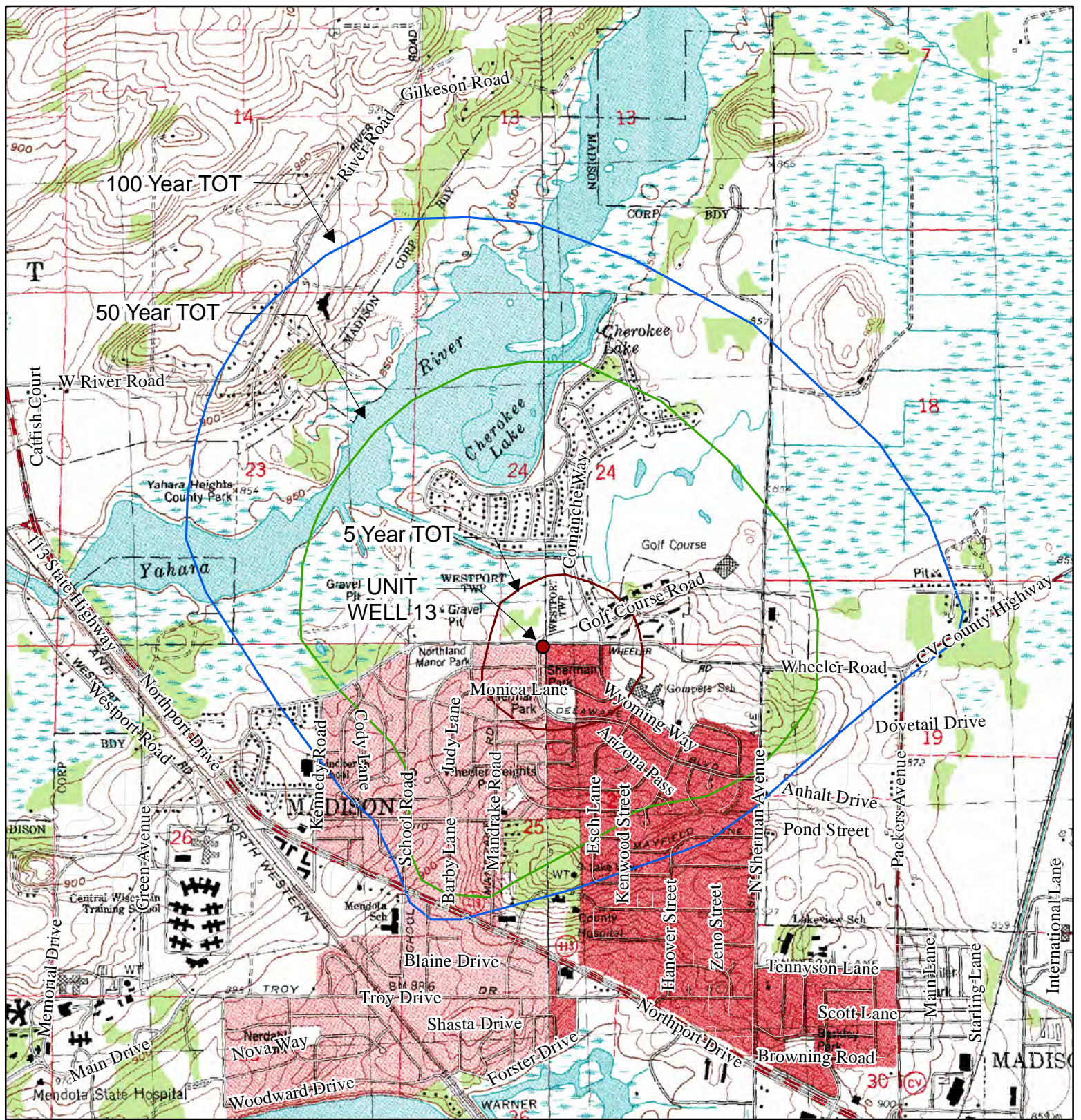
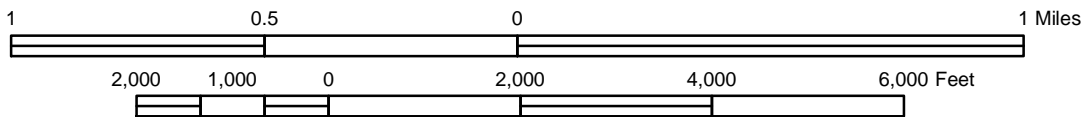


FIGURE 3-3
 5, 50, 100 YEAR T.O.T. Z.O.C.s ASSUMING
 FULL CAPACITY PUMPING RATE
 UNIT WELL 13
 MADISON, WISCONSIN



SOURCE: USGS 15 MINUTE QUADRANGLE,
 MADISON WEST, WISCONSIN, 1983

Scale 1:24,000

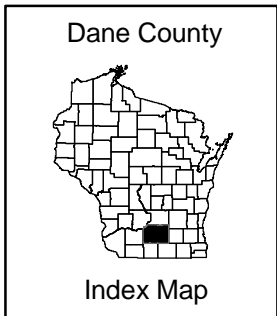
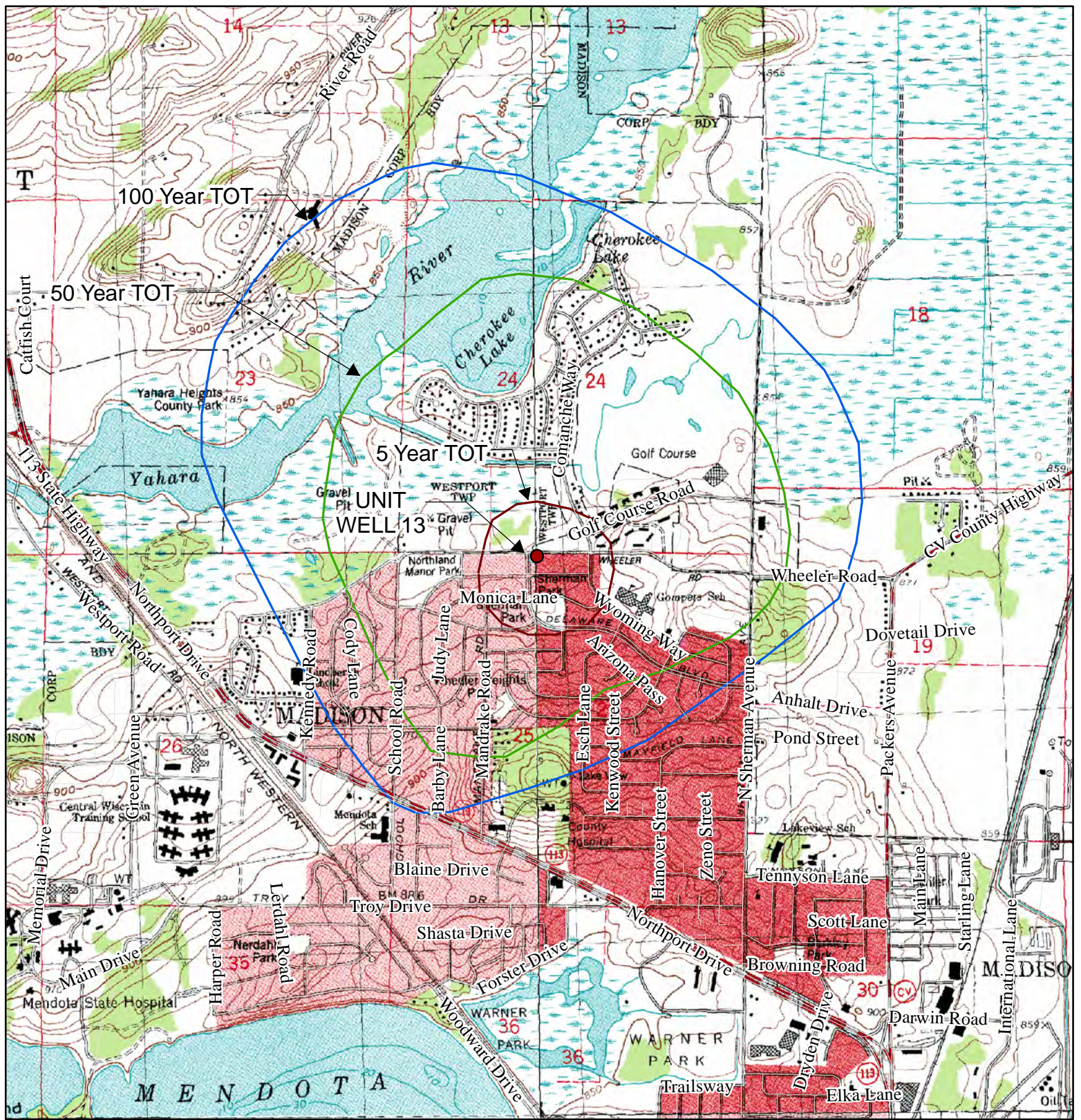
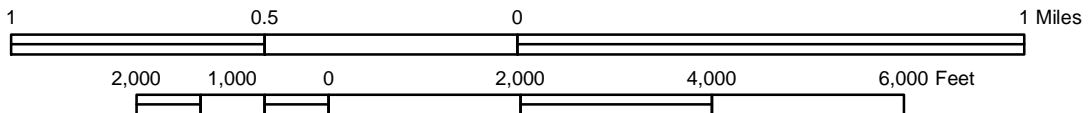


FIGURE 3-4

5, 50, 100 YEAR T.O.T. Z.O.C.s ASSUMING
 PUMPING AT AVERAGE RATE DURING
 THE MAXIMUM YEAR
 UNIT WELL 13
 MADISON, WISCONSIN



SOURCE: USGS 15 MINUTE QUADRANGLE,
 MADISON WEST, WISCONSIN, 1983

Scale 1:24,000

**TABLE 3-1
SUMMARY OF EXTENT OF ZOCs (CAPTURE ZONE)
WELLHEAD PROTECTION UNIT WELL 13
MADISON, WISCONSIN**

Item	Simulation No. 1 (projected 2030 pumping rates)	Simulation No. 2 (one-half design capacity pumping rates)	Simulation No. 3 (continuous pumping at full capacity)	Simulation No. 4 Average Pumping Rate During Maximum Pumpage Year
Simulated Pumping Rate (MGD)	1.440 (1,000 GPM)	1.656 (1,150 GPM)	3.312 (2,300 GPM)	2.615 (1,816 GPM)
Upgradient Extent of ZOC (feet)				
5-year TOT	700 – 900	900 – 1,000	1,200 – 1,500	1,000 – 1,200
50-year TOT	2,700 – 3,100	2,700 – 3,400	3,600 – 4,300	3,300 – 4,300
100-year TOT	4,000 – 4,900	4,000 – 5,100	5,500 – 6,900	4,200 – 6,100
Downgradient Extent of ZOC (feet)				
5-year TOT	450 – 700	500 – 800	900 – 1,200	800 – 1,000

Notes:

MGD = Million Gallons per Day
ZOC = Zone of Contribution
TOT = Time of Travel

Figure 2 in Appendix H shows ultimate regional ZOCs for Unit Well 13 and for other select high capacity wells in Dane County. Groundwater flow path lines extend upgradient from Well 13 for a distance of slightly more than 1 mile.

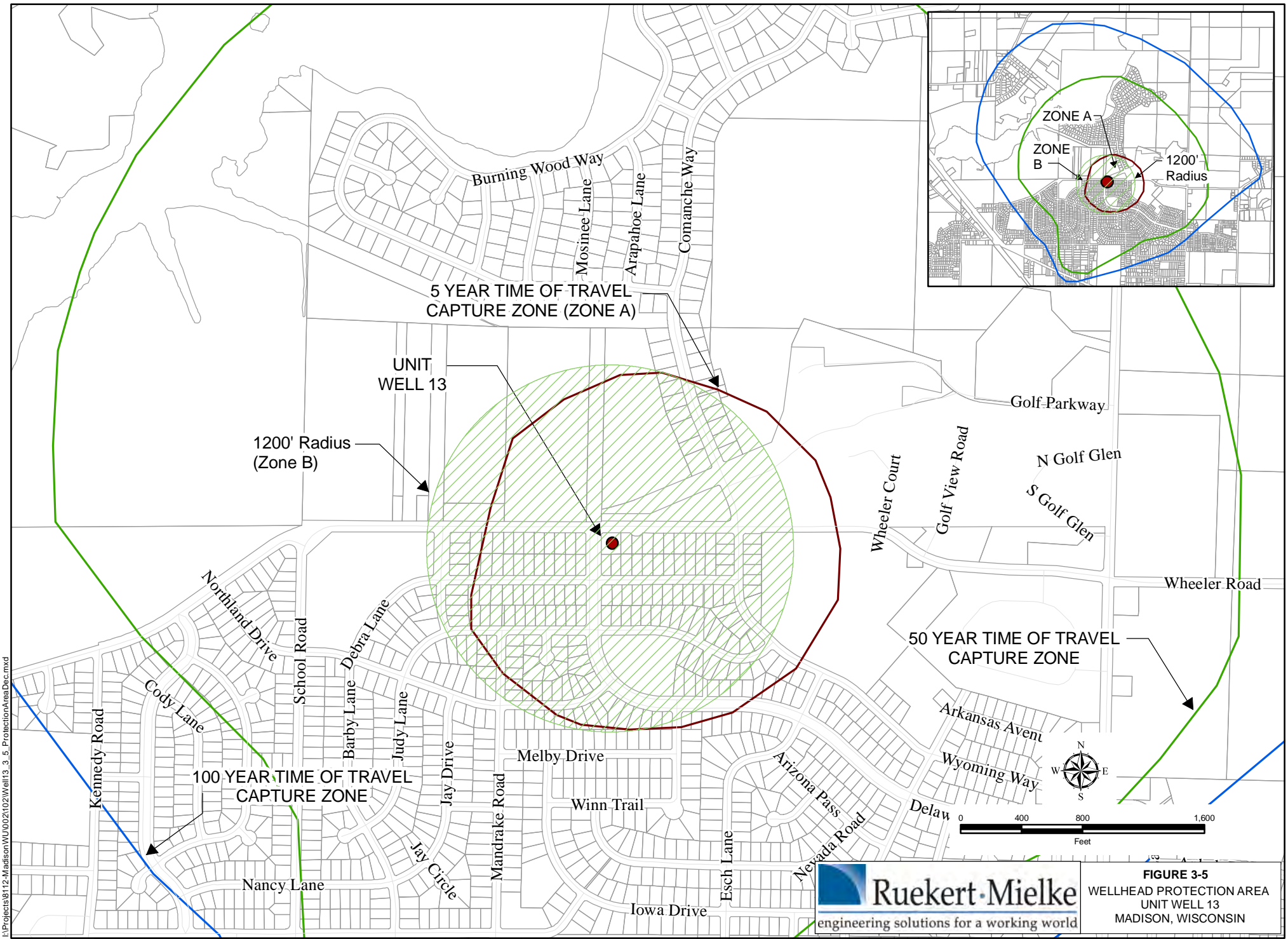
3.4 WELLHEAD PROTECTION AREA

The Wisconsin Administrative Code (Chapter NR 811.16(5) (e)) requires that a WHPA for a municipal water supply well “encompass, at a minimum, that portion of the recharge area equivalent to a 5-year TOT to the well.” Any of the four simulations described above could be used to model the 5-year TOT ZOC for Unit Well 13. However, since it is possible that Unit Well 13 could be pumped at maximum capacity without interruption in times of extraordinarily high water use or during an emergency, the capture zone for Unit Well 13 using simulation No. 3 was utilized to generate the long-term capture zone and resultant WHPA for Unit Well 13 in this WHPPP. This has provided us with a very conservative estimate (over estimation) of capture zone at Unit Well 13 and should provide maximum protection of contamination for the well.

Review of simulation No. 3 indicates that the 5-year TOT ZOC for Unit Well 13 extends in the up gradient direction approximately 1,200 to 1,500 feet, and approximately 900 to 1,200 feet down gradient from the well. In the same simulation, the 100-year TOT ZOC extends approximately 5,500 to 6,900 feet upgradient from Unit Well13. A portion of the 50 and 100-year TOT ZOC extends beneath the Yahara River.

Figure 3-5 shows the WHPA for Unit Well 13. Two zones of protection are identified within the WHPA. Zone A is the area around Unit Well 13 that is defined by the 5-year TOT ZOC delineated for Simulation No. 3 (continuous pumping at full capacity). Zone B is the area around Unit Well 13, beyond Zone A (the 5-year TOT ZOC), but is within a 1,200-foot fixed radius around Unit Well 13. A 1,200-foot radius is selected because Wisconsin Administrative Code Chapter (WAC) NR 811.16(4) requires a 1,200-foot separation distance between a municipal water supply well and selected potential contamination sources. WAC ch. NR 811 specifies lesser separation distances for other potential contamination sources.

The delineated WHPA for Unit Well 13 should provide a conservative zone of protection for the well and should account for changes in pumping rates, pumping duration, interference drawdown from other existing and future wells, changes in head in the aquifer, and prevent future new potential contaminant sources or activities from occurring within the delineated WHPA. The WHPA is located entirely within the City of Madison.



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FIGURE 3-5
WELLHEAD PROTECTION AREA
UNIT WELL 13
MADISON, WISCONSIN

4.0 POTENTIAL CONTAMINANT SOURCES

4.1 CONTAMINANT SOURCE INVENTORY

A contaminant source inventory (CSI) was performed for the Unit Well 13 study area between December 2010 and January 2011. The CSI consisted of a search of government records, applicable DNR Web sites, and a windshield reconnaissance survey of the WHPA, within a ½-mile radius of Unit Well 13, and within the recharge area equivalent to the delineated 50 and 100-year TOT of Unit Well 13, as applicable (the windshield survey did not include the area in the 100-year TOT that was projected beneath the Yahara River). The windshield survey also included visual observation of the general land use and activities, which have the potential to adversely impact Unit Well 13 in the future.

The locations of identified potential, existing, and former contaminant sources in the WHPA, within a ½-mile radius of Unit Well 13, and within the recharge area equivalent to the delineated 50 and 100-year TOT's of Unit Well 13 are illustrated on Figure 4-1. A summary of the identified potential contaminant sources within the WHPA study area is presented in Table 4-1.

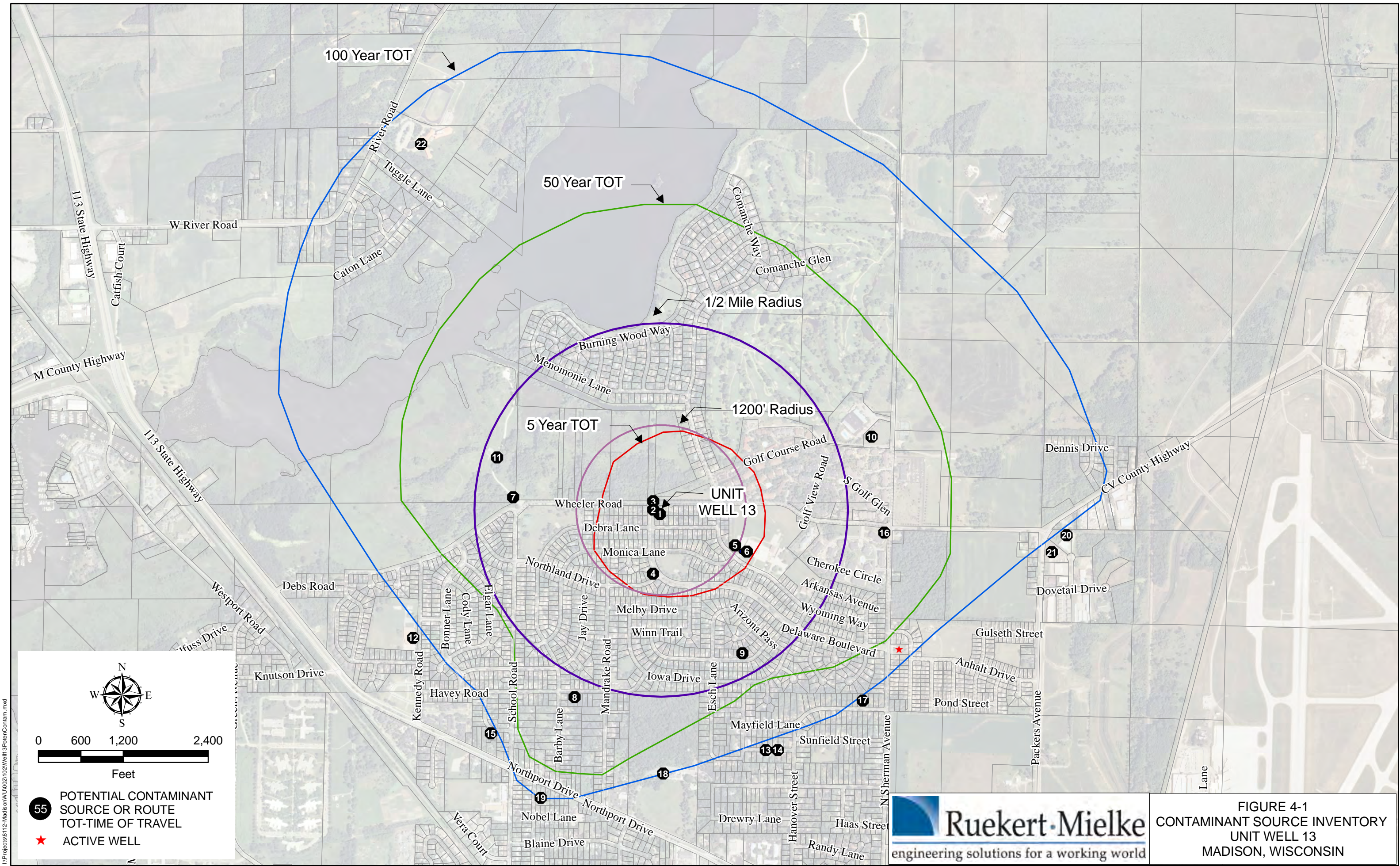
Potential, existing, and former contaminant sources within the WHPA and capture zones for Unit Well 13 include active above ground storage tank (AST) sites; closed leaking underground storage tank (LUST) sites; closed and active underground storage tank (UST) sites; a SPILLS site; solid and hazardous waste information management sites (SHWIMS); facility index system (FINDS) sites; a TIER 2 facility listing site; road salt use; and probable use of pesticides, herbicides, and nutrients on commercial and residential lawns and gardens and at a golf course. Based on the available information, the following are descriptions of known potential, existing, and former contaminant sources in Zones a and B of the WHPA, within a ½-mile radius, and within the recharge area equivalent to the delineated 50 and 100-year TOT of Unit Well 13.

Zone A

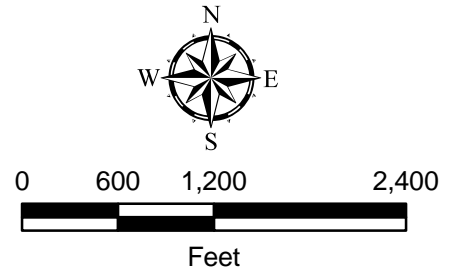
Map id #1 consists of an active 490-gallon diesel tank located approximately 75 feet from Unit Well 13 and is associated with the emergency generator set-up at Unit Well 13. The tank is reported to be of single wall construction. It is not known if secondary containment is utilized at this location. This site is considered to present a moderate to high threat of contamination to Unit Well 13. This site also contains one chloride and 2 fluoride cylinders in the well house that are utilized for disinfection and for tooth decay prevention, respectively. These cylinders are considered to pose a low threat of contamination to Unit Well 13.

Map id #2 consists of an active storm sewer. The nearest storm sewer is located on Delaware Blvd, approximately 90 feet from Unit Well 13. Additional storm sewers are also located throughout the study area. This site is considered a medium to high threat to Unit Well 13.

Map id #3 consists of an active sanitary sewer. The nearest sanitary sewer main is located beneath Delaware Blvd, approximately 50 feet west of Unit Well 13. Additional sanitary sewers are located throughout the study area. The sanitary sewers are considered a medium threat to Unit Well 13.



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- 55 POTENTIAL CONTAMINANT SOURCE OR ROUTE
- TOT-TIME OF TRAVEL
- ★ ACTIVE WELL



FIGURE 4-1
CONTAMINANT SOURCE INVENTORY
UNIT WELL 13
MADISON, WISCONSIN

**TABLE 4-1
CONTAMINANT SOURCE INVENTORY SUMMARY
WELLHEAD PROTECTION UNIT WELL 13
MADISON, WISCONSIN
January 2011**

Map Site No.	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 13	Location within Capture Zone	Estimated Threat to Supply Wells
1 (A1)	Madison Gas & Electrical Co./ 1201 Wheeler Rd. Madison, WI	EDR Report AST (FID No. 664702)	In Use AST: 490 – gallon diesel (Tank ID 919880)	Active	75 ft.	Zone A	Medium to High
1(A2)	Madison Water Utility 1201 Wheeler Rd. Madison, WI	EDR Report TIER 2 (FID No. 29862)	1 – 480 lb. chlorine gas cylinder 2 – 165 lb. fluoride cylinders	Active	25 ft.	Zone A	Low
2	City of Madison Storm Sewer Madison, WI	Verified by utility mapping	Storm sewer	Active	90 ft.	Zone A	Medium
3	City of Madison Sanitary Sewer Madison, WI	Verified by utility mapping	Sanitary sewer	Active	50 ft.	Zone A	Medium
4 (3)	White Trucking Co. Inc. 1138 Northland Drive Madison, WI	EDR Report- SHWIMS (FID No. 998075650)	No Information Available	Operating	875 ft. south	Zone A	Low
5 (4)	Black Hawk Middle School 1402 Wyoming Way Madison, WI	EDR Report- FINDS WI Environmental Site (Registry ID No. 110036725078)	Environmental Interest/Information System No Information Available	Active	1,350 ft. southeast	Zone A	Low
6 (5)	Gompers Elementary School 1502 Wyoming Way Madison, WI	EDR Report- FINDS WI Environmental Site (Registry ID No. 110036725050)	Environmental Interest/Information System No Information Available	Active	1,550 ft. southeast	50 year – TOT 1/2 mile radius	Low
7 (6)	City of Madison 902 Wheeler Road Madison, WI	EDR Report- WI Registered AST (Facility ID 156787)	Active AST: 500-gallon waste/used motor oil (Tank ID No. 202354)	Active	2,050 ft. west	50 year – TOT 1/2 mile radius	Low to Medium
7 (6)	City of Madison 902 Wheeler Road Madison, WI	EDR Report- WI Registered AST (Facility ID 156787)	Closed/Removed AST: 275-gallon waste/used motor oil (Tank ID No. 202114)	Closed/Removed	2,050 ft. southwest	50 year – TOT 1/2 mile radius	Low
8 (8)	Lisa Knowles 1009 Havey Road Madison, WI	EDR Report- WI Registered UST (Facility ID 687484)	Closed/Removed UST: 500-gallon fuel oil (Object ID No. 973185)	Closed/Removed	2,850 ft. west	50 year - TOT	Low
9 (7)	Art Tilley Trucking, LLC 1422 Nevada, Rd Madison, WI	EDR Report- SHWIMS (FID No. 113368090)	No Information Available	Unknown	2,300 ft. southeast	50 year – TOT 1/2 mile radius	Low
10 (B9)	Cherokee County Club Clubhouse 5000 N. Sherman Avenue Madison, WI	EDR Report- FINDS WI (Registry ID 110016933078)	Environmental Interest/Information System	Conditional Closure	3,150 ft. northeast	50 year - TOT	Low
10 (B9)	Cherokee County Club Clubhouse 5000 N. Sherman Avenue Madison, WI	DNR Remediation and Redevelopment and BRRTS Web sites WI - LUST (DNR Activity No. 03-13-001501)	LUST, Petroleum contamination in fractured bedrock, residual soil and groundwater. Case closed on 8/22/2003 with groundwater use restriction and placed on GIS Registry.	Conditional Closure	3,150 ft. northeast	50 year - TOT	Medium
10 (B10)	5000 N. Sherman Avenue Madison, WI	EDR Report WI Registered UST (Facility ID 68932)	Closed/Removed UST: 500-gallon leaded gasoline (Object ID 278837)	Closed/Removed	3,150 ft. northeast	50 year - TOT	Low
11	Cherokee Marsh School Road EXT N Madison, WI	EDR Report - (Orphan Site) SHWIMS EDR ID S108150113	No Information Available.	Active	2,400 ft. northwest/variable	50 year – TOT ½ mile radius	Low

TABLE 4-1 (Continued)

Map Site No.	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 13	Location within Capture Zone	Estimated Threat to Supply Wells
12 (6)	Lindberg Elementary School 4500 Kennedy Rd Madison, WI	EDR Report- FINDS WI (Registry ID 110036772276)	Environmental Interest/Information System	Active	3,900 ft. southwest	At 100-year TOT	Low
13 (C12)	Mike Martens 1514 Longview St Madison, WI	EDR Report WI Registered UST (Facility ID 111293)	Closed/Removed UST: 500-gallon fuel oil (Object ID 273710)	Closed/Removed	3,600 ft. southeast	At 100-year TOT	Low
14 (C13)	Greg Paque 1518 Longview St Madison, WI	EDR Report WI Registered UST (Facility ID 90064)	Closed/Removed UST: 550-gallon fuel oil (Object ID 273407)	Closed/Removed	3,500 ft. southeast	At 100-year TOT	Low
15 (14)	Donald Mead 4210 Barnett St Madison, WI	EDR Report WI Registered UST (Facility ID 687775)	Closed/Removed UST: 300-gallon fuel oil (Object ID 974421)	Closed/Removed	3,900 ft. southwest	At 100-year TOT	Low
16 (15)	Operating as Golf Driving Range 1850 Wheeler Rd Madison, WI	EDR Report WI Registered UST (Facility ID 61867)	Closed/Removed UST: 275-gallon fuel oil (Object ID 278691)	Closed/Removed	3,100 ft. (Exact location unknown)	50-year TOT	Low
17 (16)	Bridgetta Barnett 1646 Mayfield LN Madison, WI	EDR Report WI Registered UST (Facility ID 58477)	Closed/Removed UST: 500-gallon fuel oil (Object ID 273471)	Closed/Removed	3,850 ft. southeast	At 100-year TOT	Low
18 (E21)	Madison City – Lakeview San 1202 Northport Dr Madison, WI	EDR Report- WDS (FID No. not reported)	Unknown	Unknown	3,700 ft. south	100-year TOT	Low
18 (E22)	1202 Northport Dr Madison, WI	EDR Report WI Registered UST (Facility ID 66395)	Closed/Removed UST: Unknown (Object ID 271774) Closed/Removed UST: 280-gallon fuel oil (Object ID 272425)	Closed/Removed	3,700 ft. south	100-year TOT	Low
18 (E23)	1206 Northport Dr Madison, WI	EDR Report WI Registered UST (Facility ID 101651)	Closed/Removed UST: 500-gallon Leaded Gasoline (Object ID 273145)	Closed/Removed	3,700 ft. south	100-year TOT	Low
18 (E24)	1206 Northport Dr Madison, WI	EDR Report- SPILLS (Site ID. 4815900)	Historic Oil Spill, Leak in Transformer	Contained/Recovered	3,700 ft. south	100-year TOT	Low
19 (31)	Jack Bagley 4013 Toban Madison, WI	EDR Report WI Registered UST (Facility ID 91568)	Closed/Removed UST: 250-gallon fuel oil (Object ID 273170)	Closed/Removed	4,300 ft. south/southwest	100-year TOT	Low
20 (R79)	Resource Solutions Corp. Operating as Scrap Metal Recycling 5493 Express Cir Madison, WI	EDR Report- SHWIMS (FID. 113343120) Visual Field Inspection	No Information Available Operating as Scrap Metal Recycling Facility	Operating	5,600 ft. east	100-year TOT	Low
21 (R80)	Four Lakes Paving Co. 5489 Express Cir Madison, WI	EDR Report WI Registered AST (Facility ID 717327)	In Use AST: 550 – gallon diesel (Tank ID 1093411) Closed/Removed UST: 250-gallon waste/used motor oil (Object ID 1093418) Closed/Removed UST: 250-gallon waste/used motor oil (Object ID 1093412)	In Use Closed/Removed Closed/Removed	5,550 ft. east	100-year TOT	Low
22 (W95)	Adult Christian Education Foundation Operating as Madison Country Day School 5606 River Road Waukegan, WI	EDR Report- RCRA-NonGen (EPA ID WID988641577) FINDS WI (Registry ID 110005505541) WI LUST (FID 113248190)	Handler Only, No Violations Found Environmental Interest/Information System Soil Contamination, Gasoline, Low Risk	Active Active Closed	6,200 ft. northwest	100-year TOT	Low

TABLE 4-1 (Continued)

Map Site No.	Owner/Location	Database or Reference Source	Existing, Potential, or Former Contaminant Sources	Reported Status	Approximate Distance to Unit Well 13	Location within Capture Zone	Estimated Threat to Supply Wells
23	Numerous Properties and Roadway Throughout Area	Site Reconnaissance	Parking Surfaces and Roads: Runoff to drainage ways and detention areas.	Active	Variable	All Zones	Low-Moderate
24	Numerous Properties and Roadway Throughout Area	Site Reconnaissance	Grass Areas: Potential nutrient loading	Active	Variable	All Zones	Low-Moderate

- Notes:
1. 50 year – Time of Travel (TOT)
 2. 100 year – Time of Travel (TOT)
 3. Within 1200-ft. radius.
 4. The Facility Index System (FINDS)
 5. Wisconsin Leaking Underground Storage Tank List (LUST)
 6. Underground Storage Tank (UST)
 7. Aboveground Storage Tank (AST)
 8. Solid & Hazardous Waste Information Management System (SHWIMS)
 9. Tier 2 Facility Listing (TIER 2)
 10. Registry of Waste Disposal Sites (WDS)
 11. Resource Conservation and Recover Act-NonGenerator (RCRA-NonGen)

Map id #4, White Trucking, consists of an active SHWIMS site. No further information was available on this site. The windshield survey indicates that this site is a residence, so it is likely that the listed address is the owners address. No trucking operations were observed at this site. This site is considered a low threat to Unit Well 13.

Map id #5, Blackhawk Middle School, consists of an active FINDS site. No further information was available on this site. No unusual or threatening activities were observed during the windshield survey. This site is considered a low threat to Unit Well 13.

Zone B

Map id #6, Gompers Elementary School, consists of an active FINDS site. No further information was available on this site. No unusual or threatening activities were observed during the windshield survey. This site is considered a low threat to Unit Well 13.

1/2-Mile Radius

Map id #7, a City of Madison waste oil recycling facility, which consists of a 500 gallon AST. No secondary containment was noted. This site is considered a low-medium threat to Unit Well 13.

Map id #9, Tilley Trucking, consists of an active SHWIMS site. No further information was available on this site. This site is considered a low threat to Unit Well 13.

Map id #11, Cherokee Marsh, consists of an active SHWIMS site. No further information was available on this site. This site is considered a low threat to Unit Well 13

50-Year TOT

Map id #8, a former residential 500-gallon registered UST. The UST has been closed and removed. This site is considered a low-medium threat to Unit Well 13.

Map id #10, Cherokee Country Club, consists of an active FINDS site and a closed LUST site. The LUST site was characterized by petroleum contamination in fractured bedrock and residual soil and groundwater contamination. The leaking UST was closed and removed from the site. This site is considered a medium threat to Unit Well 13.

Map id #16, consists of a golf driving range with a closed and removed UST. This site is considered a low threat to Unit Well 13

100-Year TOT

Map id#12, Lindberg Elementary School, consists of an active FINDS site. No further information was available on this site. No unusual or threatening activities were observed during the windshield survey. This site is considered a low threat to Unit Well 13.

Map id #13, consists of a closed and removed UST. This site is considered a low threat to Unit Well 13.

Map id #14, consists of a closed and removed UST. This site is considered a low threat to Unit Well 13.

Map id #15, consists of a closed and removed UST. This site is considered a low threat to Unit Well 13.

Map id #17, consists of a closed and removed UST. This site is considered a low threat to Unit Well 13.

Map id #18, consists of a closed and removed USTs and a historic SPILL site. The spill was contained and removed. The site has above ground propane tanks, which are likely utilized for heating purposes. This site is considered a low threat to Unit Well 13.

Map id #19, consists of a closed and removed UST. This site is considered a low threat to Unit Well 13.

Map id #20, Resource Solutions consists of an active SHWIMS site. The windshield survey indicates the site is operating as a scrap metal recycling facility. This site is considered a low threat to Unit Well 13.

Map id #21, Four Lakes Paving, contains an active 550-gallon diesel fuel AST. This site is considered a low threat to Unit Well 13.

Map id #22, Madison Country Day School, is listed as a RCRA non-generator, a FINDS site, and a LUST site. No violations were reported for the RCRA and FINDS listings. The LUST site was characterized by soil contamination with gasoline. The site is closed and is considered a low threat to Unit Well 13.

General Comments

Review of the Dane County Comprehensive Plan indicates that several private septic systems are present in the 50 and 100-year TOT of Unit Well 13. The nearest system is located approximately 3,500 feet east of Well 13, in the Town of Burke. These systems are considered a low threat to Unit Well 13.

One active private well and three abandoned private wells are identified within the WHPA, and the 100-year capture zone of Unit Well 13. Pertinent information on the active and abandoned wells is presented in Appendix I, Table I-1.

There are no apparent solid waste storage sites in the CSI study area of Unit Well 13.

There are no apparent cemeteries in the CSI study area of Unit Well 13.

There are no sludge or septage spreading areas in the Unit Well 13 WHPA. The nearest sludge or septage application areas are located approximately 3 miles west of Unit Well 13 (DCRPC, 1999).

No bulk salt storage sheds or bulk pesticide, fertilizer storage, and/or mix-load sites were identified within the CSI study area.

The separation distances between Unit Well 13 and potential contaminant sources identified in the CSI are summarized in Table 4-2. With the possible exception of the sanitary main that passes near Well 13, it appears that the required separation distances from Unit Well 13 and potential contaminant sources identified in the WAC ch. NR 811.16 are currently being met. If the sanitary main meets AWWA pressure specifications and is tested in place, a 50-foot separation distance is permitted by DNR.

4.2 LAND USES AND WELLHEAD PROTECTION PLANNING

Existing land uses in the vicinity of Unit Well 13 are generally compatible with WHP planning. Land uses and activities summarized in Table 4-2 should be prohibited in the vicinity of Unit Well 13, within the respective minimum separation distances shown. It is generally not desirable to have manufacturing or industrial districts located in WHPAs. Land uses summarized in Table J-1 in Appendix J should be prohibited from WHPA Zones A and B. Where any of the uses listed in Table J-1 currently exist within Zones A and B, owners should be allowed to upgrade the facilities to facilitate or enhance groundwater protection.

Tables 4-4 and 4-5 in Appendix J summarize various potential sources of groundwater contamination and land uses, and their relative risk to groundwater, respectively.

**TABLE 4-2
MINIMUM SEPARATION REQUIREMENTS
BETWEEN PUBLIC WELLS AND
POTENTIAL CONTAMINANT SOURCES
WELLHEAD PROTECTION PLAN, UNIT WELL 13
MADISON, WISCONSIN**

Potential Contamination Source	Minimum Separation Distance
Emergency Power System and Above Ground Storage Tank Meeting requirements of Comm 10.260	10 feet
Storm or Sanitary Sewer – Successfully Pressure Tested per Code	50 feet
Sanitary Sewer Main	200 feet ¹
Sanitary Lift Station, sanitary manhole	200 feet
One or two Family Residential Heating Fuel Oil, UST or AST or POWTS (septic tank) treatment or holding tank	200 feet
Any Farm UST or AST meeting the most restrictive requirements of Comm 10.260	300 feet
POWTS within a design capacity of Less than 12,000 gpd	400 feet
Cemetery	400 feet
Storm Water Retention or Detention Pond	400 feet
Gasoline or Fuel Oil Tank Approved by Comm 10.10	600 feet
Land Application of Municipal, Commercial, or Industrial Waste	1,000 feet
Boundaries of Land Spreading Facility Regulated Under Chapter NR 718	1,000 feet
Agricultural, Industrial, Commercial, or Municipal Wastewater Plant Treatment Units, Lagoons or Storage Structures	1,000 feet
Manure Stacks or Storage Structures	1,000 feet
POWTS with a design capacity of 12,000 gpd or more	1,000 feet
Solid Waste Storage, Transportation, Transfer, Incineration, Air Curtain Destructor, Processing, Wood Burning, or One-Time Disposal or Small Demolition Facility	1,200 feet
Sanitary Landfill	1,200 feet
Property with Residual Groundwater Contamination Exceeding Chapter NR 140 Enforcement Standards as Recorded on the DNR GIS Registry	1,200 feet
Coal Storage Area	1,200 feet
Salt or Deicing Material Storage	1,200 feet
Any single wall UST or AST, including Farm, not Approved by Comm 10.10 for a single well tank installation	1,200 feet
Bulk Fuel Storage Facilities	1,200 feet
Pesticide or Fertilizer Handling or Storage Facilities	1,200 feet

Reference: Wisconsin Administrative Code, NR 811, November 2010.

Footnote:

¹ Lesser separation for sanitary sewer may be allowed if the sewer is constructed of water main materials and pressure tested according to code requirements. Less than 50 feet separation is not allowed.

5.0 MANAGEMENT STRATEGIES

5.1 ALTERNATIVE MANAGEMENT STRATEGIES

Table 5-1 summarizes the management strategies and Program activities contained in the WHPP Management Plan that was developed for the City of Madison. Program activities were identified for resource management within the delineated WHPA and within the 100-year ZOC.

The various Program activities are grouped into five main categories as follow:

1. Existing Programs
2. Land Use Controls
3. Intergovernmental Cooperation
4. Monitoring
5. Public Education and Awareness

Because all City residents and property owners within the WHPA rely on groundwater resources for water supply, emphasis should be placed on management activities that will provide a mutual benefit to the City of Madison residents and other property owners located within the WHPA and applicable TOT ZOCs.

5.1.1 Category 1 - Existing Programs

5.1.1.1 Hazardous Waste Collection/Disposal Program (Clean Sweep)

To allow for the collection and disposal of residential, agricultural, and small business hazardous chemicals and wastes, Public Health Madison and Dane County (PHMDC) sponsors the Clean Sweep Collection Program. Disposal of household residential hazardous wastes is free. Small quantities of hazardous materials and wastes from small businesses are accepted by appointment, and there is a per pound charge for materials. There is no charge for disposal of hazardous materials disposed of by producers of agricultural crops and commodities (providing funding is available). Collections are held between 7:30 a.m. and 2:00 p.m. on Tuesdays, Wednesdays, Fridays, and Saturdays; May 3 through October 29, 2011. The Clean Sweep site is located on the north end of the Dane County Highway Garage property, 2302 Fish Hatchery Road, Madison, Wisconsin. The phone number at the Clean Sweep site is (608) 267-3105.

Information about the Clean Sweep Collection Program can be obtained by calling (608) 243-0368 (recorded information) or (608) 243-0347 (Dave Radisewitz). Clean Sweep Collection Program web sites are at:

www.danecountycleansweep.com

and,

www.cityofmadison.com/health/envhealth/clnswp.html

**TABLE 5-1
SUMMARY OF MANAGEMENT STRATEGIES
WELLHEAD PROTECTION AREA PLAN - UNIT WELL 13
MADISON, WISCONSIN**

Program Category	Activity	Description	Responsible Unit(s) of Government	Implementation Schedule	
				Date	Action Item
1. Existing Programs	a. Hazardous Waste Collection (CLEAN SWEEP)	<ul style="list-style-type: none"> Hazardous waste collection and disposal. Residential, agricultural, and small business hazardous waste. Commercial with small fee. May through October collections in Madison. Target local property owners and residents to participate. 	<ul style="list-style-type: none"> Public Health Madison and Dane County (PHMDC) PHMDC 	1. Spring 2011.	1. Madison Water Utility send information about the Clean Sweep Collection Program to property owners in the WHPA, to encourage participation in the program.
	b. On Site Waste Disposal System (Septic) Maintenance	<ul style="list-style-type: none"> Maintenance/servicing contract currently required for system owners on record. Orders issued to confirmed failing system owners. Include all property/septic system owners in WHPA in notification database. Conduct Public Education. 	<ul style="list-style-type: none"> PHMDC 	1. Spring 2011, then annually	1. Madison Water Utility request that PHMDC provide information to owners of private sewage disposal systems about sewage system maintenance, and the types of waste that should not be disposed of in a septic system.
				2. Summer / Fall 2011	2. Madison Water Utility prepare an article for newspaper release about septic system dos and don'ts.
				3. Every 3 years	3. Public Health Madison and Dane County ensure that system maintenance and pumping are performed.

TABLE 5-1 (cont.)

Program Category	Activity	Description	Responsible Unit(s) of Government	Implementation Schedule	
				Date	Action Item
1. Existing Programs (cont.)	c. Private Well Abandonment	<ul style="list-style-type: none"> Enforce well abandonment ordinance(s) (Dane County Chapter 45 and City of Madison General Ordinance Sec. 13.21) and review new well construction. Require proper abandonment of unused and unsafe wells. Update well inventory in WHPA once every 5 years. Familiarize with WI Admin. Codes, Chapters NR 141, 811, and 812. 	<ul style="list-style-type: none"> Wisconsin DNR Public Health Madison and Dane County City of Madison 	<ol style="list-style-type: none"> Summer 2011, then annually Summer 2013, then every five years (2016) Ongoing 2011, then every five years Ongoing Spring 2011 As needed 	<ol style="list-style-type: none"> Madison Water Utility request that PHMDC provide them the names and addresses of owners of private wells located in the Unit Well 13 WHPA. Madison Water Utility determine the location of other private water supply wells that may be located within the WHPA and which are not recorded in the County database. Madison Water Utility send private well owners within the WHPA, DNR pamphlets about well upkeep and proper abandonment procedures in the event the owners abandon their existing wells. Madison Water Utility update the private well inventory for wells located in the WHPA. City of Madison and Dane County enforce existing well abandonment ordinances, to ensure that all private wells are permitted, or properly abandoned if unused. Madison Water Utility request that Dane County consider proximity and depth of proposed private wells relative to Unit Well 13 prior to issuing permits for construction of new private water supply wells. Madison Water Utility direct residents to the DNR private well code (Chapter NR 812), to the Wisconsin DNR private well section (608-266-0821), and to licensed well drillers and pump installers when questions arise about private water supply wells.

TABLE 5-1 (cont.)

Program Category	Activity	Description	Responsible Unit(s) of Government	Implementation Schedule	
				Date	Action Item
1. Existing Programs (cont.)	d. Land Application of Sludge and Septage	<ul style="list-style-type: none"> Enforce existing rules. 	<ul style="list-style-type: none"> Wisconsin DNR Dane County Madison Metropolitan Sewerage District (MMSD) 	1. Spring 2011	1. Madison Water Utility provide a copy of the WHPA and recharge area maps to the MMSD and request that sludge not be spread in the Unit Well 13 recharge area equivalent to the 50-year TOT capture zone.
				2. Spring 2011	2. Madison Water Utility provide a copy of the WHPA and recharge area maps to the DNR Watershed Management office (608-267-7694 (central office) 608-275-3325 (Fitchburg office)) and request that new permits for sludge and septage spreading not be issued for properties located in the Unit Well 13 recharge area equivalent to the 50-year TOT capture zone.
				3. Ongoing	3. Madison Water Utility encourage development of additional authorized septage discharge points in the City of Madison wastewater treatment system.
				4. Ongoing	4. DNR enforce rules, particularly in WHPAs.
				5. Ongoing	5. Dane County develop regulatory program including ordinance.
	e. Spill Notification and Awareness of Remedial Investigation and Cleanup	<ul style="list-style-type: none"> Monitor and keep informed of potential contamination sources in the WHPA and recharge areas. Work with DNR to achieve investigation and cleanup of known contamination sources. 	<ul style="list-style-type: none"> Wisconsin DNR Dane County Emergency Management Wisconsin DATCP and COMM City of Madison Fire Department 	1. Spring 2011	1. Madison Water Utility request that DNR, City Police, and the Dane County Emergency Management Office inform the City about future events (spills, leaks, investigations, etc.) that occur in the Unit Well 13 WHPA or in upgradient recharge areas.
				2. 2011, then ongoing	2. Madison Water Utility monitor the status of existing and potential contamination sources in the WHPA, investigations regarding nature and extent of releases, and the status of cleanup activities, then determine if Utility action is needed.
2. Land Use Controls	a. Existing Zoning/Wellhead Protection Overlay Zoning and Ordinance	<ul style="list-style-type: none"> Enforce existing zoning. Discourage conditional uses or zoning changes that increase risk to groundwater. 	<ul style="list-style-type: none"> City of Madison Dane County Planning and Development 	1. 2008 - Ongoing	1. City of Madison amend WHP ordinance and revise WP-13 Wellhead Protection District No.13.
				2. 2011	2. City of Madison provide Dane County with a copy of the WHP ordinance and WHPA map.
				3. Ongoing	3. Dane County consider developing WHP Overlay District ordinance.

TABLE 5-1 (cont.)

Program Category	Activity	Description	Responsible Unit(s) of Government	Implementation Schedule	
				Date	Action Item
3. Intergovernmental Cooperation	a. Land Use Planning and Site Plan Review	<ul style="list-style-type: none"> Cooperate in land use planning to protect groundwater resources and WHPAs. Keep apprised of development in WHPA. Ensure development complies with separation distances between the well and potential contamination sources as required by WI Admin. Code, Chapter NR 811.16. 	<ul style="list-style-type: none"> City of Madison Planning and Development Department Dane County Planning and Development Department Town of Burke Town of Westport 	<p>1. Spring 2011</p> <p>2. Ongoing</p> <p>3. Ongoing</p> <p>4. Ongoing</p> <p>5. 2011 – Ongoing</p>	<p>1. City of Madison provide Dane County, the Town of Burke, and the Town of Westport with a copy of:</p> <ul style="list-style-type: none"> a. The WHPP and maps showing the Unit Well 13 WHPA and ZOCs. b. A summary of separation distances required between municipal water supply wells and potential contamination sources (Wisconsin Administrative Code, Chapter NR 811.16(4)(d)). c. A list of potential contamination sources that can threaten groundwater. d. A list of high risk land uses that should be prohibited from WHPAs. <p>2. City of Madison Planning and Development Department ensure that development complies with separation distances required between municipal water supply wells and potential contamination sources.</p> <p>3. City of Madison encourage the Village of Shorewood Hills to review proposed development in the ZOCs in their jurisdiction, with regard to Unit Well 13 recharge area.</p> <p>4. City of Madison Planning and Development Department develop an Environmental Permits Checklist for site plan review. The checklist will help ensure compliance with local, County, and State permits and will raise awareness about groundwater protection.</p> <p>5. City of Madison Planning and Development Department provide a copy of the WHPA map and Site Plan Review Environmental Permits Checklist to developers and property owners and require that the developer indicate on the environmental permits checklist and hazardous substances reporting form whether the proposed development is in a WHPA.</p>
4. Monitoring	a. Contaminant Source Inventory (CSI) Maintenance	<ul style="list-style-type: none"> Update CSI and conduct windshield survey 	<ul style="list-style-type: none"> Madison Water Utility 	<p>1. December 2010, then every 5 years (December 2015)</p>	<p>1. Madison Water Utility update the CSI by conducting a windshield survey of properties located in the WHPA and by performing State and Federal database checks.</p>

TABLE 5-1 (cont.)

Program Category	Activity	Description	Responsible Unit(s) of Government	Implementation Schedule	
				Date	Action Item
5. Public Education and Awareness (cont.)	e. Land Use and Contaminant Source Awareness	<ul style="list-style-type: none"> Notify and offer guidance to owners of potential high risk land uses in WHPA. 	<ul style="list-style-type: none"> City of Madison 	1. 2011	<p>1. Madison Water Utility provide information to owners of property with existing or potential contamination sources located within the WHPA to emphasize the importance of awareness of the WHPA, the owner's location with respect to the WHPA, and potential contamination source(s) of concern. Specific information to be provided includes:</p> <ul style="list-style-type: none"> a. Leaking underground and above ground storage tanks. b. Materials describing the proper use and application of lawn fertilizers and pesticides.
	f. School Programs	<ul style="list-style-type: none"> Participate in school programs. 	<ul style="list-style-type: none"> City of Madison University Extension Office Madison Public Schools 	<p>1. 2011</p> <p>2. 2011</p>	<p>1. Madison Water Utility inform schools about the availability of tours at water supply facilities.</p> <p>2. Madison Water Utility prepare a water/groundwater fact sheet for school education.</p>

The Clean Sweep Collection Program is advertised using public service announcements and materials distributed by municipalities. Funding for the program is provided by a percentage of tipping fees collected at local landfills and support from the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP). Additional information about the Clean Sweep Collection Program is in Appendix K.

The Clean Sweep Collection Program will be coupled with the City of Madison's WHP planning efforts. The following will be completed for this management activity:

1. To encourage participation in the program, Madison Water Utility will send information about the Clean Sweep Collection Program to property owners in the WHPA.

5.1.1.2 On-Site Waste Disposal System Maintenance

Review of the Dane County Comprehensive Plan, Private Onsite Wastewater Treatment Systems Map (DC Environmental Health, 2007), indicates that no private on-site waste disposal (septic) systems are present within either Zone A, Zone B, or the 50-year TOT ZOC of the Well 13 WHPA. However, it does appear that several septic systems are located within the 100-year TOT ZOC. The septic systems are located in the Town of Burke, approximately 3,500 feet east-northeast of Unit Well 13. Several other septic systems are located beyond the 100-year TOT ZOC, on the Towns of Westport and Burke. The presence of the limited number of septic systems within the 100-year TOT and beyond, are considered low risk to Unit Well 13.

Public Health Madison and Dane County has an existing program for maintenance and servicing of private on-site waste disposal (septic) systems. Data for private waste disposal systems are recorded in a central database. All owners of septic systems are required every three years to have their septic tanks pumped and inspected and any required maintenance performed. The County charges the owners of septic systems an \$8.67 annual fee per system. The fee is included on the property owner's yearly tax bill.

The PHMDC investigates complaints about non-complying sewage disposal systems and issues replacement orders to owners of failing systems.

For this management activity, the City will perform the following:

1. Request that Dane County provide information to owners of private sewage disposal systems located within the ultimate well capture zones, about sewage system maintenance, and the types of waste that should not be disposed of in a septic system.
2. Prepare an article for the newspaper about private sewage disposal systems do's and don'ts.

5.1.1.3 Well Abandonment

The proposed strategies under this category for WHP include public education and private well inventory maintenance. Public education should improve awareness on the part of private well owners of the importance of proper well abandonment. A search of the DNR, Dane County, and City of Madison private well records and private well data bases indicates that there are not any active private wells located in the WHPA or within the 100-year TOT ZOC for Unit Well 13.

The City of Madison (General Ordinance Section 13.21) and Dane County (Chapter 45) have well abandonment ordinances for non-complying, unsafe, and unused wells. A copy of the City of Madison Well Abandonment Ordinance and the Dane County ordinance relating to Private Water Systems are in Appendix L. Other information about wells and well abandonment is in Appendix M.

Dane County and the Wisconsin DNR have regulatory authority for proper construction and abandonment of unused wells (Wisconsin Administrative Code, Chapters NR 811 and 812). Dane County sanitarians review well siting permit applications, issue permits, inspect wells after construction and oversee the abandonment of unsafe, unused, or non-complying wells. The PHMDC administers a county reimbursement program for abandoning these categories of wells.

The following will be completed for this management activity:

1. Madison Water Utility will request that the PHMDC provide them the names and addresses of owners of private wells located in the Unit Well 13 WHPA.
2. Madison Water Utility will determine the location of other private water supply wells that may be located within the WHPA and which are not recorded in the County database.
3. Madison Water Utility will provide information in the Consumer Confidence Report about proper abandonment procedures in the event the property owners have an unused well on their property.
4. Every five years, Madison Water Utility will update the private well inventory for wells located in the WHPA.
5. The City of Madison and Dane County will enforce the existing City and Dane County well abandonment ordinances, to ensure that all private wells are permitted or properly abandoned if unused.
6. Madison Water Utility will request that Dane County consider proximity and depth of proposed private wells relative to Unit Well 13 prior to issuing permits for construction of new private water supply wells.
7. Madison Water Utility will direct residents to the DNR private well code (Chapter NR 812) to the Wisconsin DNR private well section (608-266-0821), and to licensed well drillers or pump installers, as necessary, when questions arise about private water supply wells.
8. The Madison Water Utility will provide information in the Consumer Confidence Report about proper abandonment of unused private wells.

5.1.1.4 Land Application of Sludge and Septage

The nearest permitted septage application site to Unit Well 13 is located approximately 3 miles west of Unit Well 13. This site is considered low risk to Unit Well 13. The site is permitted under Wisconsin DNR authority.

The following will be completed for this management activity:

1. Madison Water Utility will provide a copy of the WHPA and recharge area maps to the MMSD and request that sludge and septage not be spread in the Unit Well 13 recharge area equivalent to the 50-year TOT capture zone.
2. Madison Water Utility will provide a copy of the WHPA and recharge area maps to the DNR Watershed Management office (608-267-7694 (central office) 608-275-3325 (Fitchburg office)) and request that new permits for sludge and septage spreading not be issued for properties located in the Unit Well 13 recharge area equivalent to the 50-year TOT capture zone.
3. Madison Water Utility will encourage development of additional authorized septage discharge points in the City of Madison wastewater treatment system.

5.1.1.5 Spill Notification and Awareness of Remedial Investigation and Cleanup

Review of the available potential contaminant source data bases indicates that several closed LUST sites, active UST and AST sites, and other potential contaminant sources are present within the WHPA of Unit Well 13. To monitor the status of these site and any potential future sites, the following activities will be completed:

1. Madison Water Utility will request that the City Police, DNR, and the Dane County Emergency Management Office inform the Utility about future events (spills, leaks, investigations, etc.) that occur in the Unit Well 13 WHPA or in upgradient recharge areas.
2. Madison Water Utility will monitor the status of existing and potential contamination sources in the WHPA and upgradient recharge areas, investigations regarding nature and extent of releases, and the status of cleanup activities.

5.1.2 Category 2 - Land Use Controls

5.1.2.1 Existing Zoning/Wellhead Protection Overlay Zoning and Ordinance

The City of Madison and Dane County have land subdivision and zoning ordinances to control and direct development. Land subdivision and zoning ordinances are used to safeguard flood plains, wetlands, shore lands, highway access, air quality, surface water, and other concerns. Existing zoning regulations will be enforced to help protect municipal well recharge areas and groundwater.

The City of Madison has adopted a WHP ordinance to help protect the Utility's source of supply. The ordinance prohibits incompatible development with the establishment of an overlay district for the 5-year TOT ZOC (Zone A) and the 1,200-foot radius ZOC (Zone B). The WHP ordinance helps ensure that future potential contamination sources are not located in the Unit Well 13 WHPA. A copy of the WHP ordinance is in Appendix N.

The following will be completed for this management activity:

1. The City of Madison will provide Dane County with a copy of the WHP ordinance and Unit Well 13 WHPA map.

5.1.3 Category 3 - Intergovernmental Cooperation

5.1.3.1 Land Use Planning and Site Plan Review

Land use planning is performed to control and direct development. Land use planning and site plan review should also be used to help protect WHPAs. The following will be completed for this management activity:

1. The City of Madison will provide Dane County, with a copy of:
 - a. The WHPP and maps showing the Unit Well 13 WHPA and ZOCs.
 - b. A summary of separation distances required between municipal water supply wells and potential contamination sources (Wisconsin Administrative Code, Chapter NR 811.16(4)(d)).
 - c. A list of potential contamination sources that can threaten groundwater.
 - d. A list of high-risk land uses that should be prohibited from WHPAs.
2. The City of Madison Planning and Development Department will ensure that development complies with separation distances required between municipal water supply wells and potential contamination sources.
3. The City of Madison will review all proposed development activities and projects in the Unit Well 13 WHPA.
4. The City of Madison Planning and Development Department will develop an Environmental Permits Checklist for site plan review. The checklist will help ensure compliance with local, county, and state permits; and will raise awareness about groundwater protection.
5. The City of Madison Planning and Development Department will provide a copy of the WHPA map and Site Plan Review Environmental Permits Checklist to developers and property owners and require that the developer indicate on the environmental permits checklist and hazardous substances reporting form whether the proposed development is in a WHPA.

5.1.4 Category 4 - Monitoring

5.1.4.1 CSI Maintenance

As part of this study, a CSI was conducted within the delineated WHPA and ZOCs. It will be important to maintain current knowledge of land use, potential contamination sources, and development within the WHPA. The following will be completed for this management activity:

1. Madison Water Utility will update the CSI by conducting a windshield survey of properties located in the WHPA and by performing state and federal database checks on an interval of once every five years.

5.1.4.2 Water Quality Monitoring

Currently, each of the City of Madison's supply wells are tested annually, some are tested more often depending on the analytes and the detected level. Volatile organic compounds (VOCs) are tested annually and quarterly for several wells. Synthetic organic compounds (SOCs) are tested every three years. Inorganic testing is done every three years. Microbiological testing, total coliform bacteria, are tested for weekly. Results are summarized and reviewed for conformance with regulatory drinking water standards, for comparison with current water quality results, and to identify any potential trends in contaminant concentrations.

The following will be completed for this management activity:

1. Madison Water Utility will perform water quality monitoring as required by DNR and as otherwise needed.

5.1.5 Category 5 - Public Education and Awareness

The City of Madison will implement an education program to inform area residents of the need to protect the public water supply. Education is the best way to help people understand that what they apply on or dispose in their land today may be what they or their neighbors drink tomorrow. The public education program will consist of the following:

1. Make available copies of the WHPP
2. Public Informational Meeting
3. News releases
4. Make available and distribute information materials
5. Land Use and Contaminant Source Awareness
6. School programs

5.1.5.1 Availability of WHPP

The following will be completed for this management activity:

1. The City of Madison will provide copies of the WHPP for review by the public at the Water Utility Office, Madison Public Library, and City Hall.
2. The City of Madison will provide copies of the WHPP to, the Town of Burke, Town of Westport, and Dane County.
3. Madison Water Utility will communicate the availability of the plan through a newspaper article.

5.1.5.2 Public Informational Meeting

The purpose of a public informational meeting will be to inform residents of the WHPP, and provide an opportunity for public education and awareness.

The following will be completed for this management activity:

1. The City of Madison will conduct a public informational meeting as part of a City committee meeting or the Common Council meeting during the review phase of the WHPP.
2. The City of Madison will provide WHPA maps available for public review and an information sheet or brochure available for public use.

5.1.5.3 News Releases

The purposes of news releases are to elevate public awareness, educate the public on the need for WHP, and provide examples of prudent WHP measures. Initially, a news release will inform the public that a WHPP has been developed for Unit Well 13 and will indicate the locations where the WHPP will be available for review.

The following will be completed for this management activity:

1. Madison Water Utility will provide a news release to the local newspaper, at the beginning of the WHP project for Unit Well 13, then annually.

5.1.5.4 Informational Materials Distributed to Residents in WHPA

Informational materials will be prepared and distributed to residents living within the WHPA to educate and inform property owners about various topics such as WHP planning activities, and best waste management procedures.

The following will be completed for this management activity:

1. Madison Water Utility will prepare informational materials and/or obtain from the Wisconsin DNR Bureau of Drinking Water and Groundwater, Dane County or UW Extension; fliers, brochures, and pamphlets, including:
 - a. Information about hazardous waste collection/disposal program (Clean Sweep) activities
 - b. Materials describing the proper use and application of lawn fertilizers and pesticides
 - c. WHP planning
 - d. Annual Consumer Confidence Report (CCR) containing information about WHP planning.
2. Madison Water Utility will add information to its website homepage (<http://www.madisonwater.org>) about WHP planning.

5.1.5.5 Land Use and Contaminant Source Awareness

During the CSI, properties were identified with land uses and existing or potential contaminant sources that pose, or may pose, a risk to groundwater. To increase awareness and minimize

risk to groundwater and Unit Well 13, it is important to inform property owners about existing and potential contaminant sources on their properties. An initial mailing will be made at the beginning of the WHP program. In this mailing, property owners will be advised to contact the City if they have questions, or require additional information.

The following will be completed for this management activity:

1. Madison Water Utility will provide information to owners of property with existing or potential contaminant sources located within the WHPA to emphasize the importance of awareness of the WHPA, the owner's location with respect to the WHPA, and potential contaminant source(s) of concern. Specific information to be provided includes:
 - a. Leaking underground and aboveground storage tanks
 - b. Materials describing the proper use and application of lawn fertilizers and pesticides

5.1.5.6 School Programs

The City of Madison will participate in school education programs. The following will be completed for this management activity:

1. Madison Water Utility will inform schools about the availability of tours at water supply facilities. During tours, students will be exposed to important concepts related to groundwater and WHP.
2. Madison Water Utility will prepare a water/groundwater fact sheet for school education programs.

5.2 WATER CONSERVATION PROGRAM

The Madison Water Utility has an existing water conservation program that includes addressing the needs for water accountability in the distribution system, and water conservation by the public.

In 2005 the Utility maintained water accountability in the distribution system of 89 percent. The Utility maintains this high level of water accountability by regularly servicing water meters, reviewing water accountability records, and conducting water leak detection surveys when needed.

The Utility currently has brochures available free to the public describing useful water conservation measures. The brochures are also distributed to the public and discussed in speaking engagements with local organizations and schools by Water Utility staff.

The Madison Water Utility also has information about water conservation at its website (<http://www.madisonwater.org>). Water conservation information is in Appendix O.

The Utility has the authority to impose water use restrictions when necessary.

**TABLE 5-2
EMERGENCY CONTACT NUMBERS
WELLHEAD PROTECTION PLAN, UNIT WELL 13
MADISON, WISCONSIN**

Emergency Contact	Name	Phone No.
Water Utility Emergency Service	On-call 24/7	Office: 608-266-4665
General Manager	Tom Heikkinen	Office: 608-266-4651
Principal Engineer/Water	Alan Larson	Office: 608-266-4653
Water Quality Manager	Joe Grande	Office: 608-261-9101
Police Department	Emergency Dispatch Non-Emergency Dispatch	911 608-255-2345
Fire Department	Emergency Dispatch Administration	911 608-266-4420
Dane County Emergency Response	On-Call	911
Dane County Emergency Management Office	Hazardous Materials Planning Office (General)	608-266-4330
Local – DNR Water Supply Contact Person	Tom Stunkard Fitchburg	608-275-3300
Central Office – DNR Water Supply	Norman Hahn Madison	608-267-7661
Well Driller	Municipal Well & Pump Tracy Greenfield	Office: 920-324-3400 Cellular: 262-424-2328
Well Driller	Layne Northwest Jeff Gibson	Office: 262-246-4646 After Hours: 262-246-4646 (menu)
Pump Installer	Municipal Well & Pump Tracy Greenfield	Office: 920-324-3400 Cellular: 262-424-2328
Pump Installer	Layne Northwest Jeff Gibson	Office: 262-246-4646 After Hours: 262-246-4646 (menu)
City of Middleton, City Clerk	Lorie Burns	608-821-8350
Village of Shorewood Hills	Village Hall	608-267-2680
State Patrol	Emergency Administration	911 608-266-3212
DNR Spills Program Wisconsin Division of Emergency Mgt.	On-call 24/7	1-800-943-0003 (Menu)
Electric Utility	Madison Gas & Electric Emergency Service	608-252-1111

5.3 CONTINGENCY PLAN

The Utility has formulated a contingency plan for providing water in the event that Unit Well 13 or one or more of the City's other water supply wells became contaminated or removed from service. The plan primarily relies on the capacity of the system without the capacity of any given well or wells to meet the supply needs of the City of Madison.

The City's water system was designed to supply the maximum water demand for an indefinite period with the largest well out of service. As a result, if Unit Well 13, or any other supply well of the water system, is out of service for a short period of time, the reliable water supply capacity is sufficient to meet demands. Unit Well 13 provides reliable supply to the water system and fire protection for the northwest part of the City. In the event of the loss of Well 13, other wells in Zone 6, such as Wells 7 and 15 could be used to serve the area.

Additionally, the City's wells are widely spaced and generally have different recharge areas, thereby making them less vulnerable to potential localized contamination. Unit Well 13 has a standby diesel generator that can power the pump in the event of a power failure. Several other supply well pumping stations are equipped with standby generators or power plugs for connecting portable generators.

The contingency plan also relies on communication with first responders and a plan of action in the event of a water system emergency. Dane County Emergency Management Office will be requested to notify the Water Utility if there is an occurrence in the vicinity of the Unit Well 13 WHPA.

A list of emergency contact numbers was compiled to provide Utility staff immediate access to the appropriate agencies in the event of an emergency. This list is provided in Table 5-2.

5.4 MANAGEMENT PLAN

A management plan was formulated to help protect the Unit Well 13 WHPA from existing and potential future sources of contamination. Table 5-1 summarizes major elements of the management plan.

Public education is an important element in the management plan, particularly because the Unit Well 13 ZOCs include property in the City of Madison, Town of Burke, and the Town of Westport. Educational activities will provide a mutual benefit to the City of Madison and other property owners located within the WHPA and ZOCs.

The hazardous waste collection/disposal program (Clean Sweep) will also be an important part of the management plan. The program provides a means for residents and businesses in the WHPA and throughout the area to properly dispose of hazardous chemicals. Residents and producers of agricultural crops and commodities can dispose of hazardous materials and wastes free of charge. Small quantities of commercial wastes from small businesses can be disposed of for a nominal fee. The City will promote the Clean Sweep programs using the public education activities summarized in this plan.

Local governmental agencies (city, township, and county) recognize the need for planning to protect WHPAs. Intergovernmental cooperation is an important part of the plan as agencies work together to consider the needs for WHP during planning and permitting processes. The City will provide Dane County, the Town of Burke, and the Town of Westport with a copy of the WHPP and maps showing the Unit Well 13 WHPA, the separation distances required between municipal water supply wells and potential contamination sources (Wisconsin Administrative Code, Chapter NR 811.16(4)(d)), and a list of potential contamination sources that can threaten groundwater. The City will encourage county, and other city and village, boards to help protect the WHPA and ZOCs, and upgradient recharge areas when evaluating proposed development.

The City of Madison has a WHP ordinance and overlay zoning district. This WHP ordinance helps ensure that no future potential contamination sources or activities are located or permitted in the WHPA of Unit Well 13.